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Stabilité financière systémique face à l'instabilité récurrente : vers des approches macroprudentielles de la régulation et de la supervision

Systemic financial stability amidst recurrent instability: Toward macroprudential approaches to regulation and supervision

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Abstract

This dissertation is devoted to the topic "Systemic financial stability amidst recurrent instability: Toward macroprudential approaches to regulation and supervision". The main question of the study is how can the effectiveness of macroprudential regulation be increased, taking into account the costs of such regulation and the potential for economic growth? To obtain a comprehensive answer to this question, we study the institutional structure of the MaP, the channels of spread of the financial crisis based on Minsky's theory of the endogenous nature of crises, early warning signal systems, approaches to their identification, and whether there can be alternative structures for maintaining financial stability. In this study we use the following approaches: systematic literature review, institutionalist and holistic approach, descriptive approach, macro-level approach, comparative/descriptive approach, case study approach, qualitative analysis.

First, we study the institutional framework of the MaP to understand how the effectiveness of the MaP can be increased. We analyze and systematize the institutional aspects of the MaP: organizations/institutions and the mechanisms and make a proposal on how it can be improved. We find interesting results that the same components are important for improving some institutional aspects of MaP.

In the second chapter of the dissertation, we consider what are the causes of a financial crisis and how it can be identified. We are based on the theory of Hyman Minsky. The result of the analysis states that no single signal can be recognized as a universal predictor of the crisis. Based on our results and also on the views presented in academic and professional papers, we conclude that the best indicator of a crisis could be an EWS system, which would be a combination of vulnerability indicator/s (excessive credit) and trigger event indicators.

In the third chapter of the study question of how to effectively analyze EWS? We found that the methods for determining EWS based on numerical information can be divided into groups: *econometric* and *machine learning (ML)*. A detailed analysis of the papers allowed us to conclude that ML methods are capable of processing large amounts of data to identify patterns between many variables. We also highlight the EWS analysis method, which can be considered innovative for MaP: the analysis of *text information using deep learning (DL) methods*. Also, we seek an answer to the question whether the MaP applied after 2008 is effective. We consider eight types of risk assessment indicators (example of France, from 2003 to 2024 (or 2023)). We note that five of the eight risk assessment indicators examined showed

a sustained change after the global financial crisis. This points to the effectiveness of the MaP measures implemented since 2008.

In Chapter 4, we address the question of whether there may be alternative structures for maintaining financial stability other than the MaP. As an alternative, we consider the gift economy. In this case, a gift implies a gratuitous renunciation of benefits (high-risk and high-return transactions) to satisfy the interests of other participants (supporting financial stability).

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Résumé détaillé en français

Cette thèse est consacrée au thème « La régulation financière dans un contexte d'instabilité récurrente : vers des approches macroprudentielles de la supervision ». La question principale de l'étude est de savoir comment l'efficacité de la régulation macroprudentielle peut être améliorée, compte tenu des coûts d'une telle régulation et du potentiel de croissance économique. Pour obtenir une réponse complète à cette question, nous étudions la structure institutionnelle du MaP, les canaux de propagation de la crise financière basés sur la théorie de Minsky sur la nature endogène des crises, les systèmes de signaux d'alerte précoce, les approches de leur identification et la possibilité d'avoir des structures alternatives pour maintenir la stabilité financière.

Cette thèse explore les moyens d'améliorer la stabilité financière en augmentant l'efficacité de la politique macroprudentielle (MaP). Bien que la MaP soit utilisée depuis plusieurs décennies, elle est entrée dans une nouvelle phase de développement après la crise financière mondiale de 2008-2009. Les questions de calibrage et d'augmentation de l'efficacité de la MaP restent à ce jour l'objet de débats parmi les autorités et la recherche universitaire. Il est important de trouver un équilibre entre les mesures restrictives de la MaP et le potentiel de croissance économique. Nous pensons que cette tâche est facilitée, d'une part, par la construction d'un cadre institutionnel approprié pour la MaP; d'autre part, par la reconnaissance opportune d'une forte probabilité d'une crise financière et la capacité de calibrer les outils de la MaP en fonction de la situation actuelle (pour laquelle les signaux d'alerte précoce (EWS) sont conçus, l'étude des EWS a constitué une partie importante de cette thèse).

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Depuis la seconde moitié du XXe siècle, le système financier est devenu plus complexe, de nouveaux marchés sont apparus, des innovations financières ont émergé activement (marché

des options, fonds communs de placement, swaps de taux d'intérêt et de crédit) ; des systèmes de règlement, y compris de règlement transfrontalier, se sont développés. Dans le même temps, des vulnérabilités financières ont commencé à émerger, la probabilité de crises financières et les coûts de ces crises pour l'économie ont augmenté. La mondialisation accrue du secteur financier, l'essor des innovations technologiques et leur développement ultérieur ont conduit les banques à entrer sur les marchés internationaux, créant de nouvelles opportunités, mais aussi de nouveaux risques, tant pour les banques que pour l'économie mondiale. Aikman et al, (2013, 11) notent que depuis le début des années 1970, la probabilité de crises systémiques et les coûts des crises systémiques ont augmenté. En termes cumulés, les pertes de production induites par la crise ont atteint près de 60 %, plus de 40 % et plus de 30 % du PIB annuel d'avant la crise au Royaume-Uni, dans la zone euro et aux États-Unis, respectivement. Mais dans le même temps, les bilans des banques mondiales ont doublé entre 1990 et 2007. Par conséquent, la réduction des risques pour le système financier dans son ensemble (risques systémiques) devient une priorité des politiques publiques, et un consensus s'est dégagé au niveau international sur la nécessité d'introduire une régulation macroprudentielle.

Une nouvelle approche de la réglementation a émergé, appelée réglementation macroprudentielle. L'objectif de la réglementation macroprudentielle est de limiter les risques systémiques. Ce type de politique est étroitement lié à la réglementation microprudentielle, elles utilisent souvent des outils similaires (exigences de fonds propres pour les banques, limitation des risques de crédit et de marché, contrôle de la liquidité des institutions financières). Dans le même temps, la réglementation microprudentielle vise à accroître la stabilité financière des institutions financières individuelles, tandis que la réglementation macroprudentielle est responsable de la stabilité du système financier dans son ensemble. Les superviseurs macroprudentiels (Grigaite et al., 2020, 2) cherchent à éviter les coûts associés à l'instabilité financière et se concentrent principalement sur les corrélations et les risques globaux pour les institutions financières (alors que ces corrélations ne sont pas l'objectif principal des superviseurs microprudentiels, puisque leur objectif ultime est de protéger les consommateurs de services financiers). Dans son objectif, la réglementation macroprudentielle se rapproche des objectifs de la politique monétaire (stabilité des prix), et les deux politiques sont également étroitement liées. Essentiellement, cette nouvelle approche (Aikman et al, 2013, 13) vise à combler le fossé entre la politique macroéconomique d'une part et la réglementation microprudentielle d'autre part, afin de garantir que les règles réglementaires soient cohérentes avec les risques qui surviennent dans l'ensemble du système financier.

Pour comprendre les fondements du maintien de la stabilité financière, cette thèse étudie plusieurs cadres conceptuels de la politique macroprudentielle qui convergent autour de questions critiques communes.

Cadre institutionnel de soutien à la stabilité financière. Le cadre institutionnel de la politique comprend deux domaines principaux : les institutions/organisations qui mettent en œuvre des actions visant à maintenir la stabilité financière et les mécanismes, y compris le cadre réglementaire, au moyen desquels la stabilité financière est soutenue. En outre, la réglementation elle-même comprend le niveau national et international, ou comme dans le cas de l'Union européenne, le niveau régional s'ajoute. Les mécanismes de régulation financière comprennent l'accès à l'information, l'identification des risques, la mise en œuvre des outils MaP, le calibrage des mesures MaP, la coordination avec d'autres politiques, la communication avec d'autres politiques et la société.

Identification des risques pour la stabilité financière. Actuellement, les risques pour la stabilité financière sont identifiés au moyen de tests de résistance ou de signaux d'alerte précoce. Les tests de résistance peuvent être appliqués aux institutions financières, à un secteur économique ou à l'économie dans son ensemble. En règle générale, ces tests de résistance sont une analyse de type « et si ». Les tests de résistance reposent sur la construction de scénarios plausibles, puis sur l'évaluation des risques qui surviennent dans chaque scénario.

Un signal d'alerte précoce est un indicateur d'augmentation du risque. Un grand nombre d'études universitaires sont consacrées aux signaux d'alerte précoce d'une crise financière et il n'existe pas de compréhension commune du meilleur système de tels signaux. On suppose que le dépassement d'un certain niveau d'un signal constitue déjà une évaluation du risque financier et implique des actions ultérieures pour appliquer des outils de politique macroprudentielle. L'identification des signaux d'alerte précoce est consacrée à une partie importante de cette thèse.

Les outils de la politique macroprudentielle. La disponibilité d'instruments macroprudentiels diversifiés pour contenir le risque systémique excessif est un élément important de la réglementation financière. Actuellement, de nombreux outils de la politique macroprudentielle ont été développés, notamment les tampons contracycliques, les exigences de fonds propres de conservation, les limites d'endettement, les provisions pour pertes sur prêts, les limites de croissance du crédit, les restrictions de prêts, les limites de devises étrangères, les limites du ratio prêt/valeur, les limites du ratio service de la dette/revenu, les exigences de

liquidité, les limites du ratio prêts/dépôts, les limites des positions de change, les exigences de réserves, le concept de SIFI (institutions financières d'importance systémique) et d'autres. L'interaction des instruments de politique macroprudentielle mérite une attention particulière. Une conséquence de cela est la question du choix par les autorités de l'ensemble optimal d'instruments de politique macroprudentielle et de leur calibrage.

La question de recherche centrale abordée dans cette thèse est:

> *Comment accroître l'efficacité de la régulation macroprudentielle, en tenant compte des coûts de cette régulation et du potentiel de croissance économique ?*

L'équilibre entre le coût de la régulation pour l'économie et les bénéfices de la stabilité financière est particulièrement pertinent en cette période de crise du COVID-19. Dans cette optique, il semble opportun de déterminer la nature, les conditions et la portée des modèles possibles de cadres macroprudentiels en vue de renforcer l'efficacité de la régulation et de la supervision des marchés financiers ainsi que les pratiques de régulation microprudentielle en vigueur depuis les années 1990 sur les marchés financiers. À la lumière de la crise financière mondiale, la régulation microprudentielle à elle seule ne s'est pas avérée apte à assurer la stabilité systémique des marchés. Par conséquent, l'attention peut être portée sur la possibilité d'envisager des combinaisons innovantes d'instruments de régulation macroéconomique et de moyens susceptibles de réduire l'occurrence et la gravité des crises financières majeures sans entraver le dynamisme des marchés financiers innovants. L'évaluation de la stabilité financière au moyen d'indicateurs d'alerte précoce ou de systèmes de tests de résistance semble être un élément important pour maintenir la stabilité financière (ou contenir l'instabilité financière).

Dans le sillage de la crise financière mondiale de 2007-2008, les autorités de supervision et de régulation financières ont cherché à concevoir des politiques macroéconomiques plus préventives pour recadrer les marchés de manière stable. Les MaPs et les outils associés tels que les modèles de signaux d'alerte précoce (EWS), qui sont les principaux mécanismes de supervision et de régulation utilisés au cours des dernières décennies, peuvent être considérés comme des pratiques innovantes spécifiques par rapport aux précédentes règles microprudentielles guidées par le marché qui étaient en vigueur dans les années 1990-2000. Un grand nombre d'études récentes (Adrian et al., 2022, Laeven et al., 2022, Belkhir et al., 2022, Laeven et al., 2022a, pour n'en citer que quelques-unes) plaident en faveur de l'efficacité des MaPs. En particulier, Adrian et al. (2022) notent le rôle positif des mesures MaP introduites

pendant la pandémie de COVID-19 et le cadre politique solide mis en place au lendemain de la crise financière mondiale pour contenir l'impact financier de la pandémie.

Parallèlement, plusieurs études soulignent les coûts des MaPs en termes de réduction de l'offre de crédit au secteur des entreprises (Laeven et al., 2022a), d'augmentation de la stabilité du secteur financier en raison d'une efficacité réduite dans le secteur non financier (Belkhir et al., 2022), d'augmentation des risques dans le secteur non bancaire (Adrian et al., 2022) et d'une réduction du potentiel de croissance économique (Laeven et al., 2022a).

Les recherches soulignent généralement ces effets comme étant le résultat des mesures MaP. Dans le même temps, la contribution d'autres facteurs tels que les effets des crises économiques, la baisse de la demande et des revenus et d'autres chocs financiers ne peut être ignorée. Néanmoins, si l'on considère la tâche des MaPs de réduire la probabilité d'une crise financière, alors parmi toutes les approches, celle qui a le moins d'effets secondaires peut être considérée comme la meilleure.

Pour confirmer l'efficacité des MaPs, les coûts de leur activation ont été peu étudiés (Laeven et al., 2022). Trouver un compromis entre les avantages et les coûts de l'application des MaPs est un défi important pour les autorités (Laeven et al., 2022, Laeven et al., 2022a, Borio et al., 2022) et peut être réalisé en calibrant les instruments de politique. De plus, un calibrage approprié des instruments MaP peut réduire le montant des interventions au cours du cycle (Laeven et al., 2022a, p. 4).

Il existe peu d'outils disponibles pour aider les décideurs politiques à identifier les bonnes mesures et le bon calendrier de mise en œuvre des politiques (Barbieri et al., 2022, p. 18). Barbieri et al. (2022) proposent de diviser la croissance du crédit en trois composantes (une composante globale qui capture la croissance moyenne du crédit dans les différentes banques/entreprises, et des composantes idiosyncratiques de l'offre et de la demande qui mesurent le degré d'hétérogénéité et d'asymétrie de la distribution de la croissance du crédit entre emprunteurs et prêteurs). Le modèle suggéré régresse la croissance du crédit des banques et des entreprises sur l'ensemble des effets fixes du temps bancaire et du temps de l'entreprise. La « composante commune » est ensuite définie comme la médiane des effets fixes sur toutes les banques et entreprises sur la période. Enfin, en tant que composante « demande » (offre), elle représente la médiane des effets fixes décomposés au niveau de l'entreprise et de la banque sur la même période. Schmitz et al. (2022) donnent la priorité à la suppression des doublons réglementaires et à l'utilisation flexible du tampon de fonds propres, tout en attirant l'attention

sur le décalage temporel des données, l'incertitude des données et des modèles, et notent que la plupart des pays utilisent pour calibrer les mesures MaP. Le Conseil européen du risque systémique (ESRB, 2014) recommande six catégories : l'évolution du crédit du secteur privé et le fardeau de la dette, la surévaluation des prix de l'immobilier, les déséquilibres extérieurs, la mauvaise évaluation des risques et la solidité des bilans bancaires.

L'efficacité des MaPs repose plutôt sur l'efficience des mesures et sur les coûts de leur mise en œuvre qui dépendent presque des outils (indicateurs, modèles d'évaluation, mécanismes) qui doivent être conçus et calibrés en fonction des données et des informations disponibles (et traitables). L'identification des signaux pour l'étalonnage des MaPs est une tâche importante pour les décideurs politiques. Dans le cadre innovant de surveillance et de régulation macroprudentielles en vigueur depuis la crise financière mondiale, les EWS sont utilisés comme outils appropriés pour calibrer les MaPs.

Dans cette thèse, nous cherchons à identifier les EWS et les approches pertinentes à utiliser par les décideurs politiques pour calibrer efficacement les instruments et améliorer l'efficacité des politiques. Nous identifions les similitudes et les différences entre plusieurs approches EWS, sur la base d'une analyse et d'une synthèse complètes de plusieurs travaux dans le domaine afin de contribuer à l'évaluation des EWS les plus efficaces pour un meilleur calibrage des outils MaP, nous étudions les approches d'évaluation des EWS à la lumière des pratiques réglementaires actuelles et du développement des technologies de l'information, et faisons également des propositions pour améliorer la structure institutionnelle des MaP.

Cette thèse adopte une approche holistique, affirmant que la politique macroprudentielle est une approche efficace pour parvenir à la stabilité financière. Cependant, les questions d'identification rapide des risques systémiques, d'équilibre entre le coût et l'efficacité de la réglementation et de calibrage des mesures de MaP restent l'objet de débats politiques et de recherches universitaires. L'analyse présentée dans cet article vise à identifier un cadre institutionnel clair et complet pour la MaP afin d'identifier les moyens possibles d'améliorer l'efficacité de la politique.

La question de recherche est abordée dans quatre chapitres, chacun abordant un aspect différent de cette étude. Ces chapitres sont conçus comme des articles autonomes ou des chapitres de livres, dont certains ont déjà été rédigés, tandis que d'autres sont en cours de rédaction ultérieure sous forme d'articles.

Chapitre 1: Aspects institutionnels des politiques macroprudentielles.

Ce chapitre analyse et systématise les aspects institutionnels des MaPs et fait des propositions pour améliorer la structure institutionnelle des MaPs. Une partie de ce chapitre sera soumise pour publication au Journal of Economic Issues sous forme d'article dans un avenir proche. Une autre partie du chapitre est en attente de publication dans l'ouvrage collectif «Climate Change, Financial Markets, and Systemic Risks: From Observations to Expectations», dont la publication est prévue par Routledge début 2025.

Le chapitre identifie le cadre institutionnel des MaPs : les organismes et organisations dotés de pouvoirs en matière de MaPs et responsables de sa mise en œuvre et de son contrôle ; les mécanismes des MaPs, y compris l'accès à l'information, l'identification des risques, la mise en œuvre des instruments de politique, le calibrage des mesures politiques, la coordination avec d'autres politiques, la communication avec d'autres politiques et la société.

Les structures organisationnelles alternatives pour la MaP sont analysées. Le mandat de la MaP peut appartenir à la Banque centrale, au gouvernement (par exemple, le ministère des Finances), à un autre organisme financier, à un comité composé de représentants de ces organisations (la coordination étant assurée à la fois par le gouvernement et la Banque centrale), à une gestion décentralisée (diverses agences). Nous concluons que les structures centralisées ou de coordination semblent préférables, car elles garantissent une délégation claire de l'autorité et de la responsabilité de prendre des décisions en temps opportun. En outre, l'attribution du mandat de la MaP à la Banque centrale (ou à une autre agence si les pouvoirs pertinents lui sont attribués) semble justifiée, car la MaP est étroitement liée à la politique microprudentielle et à la politique monétaire, et il est important que ces domaines politiques agissent dans la même direction dans l'intérêt du développement économique.

La pratique moderne de la MaP s'inspire largement de l'approche néo-institutionnaliste. Les institutions sont des organisations qui créent et appliquent des lois. Au niveau national et international, des réglementations ont été élaborées qui contiennent des règles pour les banques et autres institutions financières, qui fixent des limites pour les institutions financières (par exemple, les exigences minimales de capital, les exigences de liquidité, les restrictions de crédit) et les pouvoirs de régulation. Ces mesures visent à réduire le risque systémique et à accroître la stabilité financière, et devraient donc contribuer à la croissance économique et au développement. Les MaPs incluent des caractéristiques de différentes approches de l'institutionnalisme ; nous mettons en évidence les approches normatives et empiriques.

Le chapitre propose des recommandations pour améliorer les aspects institutionnels des MaPs. En ce qui concerne les pouvoirs et les mandats des organisations, il est important d'accorder des pouvoirs à une institution centralisée ou de coordination au niveau national, en tenant compte de la réglementation internationale. L'accès à l'information est assuré par la présence de pouvoirs appropriés ou une bonne coordination avec les agences qui consolident l'information. L'accès à l'information, la présence d'un système d'alerte précoce et la disponibilité d'outils d'analyse de big data sont importants pour l'identification rapide des risques. La sélection et la mise en œuvre des outils politiques doivent être basées sur l'identification d'un ensemble d'instruments MaP et de situations de leur utilisation, la présence d'un mandat pour l'application des mesures MaP, un système de détermination de l'intensité des mesures, l'utilisation de l'expérience antérieure et un système d'évaluation des résultats. Le calibrage des mesures politiques doit être effectué par la sélection de signaux d'alerte précoce pour une crise, l'accès à l'information, le suivi des changements de signal et un système de réponse aux changements de signal. Pour coordonner la MaP avec d'autres politiques, il est important d'établir des canaux d'échange d'informations avec d'autres organismes ou de consolider les mandats de mise en œuvre de différentes politiques au sein d'une institution et de publier une stratégie MaP. Pour une communication efficace avec les organismes économiques et la société, nous recommandons de définir des canaux de communication, la fréquence des communications, l'ouverture des objectifs de la MaP et de publier une stratégie MaP et les résultats de sa mise en œuvre.

Malgré le fait que les éléments de lutte contre les crises financières systémiques sont appliqués depuis assez longtemps, les questions d'augmentation de la stabilité financière restent très demandées. Cela est dû en partie au changement et à la complexité du système financier et à l'émergence de nouveaux risques. D'autre part, les systèmes qui existaient avant 2008 se sont révélés imparfaits et rien ne prouve que les mesures de politique macroprudentielle utilisées soient définitivement efficaces. La question reste de savoir si le système financier est suffisamment protégé contre les risques à l'heure actuelle.

Pour accroître l'efficacité de la politique macroprudentielle, il est nécessaire de déterminer le spectre selon le critère de stabilité financière/crise, et également d'ajuster le calibrage des mesures de politique macroprudentielle en fonction de l'ampleur du risque potentiel. Il est évident que les politiques monétaires et macroprudentielles sont nécessaires à un développement économique équilibré et à une protection contre les crises financières.

Chapitre 2: Stabilité financière, surveillance macroprudentielle et signaux d'alerte précoce (EWS): une interprétation minskienne.

Ce chapitre étudie la nature d'une crise financière systémique et les canaux par lesquels elle peut se propager. Ce chapitre est actuellement en préparation pour publication dans le Journal of Post Keynesian Economics, publication prévue par Taylor & Francis en 2025. Les éléments de ce chapitre ont été présentés lors du 2e Forum financier international qui s'est tenu en juin 2023 à Grenoble.

Nous avons examiné les EWS utilisés dans la politique macroprudentielle au cours des dernières décennies et la large gamme d'EWS proposés aux chercheurs. Nous proposons une systématisation des EWS par canal de crise à travers une synthèse de différents travaux qui ont été menés depuis la crise financière mondiale et qui représentent diverses approches utilisées dans ce domaine. Nous concluons qu'il existe une grande variété de variables qui peuvent être utilisées comme EWS. Cependant, nous ne pouvons pas affirmer que les EWS sont suffisamment bien mis en œuvre dans les politiques macroprudentielles. En nous appuyant sur l'analyse de Minsky du caractère endogène des crises financières systémiques, nous soutenons que la variété des variables proposées comme EWS doit être revue afin de trouver des critères plus solides et plus proactifs qui pourraient être utilisés par les autorités pour améliorer l'efficacité des politiques macroprudentielles.

Le succès de la mise en œuvre de la politique macroprudentielle est largement déterminé par l'équilibre entre les coûts et les avantages ultérieurs, c'est-à-dire la diminution de la probabilité d'une crise systémique dans l'économie et l'effet modérateur que les mesures de politique macroprudentielle peuvent avoir sur la croissance économique. Par conséquent, les questions d'amélioration de l'efficacité des politiques macroprudentielles restent d'actualité des décennies après la crise financière mondiale. Nous considérons les EWS comme un élément de la politique macroprudentielle qui pourrait permettre aux autorités d'identifier le bon moment et la manière appropriée d'appliquer ou de modifier les mesures de politique macroprudentielle.

Les conclusions tirées après la crise financière mondiale coïncident avec celles tirées par Minsky dans les années 1990: la nature endogène des crises financières et leur caractère sensible au crédit dans l'évolution capitaliste, conduisant au paradoxe de la tranquillité (la situation de marché la plus calme peut être la plus risquée). Nous analysons un certain nombre de recherches pour identifier des exemples d'indicateurs EWS qui pourraient indiquer la phase d'expansion du cycle financier. Les indicateurs étudiés peuvent être divisés en trois groupes :

liés au crédit, liés au prix des actifs et mixtes (indices de condition financière). Selon l'approche de Minsky, les indicateurs liés au crédit et au prix des actifs sont endogènes et reflètent pleinement le schéma d'origine de crise de Minsky (financement de couverture, financement spéculatif et financement de Ponzi).

Divers indicateurs se sont avérés efficaces sous des hypothèses spécifiques, mais un indicateur ne correspond pas à tous les canaux probables de crise. Il est donc important d'utiliser un système d'indicateurs pour mettre en œuvre une politique macroprudentielle efficace. Comme le soutiennent Rocha et Perrelli (2023 : 109) : « L'une des principales contributions des systèmes d'alerte précoce est d'informer les gouvernements et les décideurs politiques sur les vulnérabilités du système économique sous-jacent et ses liens macrofinanciers qui pourraient éventuellement conduire à une crise monétaire.» Afin d'identifier l'ensemble limité de systèmes d'alerte précoce nécessaire qui peut être proposé aux autorités pour déterminer la probabilité d'une crise, nous examinons les canaux possibles de propagation de la crise financière. Une crise financière peut être considérée comme une combinaison de vulnérabilité et d'événements déclencheurs. Par vulnérabilité, nous entendons des prêts excessifs. Cependant, le crédit lui-même ne provoque pas de crise s'il n'y a pas d'insolvabilité des participants au processus de prêt. Nous considérons que les causes d'insolvabilité des acteurs du marché sont des déclencheurs. Les canaux de propagation de la crise (déclencheurs) peuvent être du côté de l'emprunteur comme du côté du prêteur. Les prix des actifs (marché des capitaux, immobilier, autres) peuvent également être un canal d'émergence d'une crise. Les prix élevés des actifs correspondent à la phase de boom au sens de Minsky, une correction ultérieure des prix peut être le déclencheur d'une crise (comme lors de la crise financière mondiale). Les acteurs du marché peuvent évaluer leurs risques individuels, mais ne peuvent pas évaluer correctement les risques macroéconomiques. Pour cette raison, la réglementation macroprudentielle par les autorités joue un rôle de premier plan dans la prévention des crises financières. L'« Agenda pour la réforme » de Minsky (1986) prône un « Big Government » qui chercherait, par le biais d'une réglementation financière appropriée et de systèmes de contre-attaque, à stabiliser les marchés. Les EWS pourraient être considérés comme faisant partie du cadre que les systèmes de contre-attaque peuvent utiliser à cette fin.

Nous proposons ensuite de compléter les approches de politique macroprudentielle existantes en systématisant les EWS existants en signaux liés à la vulnérabilité (liés au crédit), signaux déclencheurs (côté emprunteur, côté prêteur, liés au prix des actifs et autres) et en les utilisant comme système pour déterminer la probabilité d'une crise financière. En particulier, la

croissance du crédit, l'écart de crédit, l'écart crédit/PIB peuvent être utilisés comme indicateurs de vulnérabilité. Nous suggérons le ratio du service de la dette comme déclencheur côté emprunteur ; le ratio de couverture de la liquidité et le ratio de financement stable net comme déclencheur côté prêteur (offre) ; les écarts de prix de l'immobilier et des actions, le VIX (indice de volatilité) comme déclencheur du prix des actifs. D'autres indicateurs, en particulier ceux liés à la monnaie ou à l'investissement (taux de compte courant/d'épargne, variations des taux d'intérêt nominaux à long terme, ratio investissement/PIB) peuvent compléter le système EWS. Un développement ultérieur de l'étude pourrait consister tout d'abord à tester chacun des déclencheurs (côté emprunteur, côté prêteur, liés au prix des actifs et autres) pour déterminer leur importance dans la détermination de la probabilité d'une crise; deuxièmement, identifier un meilleur indicateur pour chacun des groupes d'indicateurs.

Chapitre 3: Les politiques macroprudentielles à la lumière du développement des technologies de l'information : une synthèse sur les signaux d'alerte précoce efficacies.

Ce chapitre est accepté pour publication sous forme d'article dans la revue Alter Economics Volume 21, n° 3 en 2024 (pp. 512-526). Les éléments de ce chapitre ont été présentés au 3e Forum financier international qui s'est tenu en septembre 2024 à Grenoble.

Le troisième chapitre attire l'attention sur le fait que les MaP se sont avérées être un outil efficace pour atténuer l'ampleur et les effets des crises financières (Adrian et al., 2022, Laeven et al., 2022, Belkhir et al., 2022, Laeven et al., 2022a), en particulier au lendemain de la crise financière mondiale. Dans le même temps, les MaP ont des coûts en termes de réduction de l'offre de crédit dans le secteur des entreprises (Laeven et al., 2022a), d'augmentation de la stabilité du secteur financier en raison d'une efficacité réduite dans le secteur non financier (Belkhir et al., 2022) et de risques accrus dans le secteur non bancaire (Adrian et al., 2022), et de réduction du potentiel de croissance économique (Laeven et al., 2022a).

Les MaP ne sont pas statiques, nécessitant un calibrage ou de nouveaux outils en fonction de la probabilité d'une crise financière. Les EWS servent cet objectif. Cependant, à travers les différents travaux présentés dans cet article, on peut évidemment constater qu'il n'existe pas un ou même quelques signaux universels. De nombreux indicateurs, y compris des indices agrégés (Eberhardt et Presbitero, 2018, Borio et al., 2019, Chen et Svirydzenka, 2021) peuvent être considérés comme des EWS ; il est clair que tout modèle visant à déterminer la probabilité d'une crise financière devrait impliquer un système des meilleurs indicateurs de

différents domaines, et probablement se concentrer sur les caractéristiques individuelles lorsqu'il s'agit des cas de différents groupes de pays.

Cette partie tire quelques conclusions majeures de l'étude de divers articles sur les EWS:

1. Il n'existe pas de compréhension commune de l'horizon temporel des EWS. L'examen des horizons temporels devrait peut-être se baser sur l'action des outils MaP (le temps nécessaire entre le calibrage ou le démarrage de l'outil et l'effet).

2. Les études ne traitent pas du calibrage des outils MaP, mais de la relation entre les EWS et la survenue d'une crise.

Les articles de recherche sont similaires en termes de méthodologie (analyse empirique). Ils prennent en compte les moments de crise et testent un certain nombre d'indicateurs comme variables explicatives. Cependant, la définition des moments de crise et l'ensemble des variables explicatives elles-mêmes diffèrent.

Les méthodes existantes pour déterminer les EWS peuvent être divisées en deux grands groupes : l'utilisation de données numériques ou l'utilisation de données textuelles pour l'analyse. L'utilisation de données numériques est beaucoup plus répandue et comprend deux directions : l'analyse économétrique et l'apprentissage automatique. L'apprentissage automatique permet de traiter une plus grande quantité de données, ce qui est pertinent pour déterminer les paramètres de stabilité financière et les signaux d'alerte précoce. Ceci est confirmé par l'expérience de la BCE dans le rapport annuel sur la stabilité financière 2023, qui présente plus de 100 paramètres caractérisant la stabilité financière.

Les techniques d'apprentissage profond sont bien établies pour l'analyse de texte, cela peut être complémentaire à l'évaluation d'une crise potentielle, car on peut juger les signaux/attentes d'une crise en évaluant le sentiment dans les actualités ou les publications sur les réseaux sociaux. La pertinence de ces indicateurs est indirectement confirmée par le rapport sur la stabilité financière de la BCE sur un certain nombre d'indicateurs classés comme simulation/attente.

Malgré l'abondance des méthodes de détermination de l'EWS et des indicateurs eux-mêmes, la question reste ouverte quant à la manière exacte dont le MaP est calibré en fonction des signaux reçus. Nous proposons de répondre à cette question en utilisant les signaux qui ont montré une corrélation avec les mesures du MaP. Nous avons étudié l'évolution des indicateurs d'évaluation des risques présentés sur le site Web de la BCE sur l'exemple de la France de 2003

à aujourd'hui. Cinq des huit indicateurs examinés ont montré un changement de tendance constant après 2008 et le durcissement des mesures du MaP. D'une part, nous pouvons confirmer l'efficacité des mesures du MaP. D'autre part, nous pouvons suggérer que ces indicateurs particuliers (dont la corrélation a déjà été mesurée en fonction de l'évolution du MaP) peuvent être de bons indicateurs pour calibrer le MaP.

Chapitre 4: À la recherche d'une régulation financière pertinente : quelques leçons de l'économie du don.

Les éléments de ce chapitre ont été publiés en co-écriture avec le professeur Faruk Ulgen dans le livre The Gift in the Economy and Society Perspectives from Institutional Economics and Other Social Sciences par Routledge en 2021 (pp. 160-188).

Ce chapitre a cherché à évaluer si la réciprocité en tant que règle de l'économie du don pouvait fournir un ancrage institutionnel pertinent qui pourrait offrir un cadre de régulation financière capable de renforcer le fonctionnement des marchés financiers et d'assurer la stabilisation systémique des économies monétaires. Alors que le programme libéral basé sur l'intérêt privé tend à ignorer la nécessité d'institutions intégrées cohérentes, une analyse institutionnelle-évolutionniste fait ressortir les fragilités structurelles du fonctionnement du capitalisme financiarisé et souligne la nécessité d'un recadrage des marchés et des institutions. Minsky (1986b, p. 281) soutient : Si les effets perturbateurs du secteur bancaire doivent être limités, les autorités doivent baisser les yeux et accepter la nécessité de guider et de contrôler l'évolution des usages et des pratiques financières. Dans un monde d'hommes d'affaires et d'intermédiaires financiers qui recherchent agressivement le profit, les innovateurs devanceront toujours les régulateurs ; les autorités ne peuvent pas empêcher les changements dans la structure des portefeuilles de se produire. Ce qu'elles peuvent faire, c'est maintenir le ratio actifs/fonds propres des banques dans des limites en fixant des ratios d'absorption des fonds propres pour divers types d'actifs. Si les autorités contrôlent les banques et sont conscientes des activités des banques marginales et des autres institutions financières, elles seront mieux placées pour atténuer les tendances expansionnistes perturbatrices de notre économie.

Paradoxal en apparence (mais logiquement naturel si l'on prend en compte «l'hypothèse d'instabilité financière endogène» de Minsky, le «paradoxe de la rationalité» d'Iwai et le «sophisme de planification» de Kahneman), la libéralisation des marchés financiers accroît le besoin de surveillance publique puisqu'elle se traduit par une financiarisation systémique avec des effets continus et permanents sur l'économie : « Dans un système financier de marché, les

évolutions du secteur bancaire et du marché des capitaux sont indissociables, et les fluctuations des conditions financières ont un impact considérable sur le fonctionnement de l'économie réelle » (Adrian et Shin, 2010, p. 5).

La stabilité du système financier apparaît donc comme une préoccupation générale qui doit être considérée à un niveau macroéconomique. Dans ce but, la règle de réciprocité semble être une source de réflexion pertinente pour fournir un modèle alternatif d'organisation des marchés financiers. Cependant, dans une société capitaliste, la réciprocité doit reposer sur des règles collectives données socialement. Il faudrait s'appuyer sur une régulation financière spécifique, encadrée selon un schéma de contraintes sociétales lié à la réciprocité, qui tienne compte de la complexité des décisions humaines (au-delà de simples modèles techniques) et des stratégies (au-delà de quelques calculs optimaux simplistes). L'élaboration nécessaire d'un cadre réglementaire financier cohérent devrait chercher à renforcer la confiance entre les acteurs du marché, mais aussi entre les marchés et la société, et entre les marchés et les régulateurs.

Pour cela, la régulation doit contraindre les acteurs de marché à respecter la réciprocité dans leurs relations de marché, par le biais de contraintes et d'incitations macro-prudentielles. Dans un tel schéma, la réciprocité jouerait un rôle holistique au-delà des restrictions réglementaires légales imposées par les autorités publiques, tandis que sa pertinence serait étroitement liée à la force de ces restrictions.

Contributions. Les différentes analyses développées dans cette recherche doctorale visent à fournir une analyse complète et holistique des moyens d'améliorer la stabilité financière par le développement d'éléments individuels de régulation macroprudentielle ou d'approches alternatives, en tenant compte de l'approche de l'équilibre entre le coût et l'efficacité de la régulation, du développement des technologies de l'information et des pratiques réglementaires modernes. Les principales contributions de cette recherche sont les suivantes :

• **Analyse globale.** Cette thèse utilise une approche diversifiée, reconnaissant que l'amélioration de l'efficacité de la politique macroprudentielle est une tâche complexe nécessitant une étude sous plusieurs angles. Chaque section de la thèse aborde un aspect différent du problème, en recherchant des solutions basées sur une synthèse des informations existantes et une nouvelle perspective basée sur les développements actuels du système financier. En étudiant le cadre institutionnel de MaP, les chemins et les causes des crises financières, le système de signaux pour l'identification des crises et le calibrage des politiques, les moyens d'identification et d'évaluation de ces signaux et les approches alternatives pour

maintenir la stabilité financière, la thèse apporte des réponses aux questions sur la manière dont l'efficacité des politiques peut être améliorée.

• **Compréhension contextuelle.** Chaque chapitre fournit une compréhension contextuelle de la stabilité financière et de l'efficacité des politiques en étudiant différents aspects du problème. Dans la thèse, nous nous concentrons sur des concepts tels que la stabilité financière, les indicateurs de stabilité financière et de crise financière, la politique macroprudentielle, son cadre institutionnel, l'efficacité de MaP, le calibrage des politiques et les signaux d'alerte précoce. En outre, l'étude des indicateurs d'évaluation des risques sur l'exemple de la France, présentés par la BCE sur la période 2003-2024 et l'analyse du Rapport annuel sur la stabilité financière 2023 permettent de tirer des conclusions sur l'efficacité du MaP depuis 2008 et fournissent des pistes pour améliorer les approches en vue d'un meilleur calibrage des mesures de politique économique. En analysant et en systématisant ces contextes, la thèse donne un aperçu du potentiel d'amélioration de l'efficacité des politiques macroprudentielles.

• **Pertinence pratique.** L'approche multidimensionnelle de l'étude accroît sa portée pratique. Les idées et propositions issues de l'analyse et de la systématisation de divers aspects de la politique nous permettent de formuler des recommandations qui peuvent être appliquées par les décideurs politiques pour améliorer l'efficacité du MaP et, par conséquent, accroître la stabilité financière. Parmi ces recommandations, nous incluons des propositions pour améliorer la structure institutionnelle du MaP ; une proposition pour un système d'alerte précoce qui prend en compte divers canaux d'occurrence de crise ; des propositions pour utiliser des méthodes d'apprentissage automatique pour analyser les big data et des méthodes d'apprentissage profond pour analyser les sentiments et les attentes en analysant les informations textuelles. La prise en compte de divers aspects de la stabilité financière et de la politique fournit une base aux décideurs politiques pour développer un cadre visant à améliorer l'efficacité des mesures de soutien à la stabilité financière.

• **Contribution académique.** Les chapitres sont destinés à contribuer au discours académique par le biais de présentations lors de conférences et de publications dans des revues académiques et des ouvrages collectifs. Cela garantit que la recherche atteint un large public. Il est prévu qu'une fois le processus d'acceptation terminé, les chapitres de cette étude seront publiés dans deux ouvrages collectifs, trois revues académiques ; Les résultats de la thèse ont été présentés lors de deux conférences internationales et de plusieurs séminaires universitaires. Cette étude contribue au débat académique et fournit des orientations pour de futures recherches

dans le domaine de la régulation macroéconomique et de la stabilité financière. Par exemple, le système de signaux d'alerte précoce proposé peut être testé sur des données pratiques. Les résultats de la thèse élargiront la portée de la littérature existante en mettant en évidence les interrelations entre les différents éléments de la régulation financière.

L'étude de divers aspects de la réglementation macroprudentielle et des approches alternatives nous a permis de formuler une vision globale des moyens possibles d'améliorer l'efficacité du MaP et de maintenir la stabilité financière; a ouvert de nouveaux domaines de recherche universitaire possibles; et nous a permis de faire des propositions aux décideurs politiques sur l'amélioration de certains aspects du MaP.

Tout d'abord, nous étudions le cadre institutionnel du MaP pour comprendre comment l'efficacité du MaP peut être augmentée. Nous analysons et systématisons les aspects institutionnels du MaP et arrivons à la conclusion qu'il comprend deux composantes principales - ce sont les organisations/institutions qui mettent en œuvre le MaP et les mécanismes par lesquels le MaP est mis en œuvre. Le MaP peut être mis en œuvre par différents types d'institutions : la Banque centrale, le Gouvernement, leurs comités ou des structures mixtes. Les résultats des travaux universitaires étudiés montrent que pour la mise en œuvre réussie du MaP, il est nécessaire que le mandat de la politique soit attribué à un organisme spécifique, car la responsabilité de l'application opportune de la politique et de l'analyse de l'efficacité des mesures appliquées est importante. C'est-à-dire que le mandat du MaP doit être centralisé, alors qu'il n'est pas essentiel qu'il s'agisse, par exemple, de la Banque centrale ou du Gouvernement. Il est plus important que cet organisme ayant le mandat du MaP ait une bonne coordination avec les titulaires de mandats pour d'autres politiques telles que la microprudentielle ou la politique monétaire ou que toutes ces politiques relèvent de la responsabilité d'une seule organisation. Nous voyons que les institutions mettant en œuvre le MaP se situent à trois niveaux : international (recommandations du Comité de Bâle), régional (peuvent être présentes ou absentes, exemple : BCE) et national (Banque centrale, Gouvernement, comités).

Dans cette étude, nous systématisons les mécanismes institutionnels d'organisation du MAP proposés dans divers travaux universitaires (Chagas Goudard et Bittes Terra, 2015; Egawa et al., 2015; Grigaite et al., 2020; Nier et al., 2011): accès à l'information, identification des risques, sélection et mise en œuvre des outils politiques, calibrage des mesures politiques, coordination avec d'autres politiques, communication avec les agents économiques et la société. Pour chacun des aspects institutionnels identifiés du MAP, nous faisons une proposition sur la manière dont il peut être amélioré. L'accès à l'information est assuré par la présence de pouvoirs

appropriés ou une bonne coordination avec les agences qui consolident l'information. L'accès à l'information, la présence d'un système d'alerte précoce (SAP) et la disponibilité d'outils d'analyse de big data sont importants pour l'identification rapide des risques. Français La sélection et la mise en œuvre des outils politiques doivent être basées sur l'identification d'un ensemble d'outils MaP et de situations de leur utilisation, la présence d'un mandat pour l'application des mesures MaP, un système de détermination de l'intensité des mesures, l'utilisation de l'expérience antérieure et un système d'évaluation des résultats. Le calibrage des mesures politiques doit être effectué par le biais de la sélection d'EWS pour une crise, de l'accès à l'information, du suivi des changements de signaux et d'un système de réponse aux changements de signaux. Pour coordonner MaP avec d'autres politiques, il est important d'avoir établi des canaux d'échange d'informations avec d'autres agences ou de consolider les mandats pour la mise en œuvre de différentes politiques dans une institution, et de publier une stratégie MaP. Pour une communication efficace avec les agences économiques et la société, nous recommandons de définir des canaux de communication, la fréquence de la communication, l'ouverture des objectifs MaP et de publier une stratégie MaP et les résultats de sa mise en œuvre.

Nous avons trouvé des résultats intéressants qui montrent que les mêmes composants sont importants pour améliorer certains aspects institutionnels du MaP, à savoir un système d'alerte précoce, qui peut améliorer à la fois l'identification des risques et (ce qui est tout aussi important) le calibrage du MaP, c'est-à-dire rendre les mesures du MaP plus efficaces. L'étape suivante de notre recherche a consisté à trouver et à analyser les causes et les canaux de la crise financière, nous avons donc essayé de répondre à la question de savoir quel devrait être un système d'alerte précoce efficace. Nous comprenons que l'option que nous avons proposée pour améliorer la structure institutionnelle du MaP n'est peut-être pas la seule et que ce domaine peut inclure un large éventail d'améliorations diverses.

Dans le deuxième chapitre de la thèse, nous cherchons une réponse à la question de savoir quelles sont les causes d'une crise financière et comment elle peut être identifiée, et donc quel devrait être un système efficace de signaux d'alerte précoce sur une forte probabilité d'une crise. Pour étudier la nature de l'émergence d'une crise financière, nous nous tournons vers la théorie de Hyman Minsky (Minsky 1986, Minsky 1992, Ferri et Minsky 1992). Les affirmations de Minsky reposent sur le fait que les causes d'une crise financière ont un caractère endogène, qui est associé aux vulnérabilités du crédit excessif et sont liées au paradoxe de l'instabilité financière (le système financier semble le plus stable au moment où il est le plus vulnérable).

En analysant les articles consacrés aux causes de la crise financière mondiale de 2008-2009 (Borio 2011, Brunnermeier et Sannikov 2014, Tymoigne 2014, Tonveronachi 2020), nous y trouvons des affirmations similaires sur la nature de l'origine de la vulnérabilité financière.

Nous analysons des articles universitaires et des articles présentés par des institutions engagées dans le développement de MaP afin d'identifier les EWS qui se sont avérés efficaces. Le résultat de l'analyse indique qu'aucun signal unique ne peut être reconnu comme un prédicteur universel de la crise. Les EWS reconnus comme efficaces dans différents articles peuvent être classés comme suit : liés au crédit : croissance du crédit, écart de crédit, écart crédit/PIB, ratio dette/service (Schularick et Taylor, 2009 ; Drehmann et Juselius, 2013 ; Borio et Lowe, 2002 ; Frankel et Sarsvelos, 2011) ; liés au prix des actifs : écart de prix de l'immobilier, écart de prix des actions, VIX (indice de volatilité), prix des matières premières (Borio et Drehmann, 2009 ; Borio et al., 2019 ; Gerdesmeir, 2010, Rey, 2018, Eberhardt et Presbitero, 2018) ; mixte, incluant des facteurs monétaires et réels : indices des conditions financières (Hatzius et al., 2010 ; Alessi et Detken, 2009 ; Ng, 2011).

À notre avis, la nature des indicateurs présentés (liés au crédit et au prix des actifs) est cohérente avec le concept de nature endogène de la crise financière. Des obligations de crédit excessives créent une vulnérabilité en termes de solvabilité et de liquidité, et le prix des actifs peut baisser sous l'influence de l'absence d'une composante de crédit ou du manque de confiance dans l'émetteur des actifs.

Sur la base de nos résultats et des points de vue présentés dans des articles universitaires et professionnels (Basu et al., 2017; Claessens et Kose, 2013), nous concluons que le meilleur indicateur d'une crise pourrait être un système EWS, qui serait une combinaison d'indicateurs de vulnérabilité (crédit excessif) et d'indicateurs d'événements déclencheurs. Nous proposons de diviser les événements déclencheurs possibles en trois groupes : événements du côté de l'emprunteur (entreprise, particuliers), lorsque l'emprunteur ne peut pas rembourser ses obligations de crédit ; événements du côté du créancier (organisme financier), lorsque l'organisme financier perd sa liquidité et sa solvabilité en raison de risques excessifs pris ; événements associés à une baisse des prix des actifs.

Nous aimerions tester l'efficacité du système EWS proposé sur des données statistiques spécifiques pour confirmer ou infirmer les hypothèses formulées, mais les limitations de l'accès aux données pour l'analyse et aux technologies de l'information pour les calculs nous ont

empêchés de le faire à ce stade. Nous espérons que cela fera l'objet de recherches plus approfondies.

Dans le troisième chapitre de l'étude, nous attirons l'attention sur le fait que l'efficacité du MaP est toujours un sujet de débat pour les décideurs politiques et les universitaires. Le resserrement du MaP pour réduire les risques pour la stabilité financière entraîne simultanément une diminution de la disponibilité des prêts, une augmentation des risques dans le secteur non bancaire et une diminution du potentiel de croissance économique (Adrian et al., 2022 ; Belkhir et al., 2022 ; Borio et al., 2022 ; Laeven et al.). Ces déclarations nous conduisent à l'idée de la nécessité de calibrer les instruments du MaP en fonction de la situation économique actuelle et les EWS contribuent également à la solution de ce problème. Par conséquent, nous continuons à explorer ce domaine et cherchons une réponse à la question de savoir comment analyser efficacement les EWS? Nous étudions également le cas de la France, la situation et les indicateurs de risque de 2008 aux dernières données pour répondre à la question de savoir si les mesures actuelles du MaP sont efficaces?

Nous avons effectué une analyse complète de plusieurs articles universitaires visant à identifier les EWS et avons constaté que les méthodes de détermination des EWS basées sur des informations numériques peuvent être divisées en groupes : économétrique (Borio et al., 2019 ; Eberhardt et Presbitero, 2018 ; Chen et Svirydzenka, 2021) et apprentissage automatique (ML) (Bluwstein et al., 2023 ; Vrontos et al., 2021 ; Alessi et Detken, 2018). Une analyse détaillée des articles nous a permis de conclure que les méthodes ML sont capables de traiter de grandes quantités de données pour identifier des modèles entre de nombreuses variables. L'importance de la capacité à traiter simultanément un grand nombre de variables est confirmée par la politique des autorités en matière d'évaluation de la stabilité financière, en particulier dans la Revue de la stabilité financière de la BCE (2023) qui utilise plus de 100 indicateurs pour évaluer la stabilité financière.

Nous mettons également en évidence la méthode d'analyse EWS, qui peut être considérée comme innovante pour MaP (nous n'avons pas rencontré auparavant de mention d'une telle méthode dans MaP) - il s'agit de l'analyse des informations textuelles à l'aide de méthodes d'apprentissage profond (DL). Nous analysons les articles universitaires sur ce sujet (Gu et Kurov, 2020; Fulo et Kocsis, 2023; Li et al., 2019), et nous constatons que les difficultés d'utilisation de ces méthodes sont mises en évidence, cependant, des moyens d'éliminer ces difficultés sont également proposés. Sur la base du fait que certaines variables de l'ECB Financial Stability Review (2023) indiquent des attentes, nous concluons que l'analyse des

données textuelles à l'aide de la méthode DL peut augmenter l'efficacité de l'EWS, et donc du MaP.

En raison des limitations de l'auteur sur les sources de données et les technologies de l'information, il n'a pas été possible de procéder à une analyse comparative de l'efficacité des méthodes présentées à l'aide d'exemples de crises spécifiques ; cela pourrait faire l'objet de développements scientifiques ultérieurs.

Dans ce chapitre, nous cherchons également à répondre à la question de savoir si le MaP appliqué après 2008 est efficace. Nous considérons huit types d'indicateurs d'évaluation des risques (exemple de la France, de 2003 à 2024 (ou 2023). Nous notons que cinq des huit indicateurs d'évaluation des risques examinés ont montré une évolution durable après la crise financière mondiale. D'une part, cela indique l'efficacité des mesures MaP mises en œuvre depuis 2008. De plus, compte tenu des changements plus durables de ces indicateurs après le renforcement des mesures MaP, nous pouvons considérer ces indicateurs comme des EWS pour les autorités, qui peuvent être utilisés pour l'étalonnage des politiques.

Au chapitre 4, nous examinons la question de savoir s'il existe d'autres structures de maintien de la stabilité financière que le MaP. Nous envisageons comme alternative l'économie du don. Dans ce cas, un don implique une renonciation gratuite à des avantages (transactions à haut risque et à haut rendement) pour satisfaire les intérêts d'autres participants (soutenir la stabilité financière). La structure alternative qui en résulte diffère du MaP en ce que, dans ce dernier, l'initiative de restreindre les transactions à haut risque émane du régulateur représenté par la Banque centrale ou le gouvernement, qui surveille les opérations du secteur financier et peut appliquer des mesures restrictives pour maintenir la stabilité financière. Dans le cas de l'économie du don, l'initiative de restreindre les transactions à haut risque émane de la communauté financière, c'est-à-dire qu'il est implicite que les institutions financières renoncent à certains des avantages pour maintenir la stabilité financière globale. Nous comprenons que le développement et le perfectionnement de cette approche alternative pour maintenir la stabilité financière nécessitent des recherches supplémentaires importantes, notamment dans le domaine des avantages et des coûts d'une telle approche, ainsi que le développement d'incitations qui peuvent encourager les institutions financières à adhérer à l'approche de l'économie du don.

General Introduction

A. Research objectives

This dissertation explores ways to enhance financial stability by increasing the effectiveness of macroprudential policy (MaP). Although the MaP has been in use for several decades, it has entered a new phase of development after the 2008-2009 global financial crisis. To date, the issues of calibration and increasing the effectiveness of the MaP remain the subject of debate among authorities and academic research. It is important to find a balance between restrictive MaP measures and the potential for economic growth. This PhD thesis argues that this task can be facilitated, first, by building an appropriate institutional framework for the MaP. Second, it could be appropriately conducted by timely recognition of a high probability of a financial crisis and the ability to calibrate MaP tools to the current situation for which early warning signals (EWS) are designed. In this line, the study of EWS is a significant part of this thesis.

B. Historical context and research motivations

B.1. Historical increase in complexity and vulnerability of the financial system, prioritization of financial stability

Since the second half of the 20th century, the financial system has become more complex, new markets have emerged, financial innovations have been actively proliferated (options market, mutual funds, interest rate and credit swaps); settlement systems, including cross-border settlement, have been developing. At the same time, financial vulnerabilities have begun to emerge, the probability of financial crises and the costs of such crises for the economy have increased since the crises have become recurrent and systemic at the global level. Indeed, increased globalization in the financial sector, the boom in technological innovations and their subsequent development have led banks enter international markets, creating new opportunities, but also strong interlinkages between markets as well as new risks, both for banks and for the global economy. Aikman et al. (2013, 11) note that since the early 1970s, the probability of systemic crises and the costs of systemic crises have been growing. But at the same time, the balance sheets of global banks doubled between 1990 and 2007. Consequently,

reducing risks to the financial system as a whole (systemic risks) is becoming a priority for public policy, and a consensus has emerged at the international level on the need to introduce stronger macroprudential regulation into the financial regulation systems at the domestic as well as international levels.

B.2. The emergence of macroprudential regulation

A new approach to regulation has been emerging, which has been called macroprudential regulation. The goal of macroprudential regulation is to limit systemic risks. This type of policy is closely related to microprudential regulation, they often use similar tools (capital requirements for banks, limiting credit and market risks, controlling the liquidity of financial institutions). At the same time, microprudential regulation is aimed at increasing the resilience of individual financial institutions to external shocks, while macroprudential regulation is aimed at ensuring the stability of the financial system as a whole against external as well as endogenous imbalances. Macroprudential supervisors (Grigaite et al., 2020, 2) seek to avoid the costs associated with financial instability and primarily focus on correlations and overall risks for financial institutions (while these correlations are not the main focus of microprudential supervisors, since their ultimate goal is to protect consumers of financial services). In its objective, macroprudential regulation comes close to the objectives of monetary policy (price stability), and the two policies are also closely interrelated. In essence, this new approach (Aikman et al, 2013, 13) aims to fill the gap between macroeconomic policy on the one hand and microprudential regulation on the other, to ensure that regulatory rules are consistent with the risks arising in the entire financial system.

C. Conceptual Frameworks

To understand the foundations of maintaining financial stability, this dissertation considers several conceptual frameworks of macroprudential policy that converge around common critical questions:

C.1. Institutional framework to support financial stability

The institutional framework of policy includes two main areas: institutions/organizations that implement actions aimed at maintaining financial stability and

mechanisms, including the regulatory framework, by means of which financial stability is supported. Also, regulation itself includes the national and international level, or as in the case of the European Union, the regional level is added. Financial regulation mechanisms include access to information, risk identification, implementation of MaP tools, calibration of MaP measures, coordination with other policies, communication with other policies and society.

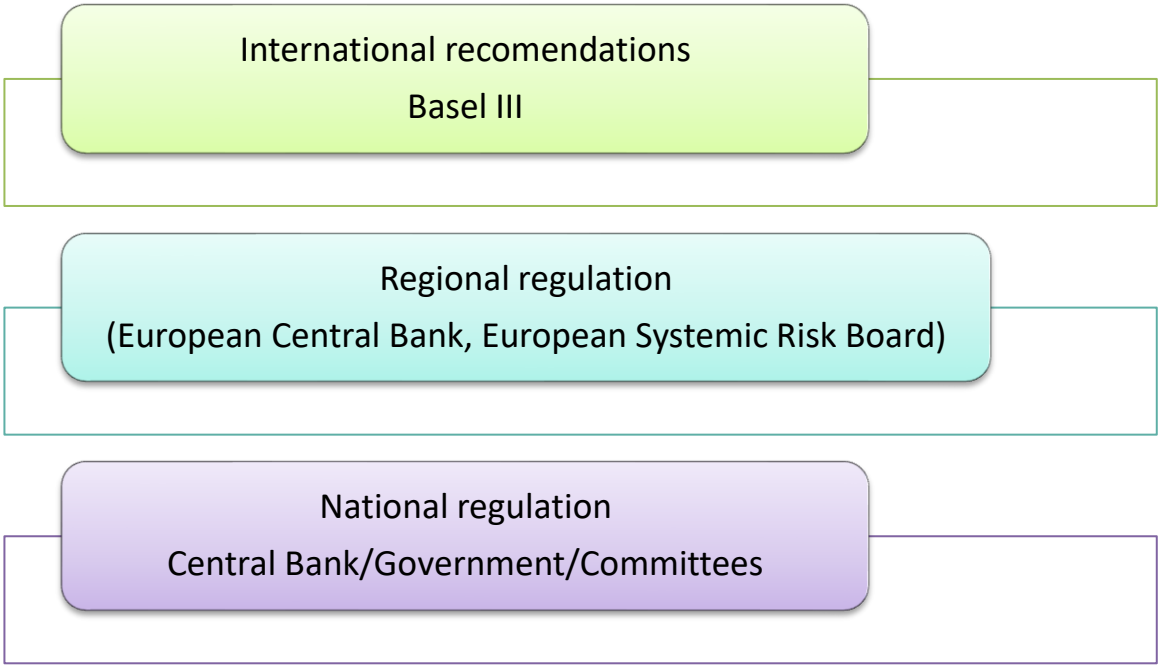

Figure 0.1 Organizational framework to maintain financial stability (by the author)

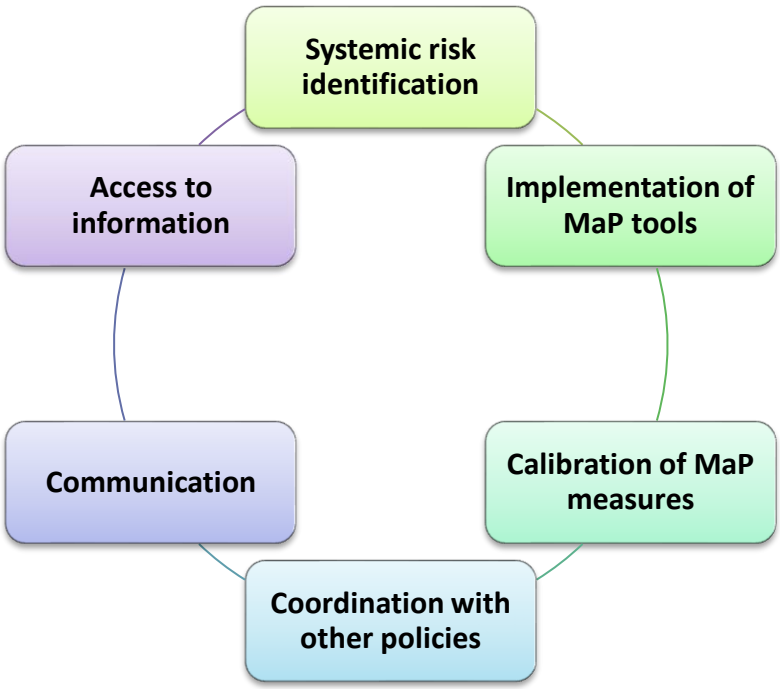

Figure 0.2 Institutional mechanisms of MaP to support financial stability (by the author)

C.2. Identification of financial instability risks

Currently, financial instability risks are identified through stress testing or early warning signals (EWS). Stress testing can be applied to financial institutions, an economic sector, or the economy as a whole. Typically, this stress testing is a "what if" analysis. Stress testing is based on constructing plausible scenarios and then assessing the risks that arise under each scenario.

An early warning signal is an indicator of increased risk. A large number of academic studies (Alessi and Detken, 2018; Borio et al., 2019; Chen and Svirydzenka, 2021; Drehmann and Juselius, 2013; Eberhardt and Presbitero, 2018; Frankel and Sarsvelos, 2011; Rey, 2018) are devoted to EWS of a financial crisis and there is no common understanding of the best system of such signals. It is assumed that overcoming a certain level of a signal is already an assessment of financial risk and implies subsequent actions to apply macroprudential policy tools. A significant part of this dissertation is devoted to the identification of early warning signals.

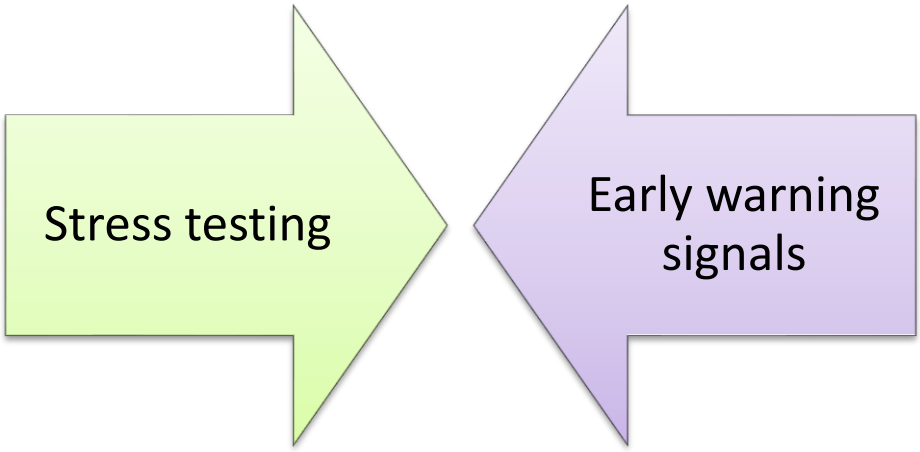

Figure 0.3 Identification of financial instability risks (by the author)

C.3. Tools of macroprudential policy

The availability of diversified macroprudential instruments to contain excessive systemic risk is an important element of financial regulation. Currently, many MaP tools have been developed, including countercyclical buffers, conservation capital requirements, leverage limits, loan loss provisions, limits on credit growth, loan restrictions, limits on foreign currency, limits on the loan-to-value ratio, limits on the debt-service-to income ratio, liquidity requirements, limits on the loan-to-deposit ratio, limits on foreign exchange positions, reserve requirements, concept of SIFIs (systemically important financial institutions) and others. The interaction of macroprudential policy instruments deserves special attention. A consequence of this is the issue of the authorities' choice of the optimal set of macroprudential policy instruments and their calibration.

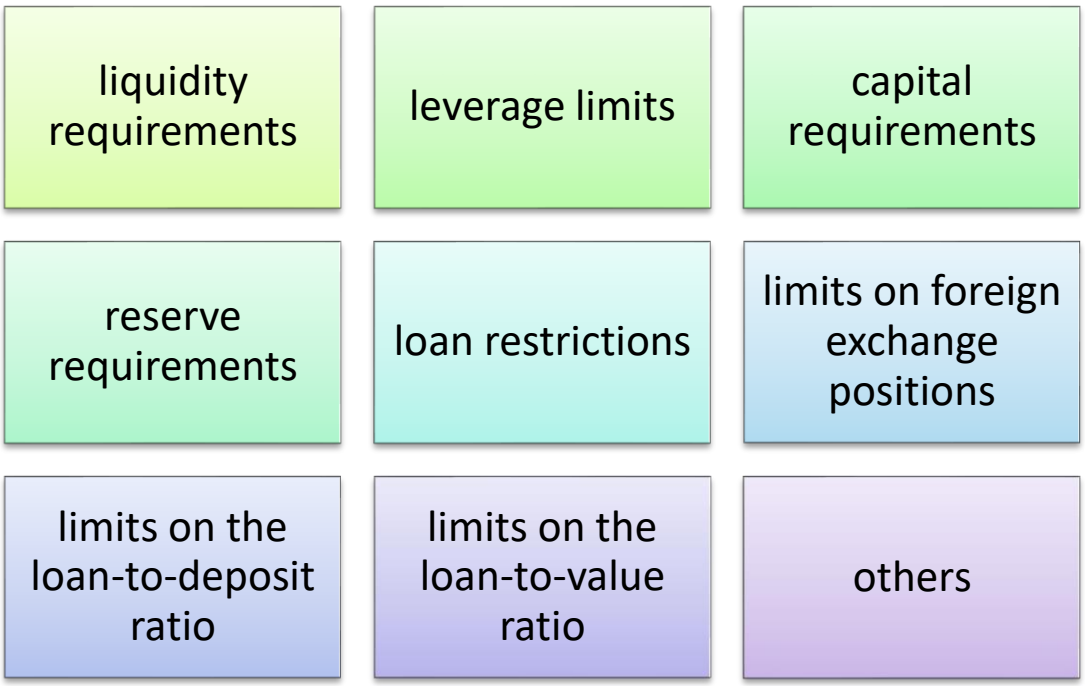

Figure 0.4. Tools of macroprudential policy (by the author)

D. Research question

The central research question addressed in this dissertation is:

How can the effectiveness of macroprudential regulation be increased, taking into account the costs of such regulation and the potential for economic growth?

The balance between the cost of regulation to the economy and the benefits of financial stability is particularly relevant at this time of COVID-19 crisis. In this aim, it seems to be suitable to determine the nature, conditions and scope of possible models of macroprudential frameworks with a view to strengthening the effectiveness of financial markets regulation and supervision along with the microprudential regulatory practices that are in force since the 1990s in financial markets. In the light of the 2007-2008 global financial crisis GFC), microprudential regulation alone has not proven to be apt to ensure systemic stability of markets. Therefore, attention can be turned to the possibility of considering innovative combinations of macroeconomic regulatory instruments and ways that could reduce the occurrence and severity of major financial crises without hampering the dynamism of innovative financial markets.

Assessing financial stability through early warning indicators or stress testing systems seem to be an important element in maintaining financial stability (or containing financial instability).

In the wake of GFC, financial supervision and regulation authorities sought at designing more preventive macro-level policies to reframe markets in a stable way. The MaPs and the related tools such as the EWS models that are the major supervision and regulation mechanisms in use over the last decades may be regarded as specific innovative practices compared with the previous market-led microprudential rules that were in force over 1990s-2000s. A large number of recent studies (Adrian et al., 2022, Laeven et al., 2022, Belkhir et al., 2022, Laeven et al., 2022a, to quote but a few) argue for the effectiveness of MaPs. In particular, Adrian et al., (2022) note the positive role of MaP measures introduced during the COVID-19 pandemic, and the strong policy framework in place in the aftermath of the GFC in containing the financial impact of the pandemic.

At the same time, several studies point to the costs of MaPs in terms of reduced credit supply to the business sector (Laeven et al., 2022a), increased financial sector stability through reduced efficiency in the non-financial sector (Belkhir et al., 2022), increased risks in the non-banking sector (Adrian et al., 2022), and reduced economic growth potential (Laeven et al., 2022a).

Research usually points out these effects as a result of MaP measures. At the same time, the contribution of other factors such as the effects of economic crises, falling demand and income, and other financial shocks cannot be ignored. Nevertheless, if we consider the task of MaP to reduce the probability of a financial crisis, then among all approaches the one with the least side effects can be considered the best.

In confirming the effectiveness of MaPs, the costs of their activation have been little studied (Laeven et al., 2022). Reaching a trade-off between the benefits and the costs of applying MaPs is an important challenge for the authorities (Laeven et al., 2022, Laeven et al., 2022a, Borio et al., 2022) and can be achieved by calibrating policy instruments. Moreover, proper calibration of MaP instruments can reduce the amount of intervention during the cycle (Laeven et al., 2022a, p.4).

There are few tools available to assist policy makers in identifying the right measures and timing of policy implementation (Barbieri et al., 2022, p.18). Barbieri et al. (2022) propose the splitting of credit growth into three components (an overall component that captures average credit growth across individual banks/firms, and idiosyncratic demand and supply components

that measure how heterogeneous and asymmetric the distribution of credit growth is among borrowers and lenders). The model suggested regresses bank and firm credit growth on the full set of bank time and firm time fixed effects. The “common component” is then defined as the median fixed effects across all banks and firms over the period. Finally, as the "demand" (supply) component, it represents the median-decomposed firm- and bank-level fixed effects over the same period. Schmitz et al. (2022) prioritize the removal of regulatory duplication and the flexible use of the capital buffer, while drawing attention to the time lag in data, data and model uncertainty, and note that most countries use to calibrate MaP measures. European Systemic Risk Board (ESRB, 2014) recommends six categories: private-sector credit developments and debt burden, overvaluation of property prices, external imbalances, mispricing of risk, and strength of bank balance sheets.

Effectiveness of MaPs is rather relying on the efficiency of the measures and on the costs of their implementation that almost depend on the tools (indicators, assessment models, mechanisms) that have to be designed and calibrated according to data and information available (and treatable). Identifying signals for MaP calibration is an important task for policy makers. In the innovative macroprudential supervision and regulation framework in force since the GFC, EWS are used as appropriate tools to calibrate MaPs.

In this thesis, we seek at identifying relevant EWS and approaches to be used by policymakers to efficiently calibrate instruments and improve policy effectiveness. We identify similarities and differences between several EWS approaches, based on a comprehensive analysis and synthesis of several works in the field in order to contribute to the assessment of the most effective EWS for better calibration of MaP tools, we study approaches to EWS assessment in light of current regulatory practices and the development of information technologies, and also make proposals for improving the institutional structure of MaP.

E. Thesis outline

This dissertation adopts a holistic approach, arguing that macroprudential policy is an effective approach to achieving financial stability. However, the issues of timely identification of systemic risks, the balance between the cost and effectiveness of regulation, and the calibration of MaP measures remain the subject of policy debate and academic research. The analysis in this research aims to identify a clear and comprehensive institutional framework for the MaP in order to identify possible ways to improve the effectiveness of the policy.

The research question is addressed in four chapters, each addressing a different aspect of this study. These chapters are designed as stand-alone articles or book chapters, some of which have already been completed, while others are in the process of being completed later as articles.

E.1. Chapter 1: Institutional aspects of macroprudential policies

This chapter analyses and systematizes the institutional aspects of MaPs and makes proposals to improve the institutional structure of MaPs. Part of this chapter will be submitted for publication to *Journal of Economic Issues* as an article in the near future. Another part of the chapter is awaiting publication in the collective book "Climate Change, Financial Markets, and Systemic Risks: From Observations to Expectations," expected for publication by Routledge in 2025.

The chapter identifies the institutional framework of MaP: bodies and organisations with MaP powers and responsibility for its implementation and control; MaP mechanisms, including access to information, risk identification, implementation of policy instruments, calibration of policy measures, coordination with other policies, communication with other policies and society.

Alternative organizational structures for MaP are analyzed. The MaP mandate may belong to the Central Bank, the Government (e.g., the Ministry of Finance), another financial body, a committee with representatives of these organizations (with coordination being carried out by both the Government and the Central Bank), decentralized management (various agencies). We conclude that centralized or coordination structures appear preferable, as they ensure clear delegation of authority and responsibility for making timely decisions. Also, assigning the MaP mandate to the Central Bank (or another agency if assigned the relevant powers) appears justified, since MaP closely correlates with microprudential policy and monetary policy, and it is important that these policy areas act in the same direction in the interests of economic development.

Modern MaPs practice is largely inspired by the institutionalist/neo-institutionalist approaches. Institutions are organizations that create and enforce laws and then shape markets behavior. At the national and international level, regulations have been developed that contain

rules for banking and other financial institutions, which set limits for financial institutions (e.g. minimum capital requirements, liquidity requirements, credit restrictions) and regulatory powers. These measures are aimed at reducing systemic risk and increasing financial stability, and therefore should contribute to economic growth and development. MaPs include features of different approaches to institutionalism; we highlight normative and empirical approaches.

The chapter offers recommendations for improving the institutional aspects of MaPs. In terms of the powers and mandates of organizations, it is important to grant powers to a centralized or coordinating institution at the national level, taking into account international regulation. Access to information is ensured by the presence of appropriate powers or good coordination with and between agencies that consolidate information. Access to information, the presence of an early warning system, and the availability of big data analysis tools are important for the timely identification of risks. The selection and implementation of policy tools should be based on the identification of a set of MaP instruments and situations of their use, the presence of a mandate for the application of MaP measures, a system for determining the intensity of measures, the use of previous experience, and a system for evaluating results. Calibration of policy measures should be carried out through the selection of EWS for a crisis, access to information, monitoring of signal changes, and a system for responding to signal changes. To coordinate MaP with other policies, it is important to have established channels of information exchange with other agencies or consolidate mandates for the implementation of different policies in one institution, and publish a MaP strategy. For effective communication with economic agencies and society, we recommend defining communication channels, frequency of communication, openness of MaP goals, and publishing a MaP strategy and the results of its implementation.

Despite the fact that elements of counteraction to systemic financial crises have been applied for quite a long time, the issues of increasing financial stability remain in maximum demand. This is partly due to the change and complexity of the financial system and the emergence of new risks. On the other hand, the systems that existed before 2008 have proved to be imperfect and there is no evidence that the macroprudential policy measures used are definitely effective. The question remains whether the financial system is adequately protected from risks at the current moment.

To increase the effectiveness of macroprudential policy, it is necessary to determine the spectrum by the criterion of financial stability/crisis, and also adjust the calibration of macroprudential policy measures depending on the magnitude of the potential risk. It is obvious

that both monetary and MaP are necessary for balanced economic development and protection from financial crises.

E.2. Chapter 2: Financial stability, macroprudential supervision and early warning signals (EWS): a Minskyian interpretation

This chapter studies the nature of a systemic financial crisis and the channels through which it can spread. This chapter is already submitted for publication in the *Journal of Post Keynesian Economics*. Materials of this chapter were presented at the 2nd International Financial Forum held in June 2023 in Grenoble.

This chapter considers the EWSs that are used in macroprudential policy over the last decades and the wide range of EWSs that are proposed for use by scholars. We propose a systematization of EWSs by channel of crisis through a synthesis of different works that have been conducted since the GFC and that represent various approaches used in this field. We conclude that there is a wide variety of variables that can be used as EWS. However, we cannot argue that EWSs are sufficiently well implemented in macroprudential policies. Drawing upon the Minskyian analysis of the endogenous character of systemic financial crises, we maintain that the variety of variables proposed as EWSs needs to be reviewed in order to find stronger and most proactive criteria that could be used by authorities to enhance the effectiveness of macroprudential policies.

The success of macroprudential policy implementation is largely determined by the balance between the subsequent costs and the benefits, i.e. the decrease in the probability of a systemic crisis in the economy, and the dampening effect that macroprudential policy measures can have on economic growth. Therefore, the issues of improving the effectiveness of macroprudential policies still remain relevant decades after the GFC. We regard EWS as an element of macroprudential policy that could allow authorities to identify the right moment ant the appropriate way to apply or modify macroprudential policy measures.

The conclusions drawn after the GFC coincide with those drawn by Minsky in the 1990s: the endogenous nature of financial crises and their credit-sensitive character in capitalist evolution, leading to the paradox of tranquility (the calmest market situation can be the most risky). We analyze a number of research to identify examples of EWS indicators that could point to the boom stage of the financial cycle. The indicators studied can be divided into three

groups: credit-related, asset price-related and mixed (financial condition indices). According to Minsky's approach, credit-related and asset price-related indicators are endogenous and fully reflect Minsky's crisis origination scheme (hedge financing, speculative financing and Ponzi finance).

Various indicators proved to be effective under specific assumptions, but one indicator does not fit all likely channels of crisis. Thus, it is important to use a system of indicators to implement effective macroprudential policy. As Rocha and Perrelli (2023:109) maintains: "One of the main contributions of EWS is to inform governments and policymakers about the vulnerabilities in the underlying economic system and its macro-financial links that could eventually lead to a currency crisis." In order to identify the necessary limited set of EWS that can be offered to the authorities to determine the likelihood of a crisis, we look at the possible channels of spread of the financial crisis. A financial crisis can be seen as a combination of vulnerability and trigger events. By vulnerability we mean excessive lending. However, credit itself does not cause a crisis if there is no insolvency of the participants in the lending process. We consider the causes of insolvency of market participants to be triggers. The channels for spreading the crisis (triggers) can be on the side of the borrower as well as on the side of the lender. Asset prices (capital market, real estate, others) can also be a channel for the emergence of a crisis. High asset prices correspond to the boom stage in Minsky's sense, a subsequent price correction can be the trigger of a crisis (as in the GFC). Market participants can assess their individual risks, but cannot correctly assess macroeconomic risks. For this reason, macro-prudential regulation by the authorities plays a leading role in preventing financial crises. The "Agenda for Reform" of Minsky (1986) advocates a "Big Government" that would seek, through appropriate financial regulation and thwarting systems, at stabilizing the markets. EWS could be regarded as part of the framework the thwarting systems may use in this aim.

We then propose to complement existing macroprudential policy approaches by systematizing existing EWS into vulnerability-related signals (credit-related), trigger signals (borrower-side, lender-side, asset price-related and others) and use them as a system in determining the likelihood of financial crisis. In particular, credit growth, credit gap, credit-to-GDP gap can be used as vulnerability indicators. We suggest the debt service ratio as a borrower-side trigger; liquidity coverage ratio and net stable funding ratio as a lender (supply) side trigger; property and equity price gaps, VIX (volatility index) as an asset-price trigger. Other indicators, in particular those of a monetary or investment related (current account/savings rates, changes in nominal long-term interest rates, investment-to-GDP ratio)

can complement the EWS system. A further development of the study could be firstly to test each of the triggers (borrower-side, lender-side, asset price-related and others) for significance in determining the likelihood of a crisis; secondly, to identify one best indicator for each of the indicator groups.

E.3. Chapter 3: Macroprudential policies in the light of the development of information technologies: a synthesis on the effective early warning signals

This chapter is accepted for publication as an article in the *Journal Alter Economics* in 2024 (Volume 21, no. 3 pp. 512-526). Materials of this chapter were presented at the 3rd International Financial Forum held in September 2024 in Grenoble.

This third chapter draws attention to that MaPs have proven to be an effective tool to mitigating the scope and the effects of financial crises (Adrian et al., 2022, Laeven et al., 2022, Belkhir et al., 2022, Laeven et al., 2022a), especially in the aftermath of the GFC. At the same time, there are costs of MaPs in terms of reduced credit supply in the business sector (Laeven et al., 2022a), increased financial sector stability through reduced efficiency in the non-financial sector (Belkhir et al., 2022) and increased risks in the non-banking sector (Adrian et al., 2022), and reduced economic growth potential (Laeven et al., 2022a).

MaP is not static, requiring calibration or new tools depending on the likelihood of a financial crisis. EWS serve this purpose. However, through the different works presented in this article, one can obviously note that there is not one or even a few universal signals. Many indicators, including aggregate indices (Eberhardt and Presbitero, 2018, Borio et al., 2019, Chen and Svirydzenka, 2021) can be considered as EWSs; it is clear that any model that aims at determining the likelihood of financial crisis should involve a system of best indicators from different areas, and probably focus on individual characteristics when it comes to the cases of different groups of countries.

This part draws a few major conclusions upon the study of various papers on EWS:

1. There is no common understanding of the time horizon of EWS, perhaps looking at time horizons should be based on the action of MaP tools (how long it takes from calibration or the start of the tool to the effect).

2. The studies do not deal with the calibration of the MaP tools, but with the relationship between EWS and whether a crisis has occurred.

The research papers are similar in terms of methodology (empirical analysis). They consider moments of crisis and test a number of indicators as explanatory variables. However, both the definition of crisis moments and the set of explanatory variables themselves differ.

Existing methods for determining EWS can be divided into two large groups: using numerical data or using textual data for analysis. The use of numerical data is much more widespread and includes two directions econometric analysis and machine learning. Machine learning allows processing a larger amount of data, which is relevant for determining financial stability parameters and early warning signals. This is confirmed by the ECB's experience in the Annual Financial Stability Report 2023, which presents more than 100 parameters characterizing financial stability.

Deep learning techniques are well established for text analysis, this can be complementary to the assessment of a potential crisis, as one can judge the signals/expectations of a crisis by assessing sentiment in news or social media postings. The relevance of such indicators is indirectly supported by the ECB Financial Stability Report of a number of indicators that are categorized as simulation/expectation.

Despite the abundance of methods for determining EWS and the indicators themselves, the question remains open as to how exactly MaP is calibrated depending on the signals received. We propose to address this question by using those signals that have shown a correlation with measures of MaP. We have studied the evolution of the Risk assessment indicators that are presented on the ECB website on the example of France from 2003 to today. Five of the eight indicators examined showed a steady change in trend after 2008 and the tightening of MaP measures. On the one hand, we can confirm the effectiveness of MaP measures. On the other hand, we can suggest that these particular indicators (whose correlation has already been measured according to the change in MaP) may be good indicators for calibrating MaP.

E.4. Chapter 4: In search of relevant financial regulation: some lessons from the gift-economics

This chapter is published in co-authored with Prof. Faruk Ulgen in the book *The Gift in the Economy and Society Perspectives from Institutional Economics and Other Social Sciences* by Routledge in 2021 (pp. 160-188).

This chapter sought to assess whether reciprocity as a gift-economics rule could provide a relevant institutional anchor that could offer a financial regulatory framework able to strengthen the working of financial markets and ensure systemic stabilisation of monetary economies. While the liberal private interest based agenda tends to ignore the need for consistent embedded institutions, an institutional-evolutionary analysis brings out structural fragilities of the working of financialised capitalism and points to a necessary reframing of markets and institutions. Minsky (1986, p. 281) maintains: "If the disrupting effects of banking are to be constrained, the authorities must drop their blinders and accept the need to guide and control the evolution of financial usages and practices. In a world of businessmen and financial intermediaries who aggressively seek profit, innovators will always outpace regulators; the authorities cannot prevent changes in the structure of portfolios from occurring. What they can do is keep the asset-equity ratio of banks within bounds by setting equity-absorption ratios for various types of assets. If the authorities constrain banks and are aware of the activities of fringe banks and other financial institutions, they are in a better position to attenuate the disruptive expansionary tendencies of our economy."

Seemingly paradoxical (but logically natural if Minsky's "endogenous financial instability hypothesis", Iwai's "paradox of rationality" and Kahneman's "planning fallacy" are taken into account), the liberalization of financial markets increases the need for public oversight since it results in a system-wide financialization with continuous and permanent effects on the economy: "In a market-based financial system, banking and capital market developments are inseparable, and fluctuations in financial conditions have a far-reaching impact on the workings of the real economy" (Adrian and Shin, 2010, p. 5).

Therefore, a financial system's stability appears to be a general concern that should be considered at a macro level. For this aim, the rule of reciprocity seems to be a relevant source of reflection to provide an alternative model of financial market organization. However, in a capitalist society, reciprocity needs to be resting on socially given collective rules. It should be relying on a specific financial regulation that should be framed according to a reciprocity-linked

societal-constraints schema that considers the complexity of human decisions (beyond some mere technical models) and strategies (beyond some simplistic optimum calculus). The necessary elaboration of a consistent financial regulatory framework should seek strengthening the trust among market actors but also between markets and society, and between markets and regulators.

This chapter argues that in this aim, regulation has to oblige market players to respect reciprocity in their market relations through macro-prudential constraints and incentives. In such a schema, reciprocity would play a holistic role beyond legal regulatory restrictions imposed by public authorities while its relevance would be closely related to the strength of those restrictions.

Table 0.1 below provides a comprehensive summary of the issues studied in these four chapters along with the methodology of research conducted and the major references used in related analyses.

Chapter 1	Title	Institutional aspects of macroprudential policies
	Problematic	What is an effective institutional structure for organizing MaP and possible directions for improving the institutional framework of MaP to maintain financial stability?
	Methodology	Systematic literature review
	References	Acemoglu et al. (2015); Aikman et al. (2013); Chagas Goudard and Bittes Terra (2015); Egawa et al. (2015); Grigaite et al. (2020); Hoefer (2022); Nier et al. (2011); Vargas-Hernández (2021).
	Approach	Institutionalist and holistic approach, descriptive approach
	Results	The aim of this chapter is to analyze and systematize the institutional aspects of MaPs, to make a proposal for improving the institutional structure of MaPs. The chapter defines the institutional framework of MaPs, analyses alternative structures of MaPs, concludes that MaPs need to be centralized and coordinated with other policies, and considers different institutional approaches. The paper proposes recommendations for improving the institutional aspects of MaPs: access to information; the presence of an early warning system, and the availability of big data analysis tools are important for the timely identification of risks; a system for determining the intensity of measures, the use of previous experience, and a system for evaluating results; calibration of policy measures; coordination the MaP with other policies, effective communication with economic agencies and society.
	Future Research	Further research could focus on assessing the effectiveness of the MaP after the proposed institutional changes both as a whole and for each proposal separately. Also, the institutional structure of the MaP is quite complex and it seems that there are other options for improvement in the institutional structure that could also be explored.

Chapter 2	Title	Financial Stability, Macroprudential Supervision and Early Warning Signals (EWS): A Minskyian Interpretation
	Problematic	What causes financial crises and how can it be identified in advance?
	Methodology	Systematic literature review
	References	Borio (2011); Claessens (2015); Drehmann and Mikael (2014); Eberhardt and Presbitero (2018); Ferri (2019); Ferri and Minsky (1992); Gerdesmeier et al. (2010); Minsky (1986); Minsky (1982); Nikiforos (2020); Tonveronachi (2020); Torres Filho et al. (2019); Ülgen (2017); Ülgen (2014).
	Approach	Holistic/macro-level approach, comparative/descriptive approach
	Results	Exploring current approaches to macroprudential policy, we find similarities with the financial instability hypothesis of Hyman Minsky that mainly relied on the endogenous nature of the crisis, the danger of excessive credit, and the financial stability paradox, developed long before the 2007-08 global financial crisis. Reviewing the set of academic papers investigating the effectiveness of EWS, we find that most of the indicators recognized in the research as effective are consistent with Minsky's approach since they bring forward the endogenous nature of instabilities. Moreover, it is obvious that one indicator cannot be considered as a universal predictor of crises. A set of indicators is required to allow an effective macroprudential policy. We propose an EWS framework where crisis is the result of the occurrence of financial vulnerability and trigger events because crises have different channels of occurrence. The resulting EWS framework is consistent with Minsky's approach and points to the endogenous nature of the evolution of credit to finance market expectations as the main vulnerability of financial stability.

	Future Research	A further development of the study could be firstly to test each of the triggers (borrower-side, lender-side, asset price-related and others) for significance in determining the likelihood of a crisis; secondly, to identify one best indicator for each of the indicator groups.
Chapter 3	Title	Macroprudential policies in the light of the development of information technologies: a synthesis on the effective early warning signals
	Problematic	How to identify early warning signals for effective application and calibration of MaP tools in light of current financial stability analysis practices and development of information technologies?
	Methodology	Comparative/descriptive approach, case study approach, qualitative analysis
	References	Alessi and Detken (2018); Borio et al. (2019); Bluwstein et al. (2023); Chen and Svirydzenka (2021); European central bank (2023); Eberhardt and Presbitero (2018); Fulop and Kocsis (2023); Gu and Kurov (2020); Li et al. (2019); Vrontos et al. (2021).
	Approach	Qualitative research
	Results	This chapter demonstrates that effectiveness of different tools to implement successful MaPs is still a critical matter of research. Early warning signals (EWS) are used as indicators of the likelihood of future crisis. The aim of this chapter is to examine approaches to identify EWS to maximize the effectiveness of MaPs in the light of the developments of information technologies. The paper presents a comprehensive and synthetic analysis of academic works that determine effective EWS by analyzing numerical information using econometric and machine learning (ML) methods or extracting economic information from text based on deep learning (DL) techniques that may be regarded as innovative approaches to financial supervision and regulation. The results obtained, taking into account current regulatory practices, suggest the advantages of identifying effective EWSs by machine learning approaches to analyzing numerical data, as it allows

		simultaneous processing of a large number of variables; and the potential for developing the application of methods for extracting economic information from textual data to determine expectations. In addition, the study of Risk assessment indicators on the example of France, presented by the ECB in the period from 2003 to 2024 allows us to draw conclusions about the effectiveness of the MaP since 2008. Five of the eight risk assessment indicators examined showed persistent changes post-GFC. Given the stability of these indicators following the implementation of stronger MaP measures, they can be considered EWS for regulators. These indicators, combined with historical data and corresponding macroprudential policy interventions, can be used for policy calibration.
	Future Research	Further research could focus on comparing the performance of different approaches to determining the probability of a financial crisis or policy calibration (econometric and machine learning for analyzing numerical data; deep learning for analyzing text data).
Chapter 4	Title	In search of relevant financial regulation: some lessons from the gift-economics
	Problematic	Could the gift economy be an alternative approach to maintaining financial stability?
	Methodology	Systematic literature review
	References	Dolfsma et al. (2009); Mercier Ythier (2006); Ulgen (2018).
	Approach	Descriptive approach
	Results	The objective of this section is to determine whether gift economics can provide an appropriate analytical direction for the institutional framework for developing alternative financial regulation that can enhance systemic stability in market capitalist economies. A gift can be viewed as a gratuitous renunciation of benefits (high-risk and high-return financial transactions) to satisfy the interests of others (financial stability). Gift economics provides an alternative framework for MaP. In traditional MaP, the initiative comes from the

		regulator, such as the central bank or government, who supervise the financial sector and restrict high-risk transactions to ensure financial stability. In gift economics, the initiative comes from the financial sector in the form of renunciation of some benefits to maintain overall financial stability.
	Future Research	Further research could focus on finding ways to incentivize the financial sector to divest itself of high-risk transactions in order to maintain overall financial stability. A comparative analysis of the effectiveness of increasing/maintaining financial stability of MaP and the alternative approach (gift economy) could also be conducted.

Table 0.1 Overview of the chapters

Source: Elaborated by Author

F. Contributions

The various analyses developed in this doctoral research aim to provide a comprehensive and holistic analysis of the ways to improve financial stability through the development of individual elements of macroprudential regulation or alternative approaches, taking into account the approach to the balance between the cost and effectiveness of regulation, the development of information technologies, modern regulatory practice. The main contributions of this research are:

- **Comprehensive Analysis**

This PhD thesis uses diverse approaches, recognizing that improving the effectiveness of macroprudential policy is a complex task requiring study from multiple perspectives. Each section of the dissertation addresses a different aspect of the problem, seeking solutions based on a synthesis of existing information and a new perspective based on the current developments in the financial system. By studying the institutional framework of MaP, the paths and causes of financial crisis, the system of signals for crisis identification and policy calibration, ways of identification and assessing such signals, and alternative approaches to maintaining financial stability, this research provides elements of answers to questions on how policy effectiveness can be improved.

- **Contextual Understanding**

Each chapter provides a contextual understanding of financial stability and policy effectiveness by studding different aspects of the problem. In the thesis, we focus on concepts such as financial stability, indicators of financial stability and financial crisis, macroprudential policy, its institutional framework, the effectiveness of MaP, policy calibration, and early warning signals. In addition, the study of Risk assessment indicators on the example of France, presented by the ECB in the period from 2003 to 2024 and the analysis of the Annual Financial Stability Report 2023 allows us to draw conclusions about the effectiveness of the MaP since 2008 and provides directions for improving approaches to better calibration of policy measures. By analyzing and systematizing these contexts, the dissertation provides insights into the potential for improving the effectiveness of macroprudential policies.

- **Practical Relevance**

The multifaceted approach of the study increases its practical significance. The ideas and proposals made as a result of the analysis and systematization of various aspects

of the policy allow us to make recommendations that can be applied by policymakers to improve the effectiveness of the MaP and, consequently, to increase financial stability. Among such recommendations we include proposals for improving the institutional structure of the MaP; a proposal for an early warning system that takes into account various channels of crisis occurrence; proposals for using machine learning methods to analyze big data and deep learning methods to analyze sentiment and expectations by analyzing text information. Considering various aspects of financial stability and policy provides a basis for policymakers to develop a framework for improving the effectiveness of financial stability support measures.

- **Academic Contribution**

The chapters are intended to contribute to the academic discourse through conference presentations and publications in academic journals and collective books. This ensures that the research reaches a broad audience. It is envisaged that upon completion of the acceptance process, the chapters of this study will be published in two collective books, three academic journals; and the dissertation materials were be presented at two international conferences and a number of university seminars. This study contributes to the academic debate and provides directions for further research in the field of macroprudential regulation and financial stability. For example, the proposed EWS system can be tested on practical data. The results of the dissertation will expand the scope of the existing literature by highlighting the interrelationships between different elements of financial regulation.

The study of various aspects of macroprudential regulation and alternative approaches has enabled us to formulate a comprehensive view of possible ways to improve the effectiveness of MaP and maintain financial stability; has opened up new areas of possible academic research; and has allowed us to make proposals to policymakers on improving some aspects of MaP.

Chapter 1: Institutional aspects of macroprudential policies

Institutional aspects of macroprudential policy and ways of improvement

Publication Status

This part of the chapter will be submitted for publication to the *Journal of Economic Issues* as an article in October 2024.

Keywords:

- Financial regulation
- Financial stability
- Institutions
- Institutionalism
- Macroprudential policy

Abstract

In the wake of recent recurrent crises, macroprudential policies (MaPs) have been framed and implemented to deal with the weaknesses of market-led microprudential mechanisms and to strengthen the stability of financial systems. The aim of this paper is to analyze and systematize the institutional aspects of MaPs in order to bring forward some possible directions for improving the institutional structure of MaPs. Therefore, this paper identifies a relevant institutional environment for MaPs, analyzes alternative MaP structures, and concludes that MaPs need to be centralized and coordinated with other policies within an integrated institutional framework. The paper then proposes recommendations for improving the institutional aspects of MaPs.

1.1. Introduction

Since the second half of the 20th century, the financial system has become more complex, new markets have emerged, financial innovations have been actively proliferating

(options market, mutual funds, interest rate and credit swaps); settlement systems, including cross-border settlement, have been developing. At the same time, systemic financial vulnerabilities have begun to emerge, the probability of financial crises and the costs of such crises for the economy have increased. Increased globalization and strong linkages among institutions, stock exchanges, and domestic economies in the financial sector, the boom in technological innovations and their subsequent development have led banks to entering international markets, creating new opportunities, but also new risks, both for banks and for the global economy. Aikman et al, (2013, 11) note that since the early 1970s, the probability of systemic crises and the costs of systemic crises have been growing. In cumulative terms, crisis-induced production losses have reached almost 60% of annual pre-crisis GDP in the UK, more than 40% in the eurozone, and more than 30% in the US. But at the same time, the balance sheets of global banks doubled between 1990 and 2007. Consequently, reducing risks to the financial system as a whole (systemic risks) is becoming a priority for public policy, and a consensus has emerged at the international level on the need to introduce macroprudential regulation.

All this served as a reason for the development of not only national legislative initiatives in the banking sector, but also international regulation of banking. At the international level, already in 1988, the Basel Committee on Banking Supervision began developing the first Basel Accord on capital adequacy; this agreement came into force in 1992. In January 1996, the Basel Accord was clarified in terms of regulating market risks. In 1997, the Basel Committee formed the "Core Principles for Effective Banking Supervision", supplemented in 1999 and clarified in 2006. Also in 1999, the first consultation document on Basel II appeared - an improved agreement on the regulation of various banking risks. The approval of Basel II occurs in 2004, and comes into force in 2006. Almost immediately, the Basel Committee begins to create the third Basel agreement, which includes not only requirements for bank capital, but also liquidity requirements. In 2010, the final version of Basel III is published and in January 2013, clarifications appear in terms of calculating bank liquidity. We can state that since the 1990s, there has been a process of strengthening banking regulation at the international level. This process is designed to reduce the risks of the banking system and prevent the occurrence of global financial crises and continues to develop to this day. Strengthening regulation is noticeable not only at the international, but also at the national level. However, such regulation was mainly relying on a microprudential approach that consisted, for instance, of involving banks in self-regulation through different ratios, expected to strengthen their balance-sheet

positions by balancing liability and asset sides (for example, Cooke and McDonough ratios of Basel committee, Net stable funding ratio, Liquidity coverage ratio).

In the face of the 2007-09 global financial crisis (GFC) that took a systemic shape, a new approach to regulation has been emerging, which has been called macroprudential regulation. The goal of macroprudential regulation is to limit systemic risks. This type of policy is closely related to microprudential regulation, they often use similar tools (capital requirements for banks, limiting credit and market risks, controlling the liquidity of financial institutions). At the same time, microprudential regulation is aimed at increasing the financial stability of individual financial institutions, while macroprudential regulation is responsible for the stability of the financial system as a whole. Macroprudential supervisors (Grigaite et al., 2020, 2) seek to avoid the costs associated with financial instability and primarily focus on correlations and overall risks for financial institutions (while these correlations are not the main focus of microprudential supervisors, since their ultimate goal is to protect consumers of financial services). In its objective, macroprudential regulation comes close to the objectives of monetary policy (price stability), and the two policies are also closely interrelated. In essence, this new approach (Aikman et al, 2013, 13) aims to fill the gap between macroeconomic policy on the one hand and microprudential regulation on the other, to ensure that regulatory rules are consistent with the risks arising in the entire financial system.

Egawa et al (2015) note that since the GFC, there have been efforts around the world to clarify the meaning of MaP. The International Monetary Fund (IMF), as well as the Financial Stability Board (FSB), and the Bank for International Settlements (BIS), have formally defined MaP as "policies that primarily use prudential instruments to limit systemic or system-wide financial risk, thereby limiting the frequency of disruptions in the provision of key financial services that could have severe consequences for the real economy." Grigaite et al. (2020, 4) note that MaP is primarily the responsibility of national authorities. He highlights a MaPs strategy that links objectives with indicators and instruments. Indicators help identify risks and assess their severity, while instruments help prevent and mitigate the materialization of these risks.

The MaPs strategy (Grigaite et al., 2020, 4) follows four stages: (1) a risk identification stage, in which relevant indicators help to identify and assess vulnerabilities and in which indicative thresholds are defined; (2) a selection and calibration stage of instruments; (3) an implementation and communication stage, in which instruments are activated; and (4) an

evaluation stage, in which the impact of instruments is assessed in terms of possible adjustment/deactivation.

MaP includes the following operational objectives (Grigaite et al., 2020, 6): (1) prevent the excessive build-up of risk, resulting from external factors and market failures, to smoothen the financial cycle (time dimension); (2) make the financial sector more resilient and limit contagion effects (cross-section dimension); (3) encourage a system-wide perspective in financial regulation to create the right set of incentives for market participants (structural dimension).

Egawa et al. (2015) emphasize that the defining elements of MaPs are the objective, scope of analysis and policy instruments, as well as institutional mechanisms, which are another key element to ensure the effective implementation of MaPs.

This paper considers the institutional aspects of MaPs. The plan of the article is as follows. The second section justifies why institutional structure matters for effective MaPs, the third part studies alternative institutional frameworks for organizing MaPs, the fourth section studies various institutional approaches to the MaP structure, including neo-institutionalism, and the fifth section presents proposals for improving the macro-regulatory structure of financial systems.

1.2. Institutional framework for effective macroprudential policy

Institutional theory is a set of theoretical developments that are intended to provide stability to certain processes. Vargas-Hernández (2021, 3) notes that institutionalism emphasizes the relationships that exist between the political and economic spheres of society, institutions are patterns, norms, and human-made rules that allow and constrain the behavior of social actors and make social life predictable and meaningful. Institutionalists describe institutions as government actions, institutions are seen as resources for agents and rational actors to achieve their goals. Acemoglu et al (2015, 387) believe that differences in economic institutions are a fundamental cause of differences in economic development. Economic institutions determine incentives and constraints for economic actors and shape economic outcomes.

Ülgen (2021, p. 534) emphasizes that money is a public institution, a set of rules/mechanisms/laws (payment system), which organizes the issuance, use and repayment of private debts intended to finance entrepreneurial expectations. Therefore, the stability of financial transactions is a prerequisite for continuous and sustainable economic relations. However, financial stability cannot be ensured solely by market mechanisms and decisions of individuals. This leads to the consideration of financial regulation as a problem of collective organization.

Ülgen (2021, 2022) argues that the seminal institutionalist works of John M. Clark, John R. Commons, Walton Hamilton, Wesley Mitchell, and Thorstein Veblen in the early twentieth century provide the basic elements for a proper analysis of the functioning of a monetary capitalist economy and of endogenous instabilities in and anticipate the developments in the analysis of endogenous financial instability that H. Minsky ([1986] 2008) would offered several decades later. Since the global financial crisis, much of the debate has centered on the position between market liberalism and state interventionism and the extent to which markets should be shaped and regulated by government action. The task of government bodies in this case is to formulate rules and control markets in such a way that this leads to a more stable configuration. The rules, on the one hand, should provide markets with good incentives, but also prevent markets from involving society in social risks.

The basis for financial stability can be the theoretical approaches of public choice (PC) and post-Keynesian institutionalism (PKI) (Ülgen, 2022). Although PC is usually associated with hypotheses of microeconomic rationality and PKI is usually associated with macroeconomic coherence, both perspectives seek to address issues of social decision/collective action to improve the functioning of a capitalist economy. The PC Approach and Microeconomic Rationality builds on the premises of neoclassical economics such as methodological individualism, rational choice, and concludes that the behavior of both public and private decision makers is motivated by the process of rational, self-interested decision making at the microeconomic level of individuals and firms. PKI argues that collective action is necessary to create an institutional environment that supports economic activity and provides a stabilizing force in the face of the destabilizing tendencies of capitalism (Minsky 1975, 1986) points to the need for government intervention. A capitalist economy is inherently a debt economy and, as a result, it requires viable and sustainable public (non-market) rules to ensure the social validity of the debt circulation and repayment process.

The institutional structure of MaPs determines the distribution of powers and responsibilities, as well as the nature of interactions between different actors in the relationship. It is noted (Egawa et al, 2015, 2) that the key roles in effective institutional arrangements for MaPs are played by: (1) organizations with a clear mandate for MaPs; and (2) a mechanism for policy coordination and communication of assessments of issues related to financial stability. The identification of organizations with a mandate for macroprudential regulation determines who is responsible for decision-making for timely policy actions. The need to establish a coordination and communication mechanism between policymakers or agencies arises because MaP is linked to other economic policies, and the involvement of several agencies requires effective coordination and communication.

The issue of coordinating MaP with other policies, in particular microprudential and monetary policy, requires that decision makers take into account the impact of different policy actions on each other and be mutually supportive. Aikman et al. (2013, 28) note that potential trade-offs and contradictions between different policy settings are an integral part of public policy. The benefits of having a clearly defined institutional policy framework, including for MaP, facilitate finding trade-offs. Also, Aikman et al. (2013, 26) draw attention to the importance of policy flexibility and calibration; macroprudential regimes will be most effective when policies are set in a broadly symmetric manner. In practice, this means tightening MaP instruments when lending practices become excessive, but, equally important, loosening these instruments when risks decline or when credit conditions need to improve.

Thus, the characteristics of institutional arrangements for MaPs (Egawa et al, 2015, 6-7) include: (1) establishment of a mandate for MaP/financial stability; (2) ownership of a mandate for MaP/financial stability; (3) existence of a multi-agency communication/coordination process. Nier et al. (2011, 3) argue that for institutional arrangements to effectively mitigate systemic risk, they need to (1) support effective risk identification through access to information and relevant expertise, (2) provide incentives for the timely and effective use of policy instruments, and (3) ensure policy cooperation in a way that preserves the autonomy of designated policy functions. According to Nier et al. (2011, 3) MaP should be supported by the following three key elements: (1) information and resources, (2) a mandate and set of powers, and (3) a framework that allows the responsible person to be accountable for mitigating systemic risk and to ensure coordination among policies that are relevant to systemic risk. The institutional framework for MaPs can be summarized as Table 1.1 (developed by the author).

Table 1.1. Institutional framework of macroprudential policy (by the author)

Element	Institutional aspects
Organizations	Mandate
	Responsibility
Mechanisms	Access to information
	Risk identification
	Implementation of policy tools
	Calibration of policy measures
	Coordination with other policies
	Communication with other policies and society

The importance of defining the mandate of MaPs bodies follows from the need to understand who implements policy measures and is responsible for making decisions for timely policy actions. Several agencies may be involved in MaPs: the central bank, the government, the coordinating council. We consider alternative options for the institutional arrangement of organizations implementing MaPs in the next section.

1.3. Alternative institutional frameworks to organize macroprudential policies

Countries have developed their institutional structures and mechanisms regarding the distribution of powers and responsibilities for MaPs, as well as the structure of interaction, communication and coordination between different institutions.

Egawa et al. (2015) point out that current arrangements can be divided into two types: central bank centralization, where the central bank or central bank committee is the sole holder of the macroprudential mandate; and government coordination, where the government coordinates views or policies among multiple agencies with a macroprudential mandate as the

sole chair of the financial stability committee. Also, Egawa et al. (2015, 6-7) note that the MaPs/financial stability mandate is more likely to be assigned to the central bank than to the government. In contrast, the government is more likely than the central bank to play a coordinating role in inter-agency communication as the chair of such an inter-agency cooperation mechanism. Egawa et al. (2015, 4) note that the central bank has the MaP mandate in the vast majority of countries, and the central bank governor chairs the financial stability committee in many countries. In some countries, the finance ministry, representing the government, chairs the committee, meaning that it typically plays an important role in MaP as chair or coordinator of the committee.

Grigaite et al. (2020, 3) considers that today there are four institutional models of national macroprudential authorities, with powers delegated to: (1) the government, (2) the central bank, (3) the financial authority (microprudential supervision) or (4) a committee with representatives of these authorities.

Egawa et al. (2015, 10-11) classify the actual institutional arrangements for MaPs into five types:

- Centralization in the central bank: The central bank, or a committee of the central bank, is the sole owner of the macroprudential mandate.

- Coordination by the central bank: The central bank coordinates views or policies among multiple agencies, to which the macroprudential mandate is assigned, as the sole chairperson of the financial stability committee.

- Coordination by the government: The government coordinates views or policies among multiple agencies, to which the macroprudential mandate is assigned, as the sole chairperson of the financial stability committee.

- Checks and balances: The central bank and the government constitute the financial stability committee as co-chairpersons or members with equal authority to discuss and decide on MaPs.

- Decentralization: Multiple agencies with the macroprudential mandate decide on MaPs without any coordination or communication mechanism.

Nier et al. (2011, 6-7) identify five key institutional models:

- The level of institutional integration of central banking functions and financial regulation. It also affects the volume of information available in the central bank.

- Mandate of MaP. Ownership specifies which institution (or set of institutions) should be responsible for limiting systemic risk (central bank, policy committee linked to the central bank, independent policy committee, multiple agencies).

- Role of the Treasury. The formal role of the Treasury may be (1) active, if it plays a leading role in policy development or coordinating committees; (2) passive, if the Treasury participates in such committees but plays no specific role; or (3) simply absent.

- Institutional separation of policy decisions from control over policy instruments. This occurs when policy decisions and policy implementation are entrusted to different bodies or institutions.

- Having a separate body coordinating policy to address systemic risk. A separate coordinating committee is a feature of some of the models where the policy mandate is shared by several agencies.

Grigaite et al. (2020, 5) draw attention to the advantages of a combined mandate: such a structure allows for a better assessment of potential trade-offs and implications of micro- and macroprudential measures. However, a disadvantage of this structure is that potential conflicts of interest between micro- and MaPs may arise not only due to overlaps between the toolkits, but also due to differences in the optimal timing of policy measures.

The institutional model for organizing MaP should contribute to the effective mitigation of systemic risk and, in our opinion, can be represented by alternative options (Table 1.2).

Table 1.2. Alternatives for MaP organizational structure (by the author)

Mandate for map	**Policy implementation type**
Central Bank	Centralization
Central Bank Committee	Coordination
Government (Ministry of Finance)	Centralization
Government Committee	Coordination
Committee: Government + Central Bank	Balance
Various agencies	Decentralization

Centralized or coordinating structures appear preferable, as they provide clear delegation of authority and responsibility for timely decision-making. Also, assigning the MaP mandate to the Central Bank (or another agency if assigned the relevant authority) appears

justified, as MaP closely correlates with microprudential policy and monetary policy, and it is important that these policies act in the same direction in the interests of economic development.

1.4. Institutional approaches to the structure of macroprudential policy

One reason institutionalism is important (Hoefer 2022, 73) is that structures persist while people change. Institutions change the behavior of the people who work in them (more than people change institutions). Because of this, decisions are more stable than they would otherwise be. In the late 20th century or so, neo-institutionalism was developed. In this revised approach, institutions are still the organizations that create and enforce laws.

Vargas-Hernández (2021, 2) notes that the economy institutionalism sustained in the pure theories of the economic rationality, that of the main agency and the transaction costs, among others, motivated the analyses of the international management of the organizations, at a time in which the operations of the multinational corporations expand. The neo-institutionalism arises with historical, sociological focuses and of the rational election that determine the processes of the international management of institutional reformation, during the phase of most expansion. Neo-institutionalism (Hoefer, 2022, 73) studies how the decision-making rules of institutions shape the outcomes of the process.

Vargas-Hernández (2021, 9) notes that neo-institutionalism emerged as a set of rules that define processes, starting with the incentive framework and constraints imposed on the behavior of different agents for the formulation and implementation of policies, and that affect the results measured in terms of growth and development. That seems to be consistent with the concept of MaP. At the national and international level, regulations have been developed that contain rules for the conduct of banking and other financial institutions, which establish restrictions for financial institutions (e.g. minimum capital requirements, liquidity, credit restrictions) and the powers of the regulator. These measures are aimed at reducing systemic risk and increasing financial stability, and therefore should contribute to economic growth and development.

Chagas Goudard and Bittes Terra (2015, 35) note that macroprudential measures are inspired by the new institutional economics and consist of regulating the role of competitive strategies (in other words, financial innovation) of banks and non-banks, ultimately to create a more stable financial system that promotes economic development and is not susceptible to economic and financial crises. In this regard, the public authority that is supposed to perform the functions of the macroprudential authority will be the regulator, while firms within the system (banks and non-banks), families and non-financial firms that engage in asset-liability transactions will be the regulated parties.

In this context, the following articulation between institutionalisms is proposed (Chagas Goudard, and Bittes Terra, 2015, 30): (1) Based on the new institutional economics (North, 1994; Villeval, 1995), MaP defines a set of rules that, in the short term, regulate individual behavior, both of individuals and of financial institutions. (2) Based on the old institutionalists (Commons, 1931; Veblen, 1919) and neo-institutionalists (Hodgson, 2002; Conceição, 2002), according to the interaction of forces that unfold between those who formulate regulation (regulators) and those who are directly or indirectly subject to its consequences (regulated), the application of regulation is strengthened, and in the medium and long term it becomes an institutional matrix - a set of individual and social habits that are both formal and informal.

Hoefer (2022, 72-73) draws attention to different approaches to institutionalism. *A normative approach*, in which the decisions of policymakers are guided by the rules and processes of the institutions involved in the decision-making rather than by the maximization of their own ultimate goals. In this case, the choice makers are more loyal to the institution and its rules than to the outcomes that might be expected in a rational choice approach.

Rational choice institutionalism may look like the normative version, but decision makers bring their own values to the institution, choosing to join only those institutions with which they already agree. It is assumed that a person with a strong commitment to certain values or processes will bring them or try to bring them to the institution he joins. And also, to adhere to the chosen values in the future, regardless of the circumstances.

Historical institutionalism places great emphasis on the power of precedent in an institution. This overlaps with the normative approach, but argues that decisions made early on continue to influence decisions many years later. To understand decisions in a value-based institution, one must know its origins. The rules and processes that exist within an institution

make change difficult. That is, existing members of the institution will follow the rules of the early days of the institution despite attempts to bring about change within the institution.

Empirical institutionalism relies on researchers to consider the role of institutions, interactions with individuals. It is understood that institutions interact with various individuals who in turn can influence the rules and organization of institutions. Thus, the individual plays a special role in organizing the functioning of an institution.

Considering the above, we can conclude that MaP includes features of different approaches to institutionalism.

Normative: In most cases, regulated organizations are required to follow the requirements of the regulator, otherwise they can be suspended from activity, deprived of a license;

Empirical: The structure and implementation of MaP is still the subject of discussions among specialists and academic researchers (an example of which is this article);

Historical: In light of previous recurrent crises - especially since the financial liberalization era from the 1990s onwards, a sort of learning-by-doing process, permeates the regulatory reforms. At the same time, despite the systemic nature of the crises and the emergence of macroprudential policies, market actors' freedom of action as well as market-led self-regulation/microprudential regulation tools are still in force and not constrained by tight macroprudential measures to change the shape of financial systems.

1.5. Lessons for improving the macro regulatory structure of financial systems

It is clear that the institutional structure of MaP matters for effective policy implementation. A number of academic papers study the institutional aspects of MaPs (Chagas Goudard and Bittes Terra, 2015; Egawa et al., 2015; Grigaite et al., 2020; Nier et al., 2011). Among them, Nier et al. (2011, 8) consider that to ensure successful implementation of MaP, its institutional structure should provide for:

(1) Effectively identify, analyse and monitor systemic risk, including by (a) ensuring access to relevant information; and (b) using existing resources and expertise.

(2) Timely and effective use of MaPy tools by (a) establishing a strong mandate and authority; (b) enhancing the ability and willingness to act; and (c) ensuring appropriate accountability.

(3) Effective coordination in risk assessment and mitigation to reduce gaps and duplications in risk identification and mitigation, while maintaining the autonomy of individual policy functions.

We will try to supplement the lessons and recommendations for organizing the institutional structure of MaP, based on the results of the analysis obtained in our current study.

The institutional structure of MaP can be represented as two interrelated elements: organizations that have the mandate to organize MaP (their powers and responsibilities) and the rules by which economic participants operate and MaP is implemented.

We draw attention to important institutional aspects of MaP and suggest ways to improve to most effectively achieve the goals of MaP, the results are presented in Table 1.3.

Table 1.3. Institutional aspects of MaP and ways to improve (by the author)

Institutional aspects	**Ways to improve**
Mandate	Providing powers to a centralized or coordinating institution at the national level, taking into account international regulation
Responsibility	
Access to information	Having the appropriate authority or good coordination with agencies consolidating information
Risk identification	Access to information, availability of early warning systems, availability of big data analytics tools
Selection and implementation of policy tools	Identification of a set of tools and situations for their use, existence of a mandate for the application of MaP measures, a system for determining the intensity of measures, use of previous experience, a system for evaluating results

Institutional aspects	Ways to improve
Calibration of policy measures	Early warning signal selection, information access, signal change monitoring, signal change response system
Coordination with other policies	Established channels of information exchange with other agencies or consolidation of mandates for the implementation of different policies in one institution, publication of the MaP strategy
Communication with economic agents and society	Definition of communication channels, frequency of communication, open MaP goals, publication of MaP strategy and its implementation results

Complex and fragmented structures are unlikely to facilitate the effective implementation of MaP, so assigning the MaP mandate to a single structure with information, technical, expert and communication resources seems like a reasonable solution. It is also important that this structure either simultaneously implements the mandate for microprudential policy and monetary policy or has good communication with the holders of such mandates, since these types of policies are closely related and, in the case of microprudential regulation, use similar instruments. Coordination of policies is important so that their actions do not contradict each other. The system of rules for the successful implementation of MaP includes access to relevant information, a system for identifying and assessing risks, the choice and implementation of policy instruments, a system for calibrating policy measures, rules for coordination with other policies and rules for communication with economic agents and society.

1.6. Conclusion (Institutional aspects of macroprudential policy and ways of improvement)

This paper analyses and systematises the institutional aspects of MaPs and makes proposals to improve the institutional structure of MaPs.

The paper identifies the institutional framework of MaP: bodies and organisations with MaP powers and responsibility for its implementation and control; MaP mechanisms, including access to information, risk identification, implementation of policy instruments, calibration of policy measures, coordination with other policies, communication with other policies and society.

Alternative organizational structures for MaP are analyzed. The MaP mandate may belong to the Central Bank, the Government (e.g., the Ministry of Finance), another financial body, a committee with representatives of these organizations (with coordination being carried out by both the Government and the Central Bank), decentralized management (various agencies). We conclude that centralized or coordination structures appear preferable, as they ensure clear delegation of authority and responsibility for making timely decisions. Also, assigning the MaP mandate to the Central Bank (or another agency if assigned the relevant powers) appears justified, since MaP closely correlates with microprudential policy and monetary policy, and it is important that these policy areas act in the same direction in the interests of economic development.

Modern MaPs practice is largely inspired by institutionalist and neo-institutionalist approaches. Institutions are organizations that create and enforce laws. At the national and international level, regulations have been developed that contain rules for banking and other financial institutions, which set limits for financial institutions (e.g. minimum capital requirements, liquidity requirements, credit restrictions) and regulator powers. These measures are aimed at reducing systemic risk and increasing financial stability, and therefore should contribute to economic growth and development. MaPs include features of different approaches to institutionalism; we highlight normative and empirical approaches.

The paper offers recommendations for improving the institutional aspects of MaPs. In terms of the powers and mandates of organizations, it is important to grant powers to a centralized or coordinating institution at the national level, taking into account international regulation. Access to information is ensured by the presence of appropriate powers or good coordination with agencies that consolidate information. Access to information, the presence of an early warning system, and the availability of big data analysis tools are important for the timely identification of risks. The selection and implementation of policy tools should be based on the identification of a set of MaP instruments and situations of their use, the presence of a mandate for the application of MaP measures, a system for determining the intensity of measures, the use of previous experience, and a system for evaluating results. Calibration of

policy measures should be carried out through the selection of early warning signals for a crisis, access to information, monitoring of signal changes, and a system for responding to signal changes. To coordinate MaP with other policies, it is important to have established channels of information exchange with other agencies or consolidate mandates for the implementation of different policies in one institution, and publish a MaP strategy. For effective communication with economic agencies and society, we recommend defining communication channels, frequency of communication, openness of MaP goals, and publishing a MaP strategy and the results of its implementation.

Macroprudential policy for financial stability

Publication Status

This part of the chapter is awaiting publication in the collective book *"Climate Change, Financial Markets, and Systemic Risks: From Observations to Expectations"*, expected for publication by Routledge in 2025.

Keywords:

- Early warning signals
- Financial crisis
- Financial stability
- Macroprudential regulation
- Monetary policy
- Stress testing

Abstract

The 2007-2008 Global Financial Crisis (GFC) brought back into focus the issue of systemic financial instability and the regulation of financial activities at the macroeconomic level. Much work has been done in the decade following the crisis to determine the nature, conditions and scope of macroprudential regulatory models with a view to strengthening the effectiveness of financial market regulation and supervision mechanisms in parallel with the microprudential regulatory practices that have been implemented for several decades. In the light of the GFC, the latter have proven to have limited capacity to ensure the systemic stability of financial markets. Attention is therefore turned to the possibility of considering innovative combinations of macroeconomic regulatory instruments and modalities that could reduce the occurrence and severity of major financial crises without hampering the dynamism of

innovative financial markets. Macroprudential regulation comprises many elements, and the question of choosing the optimal combination of macroprudential policy instruments and their interaction is a critical issue with regard to these observations. In line with this, the main purpose of this chapter is to question whether the financial system is adequately protected from risks, more than fifteen years after the GFC.

1.7. Introduction (Macroprudential policy for financial stability)

The 2007-2008 Global Financial Crisis (GFC) has highlighted the need to regulate not only individual financial institutions, but the system as a whole. Since then, the concept of macroprudential regulation has been actively promoted. Various macroprudential policy tools have been developed and the channels through which macroprudential policies could affect the economy have been explored over time. However, questions about the effectiveness of macroprudential policies still remain open.

There is a variety of tools that can be used by national authorities to maintain financial stability. Instruments interact with each other in a complex way. The question of choosing a relevant set of tools and their calibration is one of the main issues to be considered in financial regulation frameworks. The balance between the cost of regulation and the benefits of financial stability is particularly relevant in a context of economic and financial turmoil but also under the constraints of energy transition and sustainable development since financial market are at the heart of economic and societal evolution. In this aim, it seems to be suitable to determine the nature, conditions and scope of possible macroprudential frameworks with a view to strengthening the effectiveness of financial markets regulation and supervision along with the microprudential regulatory practices that are in force since the 1990s in financial systems. In the light of the GFC, microprudential regulation alone has not proven to be apt to ensure systemic stability of markets since it was only focusing on the resilience of individual institutions to external (and limited) shocks. Therefore, attention can be turned to the possibility of considering innovative combinations of macroeconomic regulatory instruments and ways that could reduce the occurrence and severity of major financial crises without hampering the dynamism of innovative financial markets. Assessing financial stability through early warning indicators (Early Warning Signals, EWS) or stress testing models seem to be an important element in maintaining financial stability (or containing financial instability).

The concept of macroprudential policy is quite broad and includes various elements such as the instruments, the channels through which these instruments affect the economy, the evaluation of the effectiveness of the measures applied, and the assessment of the financial stability of the economy. An important issue is the interaction between macroprudential and monetary policies. The question remains whether the financial system is adequately protected from risks at the current moment. This chapter seeks to answer to this critical question.

The first section points to a plethora of definitions about financial stability and financial crisis. The second section is devoted to a review of the evolution of the regulatory framework from micro to macroprudential regulation. It details the ways of risk identification from EWS to stress testing for further application of macroprudential policy instruments. The third section considers the effectiveness of macroprudential policy, including channels of implementation and tools. The fourth section provides an overview of the interaction between monetary policy and macroprudential policy. The last section concludes.

1.8. Financial stability, financial crisis and leading indicators

The concepts of financial stability and financial crises are inherently opposite. The issues of determining financial stability have been disclosed in studies of various authors for quite a long time. A particular attention had been drawn to the definition of financial stability from the 2000s and especially over 2003–2006 (see Table 1, below). However, these various and developed researchs could not prevent the GFC that redirected again the attention of scholars and policy makers toward the systemic fragilities and weaknesses of financial markets. and to the need to strengthen financial stability at macro level. The attention to various elements of financial stability is increasing and these variables and factors are being studied separately. However, there is almost no definition of financial stability in later papers. This shows that financial stability is a complex concept with many elements. There is no an accurate definition of financial stability. Although in most cases, the stability is related to the ability of financial systems to function smoothly (mainly) as an intermediation process between loanable funds and financial needs.

Table 1.4. Definition of Financial Stability

Definition	Authors
Ability of the financial system to cope with a run of a single bank	Fecht, 2003
The financial system's ability: (a) to facilitate both an efficient allocation of economic resources—both spatially and especially intertemporally—and the effectiveness of other economic processes (such as wealth accumulation, economic growth, and ultimately social prosperity); (b) to assess, price, allocate, and manage financial risks; and (c) to maintain its ability to perform these key functions—even when affected by external shocks or by a build up of imbalances—primarily through self-corrective mechanisms.	Schinasi, 2004
Condition in which an economy's mechanisms for pricing, allocating, and managing financial risks (credit, liquidity, counterparty, market, etc.) are functioning well enough to contribute to the performance of the economy.	Schinasi, G.J., 2004 A broader definition
Stems from the prevalence of a financial system that is able to provide on a durable basis, and without major disruptions, an efficient allocation of savings to investment opportunities.	Das et al., 2004
Smooth functioning of the components of the financial system (financial institutions, markets, and payments, settlement, and clearing systems).	Cihak, 2006
Situation when the efficiency of financial intermediation between ultimate borrowers and ultimate lenders is not subject to significant adverse shocks.	Cihak, 2006 Aggregated from several Financial Stability Reports
A condition in which the financial system works smoothly with all of its key components satisfactorily performing their roles: financial institutions carrying out their financial intermediary functions, market participants maintaining a high level of confidence in their financial market, and the financial infrastructure being well developed.	Heath and Goksu, 2017
Financial stability is a society-wide concern and should be addressed at macro level as a social dilemma through collective action to ensure a continuous/stable provision of monetary/financial operations.	Ülgen, 2022

Even though there is no a universal definition of financial stability, the stability of financial markets can be defined opposite to financial instability and financial crisis, the former pointing to the ability of financial markets to allow the economy to work smoothly while the latter reflecting a state of ill-working of markets regarding their role of financing economic activities of different people and institutions in a durable way. In most cases, the same indicators are used to assess financial stability or financial crisis. As Cihak, M. (2007, p. 7) argues: "some financial stability reports define financial stability as the antithesis of financial crises: system-wide episodes in which the financial system fails to function and the institutional underpinnings

of a monetary economy - payments and settlements systems, the acceptability of bank deposits as money are disrupted".

At the same time the financial stability may be defined as a public good (Ülgen, 2020; Ülgen, 2022). Ülgen (2021, p. 536) emphasizes that financial stability as an essential public good should be produced, distributed, managed and controlled by public authorities to guide the behavior of private actors towards globally compatible economic actions to achieve the common good. Financial stability should be considered a public good (Ülgen, 2022, p. 330) because it is a systemic need that cannot be satisfied by market mechanisms. In fact, since economic relations are based on the possibility of continuous payment and settlement transactions, monetary and financial services can be considered part of the vital infrastructure of the capitalist economy. Financial stability is a public concern that links the viability of the whole with the consequences of the monetary and financial decisions of a few. Thus, the financial system exhibits the characteristics of a basic infrastructure common to the whole of society, and financial stability exhibits the characteristics of a public good. This underlines the importance of financial stability for the functioning of the entire economy. Variants of financial stability definition may include micro and macro levels. This determines the emergence of different levels of regulation: micro and macroprudential regulation. At the micro-level, we can define financial stability as the resilience of the financial system to shocks and disequilibria and to continue smoothly functioning (settlements, credit, payments) in the case of a failure of a single financial institution or in case of a systemic crisis. More broadly, at the macro-level, financial stability is connected with monetary policy issues such as inflation, GDP growth, interest and currency rates. That is why prudential policy which is responsible for financial stability, is often interconnected with monetary policy of central banks.

Due to the complexity of the financial system and to the recurrence of system wide crises, a large number of institutions are involved in ensuring financial stability at both international and national levels. International level mainly includes G-20 Forum, Financial Stability Board, International Monetary Fund, and Bank for International Settlements.At the national level, one may find national central banks and other national regulatory and supervision agencies.

The financial crisis is also a very broad concept. We can segment a crisis according to the area in which it occurs or the vulnerabilities that are behind. For example, Adrian et al. (2013) document that vulnerabilities can emerge in four areas: 1) systemically important

financial institutions (SIFIs)[1], 2) shadow banking, 3) asset markets, and 4) the nonfinancial sector. The mechanism of a financial crisis is usually associated with a wave-like economic development: "During expansionary booms, funding constraints are loose, and intermediaries can build up leverage and maturity mismatch. The high effective risk appetite of intermediaries in those times leads to a compression in the pricing of risk and an increase in asset price valuations" Adrian et al. (2013, 8).

This analysis is very close to the Financial Instability Hypothesis (FIH) of Minsky. According to Minsky (1992), financial instability arises from within, as a result of the functioning of markets especially when government/public regulation is loosened. This means that instability is rather endogenous than caused by external shocks, as assumed in standard market (equilibrium) approaches. According to FIH, without appropriate government regulation and continuous supervision, markets can go through three stages:

1. *Hedge finance:* debt obligations are covered by expected profits, this situation pushes actors to further risky operations;

2. *Speculative finance:* the situation worsens, profits are not high enough to cover debt obligations, new loans are required to repay debts;

3. *Ponzi finance:* no profit, debt obligations do not generate enough money to repay debts, debtor actors must borrow again to pay interest and dividends, but cannot repay capital. If the debt chain is interrupted, the debtor entities go bankrupt and can pull the whole banking system down with them. This would be the case when large institutions (too-big-to-fail or SIFIs) are involved in the crisis. This is a systemic crisis, which requires extra-market intervention, usually by central banks and governments.

High costs of financial crises are one of the reasons for the authorities' increased attention to supporting financial stability. Adrian et al., 2013; Aikman et al, 2013; Grigaite et al., 2020 notice that fire sales, and adverse feedback loops can result in material disruptions in financial and economic activity when adverse shocks hit, due to connections between the real and financial sectors, the cost of financial crisis also includes GDP drop and social costs.

A crisis arising in one financial or industrial sector may easily spread to the entire market due to the high interconnection between different sectors and institutions. Therefore, most local crises can be seen as potential triggers for a systemic crisis. Consequently, modern

[1] A systemically important financial institution (SIFI) is a bank, insurance company, or other financial institution whose failure might trigger a financial crisis. They are colloquially referred to as "too big to fail".

regulation is largely aimed at preventing local crises as well as limiting system interconnections.

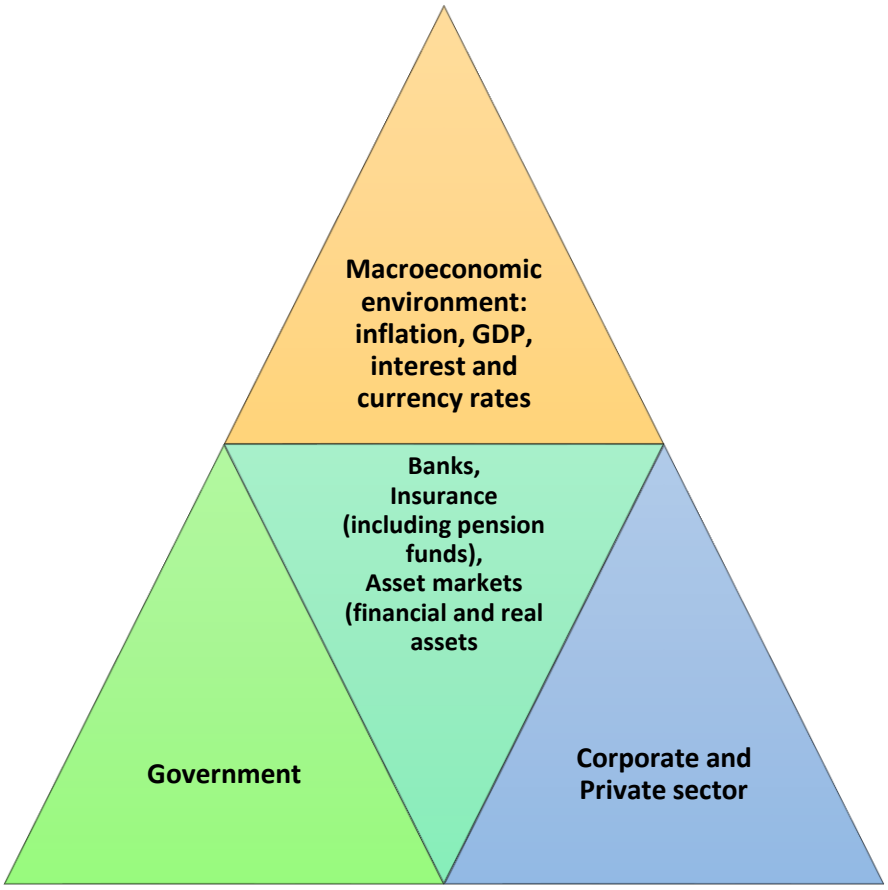

Figure 1.1. Financial System interlinkages (by the author)

Since there is no a single definition of financial stability, there are also very different approaches to defining financial stability indicators. Given the conceptual complexity of financial stability, developments in financial stability cannot be summarized in a single quantitative indicator (Schinasi, 2004, p. 11). Financial stability is difficult to define through a simple variable, due to the complex interdependence of different elements that could affect stability within the financial system as well as within the real economy (Dattels et al. 2010, p. 6).

However, as financial stability is inherently the opposite value of a financial crisis, the indicators of the financial crisis can be used to define financial stability. Several examples of groups of indicators that are used to assess financial stability as well as indicators for assessing financial crisis (instability) can be put forward.

In addition to defining the indicators of financial stability or stress, it is important to define a benchmark. Borgioli and Gouveia (2013, 19) argue that by analysing the behaviour of some relevant financial stress indicators as compared to their benchmark behaviour, it is possible to identify periods and countries where deviations are significant. The choice of the indicators, on the one hand, and of the benchmark, on the other hand, is therefore crucial for the results. The following Table 1.5 and Table 1.6 provide some examples of indicators.

Table 1.5. Examples of Financial Stability Indicators

Borgioli et al. (2013)	**Heath and Goksu (2017)**	**Dattels et al. (2010)**
Profitability and efficiency • Return on equity (ROE)	1) Increasing the resilience of the financial system Financial institutions: - deposit-takers - non-bank financial institutions (with domestic/foreign and state/private breakdowns) Financial markets: - money markets, securities and derivatives markets - interest rates and FX rates - infrastructure and financial inclusion	A. Monetary and Financial Conditions The availability and cost of funding linked to global monetary and financial conditions. (i) G-7 Real Short-Term Interest Rate (ii) G-3 Excess Household and Corporate Liquidity (iii) Goldman Sachs Global Financial Conditions Index (iv) Growth of Custodial Reserve Holdings at the Federal Reserve Bank of New York (v) G-3 Bank Lending Conditions
Asset quality ▪ Non-performing and doubtful loans and debt securities (percentage of total loans and debt securities) (NPL)	2)Containing the build-up systemic vulnerabilities: credit, debt and asset prices Credit-related: - credit growth - type of credit - connected, concentrated, directed lending Debt-related: - outstanding debt levels - leverage ratios - non-financial corporations, households and governments Asset prices: - real estate - equity and bond prices	B. Risk Appetite The willingness of investors to take on additional risk by adjusting exposure to riskier asset classes, the consequent potential for increased losses, and implication for the functioning of broader financial markets (i) Merrill Lynch Investor Survey of Risk Appetite (ii) State Street Investor Confidence Index (iii) Total Net Inflows into Emerging Market Bond and Equity Funds
Capital adequacy ▪ Tier 1 (T1)	3) Structural vulnerabilities within the financial system: financial interconnections and spillovers Domestic and cross-border:	C. Macroeconomic Risks Macroeconomic shocks with the potential to trigger a sharp market correction, given existing conditions in capital markets

Borgioli et al. (2013)	Heath and Goksu (2017)	Dattels et al. (2010)
	- financial interconnections within economies and across border - capital flows - spillover analysis - international environment	(i) Projection of Global Real GDP Growth in the World Economic Outlook (ii) G-3 Confidence Indicators (iii) OECD Composite Leading Indicators (iv) Implied Global Trade Growth (v) Global Breakeven Inflation Rate Index (vi) Cost of Protection Against Default on Mature Market Sovereign Debt
Liquidity ▪ Loans-to-deposits ratio (LtD)		D. Emerging Market Risks Risks to global financial stability stemming from emerging market asset classes, looking specifically at fundamentals in emerging markets and vulnerabilities to external risks28 (i) Estimated Fundamental Emerging Market External Debt Spreads (ii) Emerging Market Sovereign Credit Quality (iii) Emerging Market Private Sector Credit Growth (iv) Inflation Volatility (v) Corporate Credit Spreads
Leverage ▪ Assets-to-equity ratio (AtE)		E. Credit Risks Credit exposures creating the potential for defaults that could produce losses in systemically important financial institutions as well as the corporate and household sectors (i) Merrill Lynch Global High Yield Index Spread (ii) Share of Low-Quality Corporate Debt (iii) Moody's Speculative Grade Default Rate (iv) Banking Stability Index (v) Loan Delinquency Rate (vi) Household Obligation Payment Ratio
		F. Market and Liquidity Risks Market exposures of systemically important financial institutions and the potential for

Borgioli et al. (2013)	Heath and Goksu (2017)	Dattels et al. (2010)
		consequent mark-to-market losses, and the extent to which markets may be underpricing risk (i) Hedge Fund Leverage Proxy (ii) Average Net Speculative Positions in U.S. Futures Markets (iii) Estimated Common Component in Asset Class Returns (iv) Equity Risk Premia (v) Composite Volatility (vi) Funding and Market Liquidity Index

Table 1.6. Examples of Risk (Instability) Indicators

Adrian et al. (2013)	Eidenberger, J. (2014)	Pouvelle, C. (2012)
Standard measures of some of these factors for bank holding companies (BHCs) considered to be systemically important include regulatory capital and leverage ratios, asset liquidity, wholesale short-term funding	excessive credit growth	Stock market volatility
Market indicators, such as CDS premiums, equity prices, and expected default probabilities based on estimates of asset volatilities and liabilities	high returns of bank stocks	Bank stock price index volatility
Conditional Value at Risk (CoVaR) is an estimate of the value at risk of the financial system conditional on a firm's distress, based on co-movement of equity prices in the lower tail of the firm's and market return distributions		Government bond yield spread
Network measures map interlinkages between firms, help to identify key nodes or clusters, and can be used to simulate how a shock, such as the distress of a firm, could be amplified through the network		Libor-OIS spread

Confronting financial stress remains one of the major policy issues of the day. In the next section, we consider regulatory approaches that are intended to enhance financial stability.

1.9. Regulation structures: from microprudential to macroprudential

The regulation of individual financial institutions emerged long before the global financial crisis. Basel Committee (2001, p.1) offered proposals for an internal ratings based approach (the IRB approach) to capital requirements for credit risk: "The Committee believes that such an approach, which relies heavily upon a bank's internal assessment of its counterparties and exposures, can secure two key objectives consistent with those which support the wider review of The New Basel Capital Accord. The first is additional risk sensitivity, in that a capital requirement based on internal ratings can prove to be more sensitive to the drivers of credit risk and economic loss in a bank's portfolio. The second is incentive compatibility, in that an appropriately structured IRB approach can provide a framework which encourages banks to continue to improve their internal risk management practices."

Microprudential policies help maintain the stability of individual financial institutions, but do not provide insight into the systemic situation. The GFC demonstrated that microprudential policies were necessary but not sufficient to ensure financial stability. Macroprudential policies help to smooth the financial cycle and reduce the probability of financial crisis. This helps protect the economy from potential losses from a macro perspective beyond the individual concerns and then ensure stability at systemic level.

Financial risks may arise both at the level of individual financial institutions and at the level of the financial system. The development of regulation evolves in tandem with the increasing complexity of financial instruments and transactions. «Micro-prudential supervision and market conduct regulation, etc., existed well before the global financial crisis and as indeed, in some economies, did macro-prudential policy. But the global financial crisis demonstrated that micro-prudential policy is necessary but not sufficient to ensure financial stability; hence the emergence of macro-prudential policy to complement micro-prudential policy with a more systemic perspective». (Heath and Goksu, 2017, 8). Therefore, Adrian et al. (2013, 2) note: "Macroprudential policies are designed to reduce vulnerabilities to mitigate the amplification of negative shocks, and also to pre-position institutions so that they can absorb shocks".

The different approaches to regulation at the micro and macro levels are not opposed to each other; indeed, they complement each other. Heath and Goksu, (2017, 9) suggest that "it became increasingly obvious that micro-prudential analysts need macro data and macro-prudential analysts need granular micro data, and they potentially benefit from each other's

insights in order to identify emerging systemic risks and vulnerabilities". A comparison of micro- and macro-level approaches to financial regulation is presented by Borio (2003) and summarized in the Table 1.7 below.

Table 1.7. Comparison of macro- and micro-prudential approaches (by Borio, 2003)

	Macroprudential	**Microprudential**
Proximate objective	limit financial system-wide distress	limit distress of individual institutions
Ultimate objective	avoid output (GDP) costs	consumer (investor/depositor) protection
Characterisation of Risk	Seen as dependent on collective behaviour ("endogenous")	Seen as independent of individual agents' behaviour ("exogenous")
Correlations and common exposures across institutions	important	irrelevant
Calibration of prudential controls	in terms of system-wide risk; top-down	in terms of risks of individual institutions; bottom-up

Recurring systemic crises require consideration of alternative sustainable models of financial regulation. The opposition between regulation associated with state power and market activity associated with private decisions leads to an opposition between regulation between micro-rational behavior and macro-rational governance (Ülgen, 2022). A compromise approach to regulation that ensures private and public interests may be polycentric market governance between tight government control and loosely regulated free markets. Ülgen (2022) notes that in a decentralized regulatory system, the constituent entities should be governed by a comprehensive set of rules aimed at aligning the information and incentives of individual actors with broader social goals such as financial stability; these rules should be supported by mutually agreed monitoring procedures. Voss and Schroth (2018) argues that polycentric governance perspective acknowledges that, in addition to nation states, other initiatives contribute to the shaping of collective orders; they involve local governments, businesses, civil society organizations and social movements.Thus, regulation/supervision of financial systems as a whole (macroprudential) is the responsibility of public authorities, in addition to markets/private actors. In some specific cases, elements of governance may be delegated to local institutions in order to increase the flexibility and speed of regulatory action (Ülgen, 2022).Regulation is based on the identification of risk points, so the assessment of systemic risk is a critical component of choosing how to proceed with a regulatory approach. Systemic risk

generating activities are at the root of financial system vulnerabilities. Systemic risk can be defined as the probability of failures in financial institutions caused by asset impairments, potentially leading to serious negative consequences for the economy. Identifying vulnerabilities that could lead to a financial crisis is an important part of macroprudential policy. It is necessary to monitor not only individual financial institutions, but the financial system as a whole. Tools for identifying such risks include stress testing and early warning signals.

An important task is to react in advance to rising risks in the financial system. The use of early warning signals allows the timing of macro-prudential measures to be optimal. There are challenges in the application of existing indicators. Researchers are also making proposals for new indicators to identify systemic risk. An important parameter for the effectiveness of an early warning signal is its ability to signal increased risk within a time frame sufficient to apply macroprudential policy measures.

There is no consensus on what exactly constitutes a warning signal of an upcoming systemic crisis. Early warning indicators include credit and asset price growth (Biljanovska, 2019), property price growth (Deghi et al., 2020), credit to GDP ratio (Drehmann and Yetman, 2020), exchange rate (Nier et al., 2020), liquidity and interconnections between financial market participants (Heijmans and Wendt, 2020).

Biljanovska (2019) found that asset price bubble accompanied with credit imbalance indicate financial crisis. They show that credit imbalances were excessive both before the 1987 and the 2008 systemic crises, but only in the latter case they were accompanied by overvalued asset prices, and asset price overvaluations can emerge even when credit is subdued, such as before the dot-com bubble in the early 2000s and - more strikingly - since 2014. Credit imbalance is measured by credit to GDP ratio. Asset price bubbles by themselves are driven by credit also.

Deghi et al. (2020) use nonlinear dynamic stochastic general equilibrium (DSGE) model with occasionally binding housing collateral constraints to offer a new methodology to predict downside risk to house prices and finds it to be a useful early-warning indicator that can be used for financial stability surveillance. Drehmann and Yetman (2020) research credit-to-GDP ratio and find that credit gaps based on linear projections in real time perform poorly when based on country-by-country estimation, but as a panel, and impose the same coefficients on all economies, linear projections perform marginally better than the baseline credit-to-GDP gap.

Nier et al. (2020) uses a sample of 62 economies over the period of 2000: Q1–2016: Q4, builds dynamic panel regressions and shows that an appreciation of the local exchange rate is associated with a subsequent increase in the domestic credit gap. Heijmans and Wendt (2020) develop composite risk indicator which combines data on liquidity risk and systemic impact through interconnections among participants in order to determine the criticality of individual participants.

The results of the studies reviewed suggest that early warning indicators are an important part of macroprudential policy, including influencing the choice of macroprudential policy instruments. There is much scope for research in this area, as existing indicators can be improved. And there is scope to propose new indicators that can be used as EWS.

Stress testing is a prudential policy tool. Typically, it is "what if" analysis. Stress testing is based on building of scenarios and are related with market discipline. Scenario must be plausible and should take into account procyclical behavior. Different types of scenarios are correlated to different objectives. Results of stress tests are used for macro- and microprudential policy calibration. Macrofinancial imbalances include leverage, liquidity risk, risk mispricing, maturity mismatch. Although the concept of stress testing is well developed, the authors still see certain directions for improving the quality of stress testing conducted by financial institutions. At the same time, some of the works are devoted to a review of existing stress testing systems in various countries.

Jobst (2019) discuss four major steps in assessing the system-wide impact of sovereign risk: scope, loss estimation, shock calibration, and capital impact calculation. Gornicka and Valderrama (2020) present a semi-structural model of default risk. Authors use this model to simulate bank credit losses for stress-testing purposes and to calibrate borrower-based macroprudential tools. Budnik et al. (2020) presents a new Banking Euro Area Stress Test (BEAST) model for assessing system-wide resilience while accounting for interactions between the financial sector and the real economy. Study group established by the BIS (2020) compares the stress-testing methodologies then used by the seven Latin American central banks that participated in the study group. Gross et al. (2020) presents an integrated tool suite for IFRS 9 and Current Expected Credit Losses compatible estimation in top-down solvency stress tests. The research carried out and the suggestions made show that stress testing can offer options for improvement in order to provide a clear picture of the financial risks of institutions and the system as a whole.

Micro- and macroprudential regulation complement each other. The application of macroprudential approaches does not exclude dealing with risks at the level of individual financial institutions. To justify the use of a particular regulatory tool, a system for identifying potential risks must be developed. In the case of macroprudential regulation, such risk identification tools are EWS and stress testing. These methods are often not formalised by regulators and have a wide range of possibilities for suggestions for improvement.

1.10. Channels, tools and effectiveness of macroprudential policy

Macroprudential policies are central bank policies aimed at ensuring systemic financial stability and increasing the resilience of the financial sector in face of macro shocks that could threaten the viability of monetary and financial structure, by building special capital buffers or covering losses in the event of a stress scenario. An important component of macroprudential policy is to resist the formation of market bubbles and to limit systemic risk-taking by financial institutions.

Macroprudential policies are designed to reduce vulnerabilities to mitigate negative system-wide shocks. For example, macroprudential policies limit systemic risks by limiting credit growth in a particular sector of the economy when the evolution of markets could lead to systemic concerns. The accumulated experience in this area suggests that macroprudential policies are a combination of risk-containment measures aimed at containing systemic risk.

The availability of diversified macroprudential tools to contain excessive systemic risk appears to be an important development trend of regulation. Numerous macroprudential policy instruments have now been developed, including countercyclical buffers, conservation capital requirements, leverage limits, loan loss provisions, limits on credit growth, loan restrictions, limits on foreign currency, limits on the loan-to-value ratio, limits on the debt-service-to income ratio, liquidity requirements, limits on the loan-to-deposit ratio, limits on foreign exchange positions, reserve requirements, concept of SIFIs and others. The interaction of macroprudential policy instruments deserves particular attention. This issue is the subject of research and is often interlinked with the issue of the effectiveness of measures. A consequence of this is the question of choosing the optimal set of macroprudential policy instruments by authorities.

Most of macroprudential policy working papers justify the effectiveness of macroprudential policy. There are studies that focus on the impact of macroprudential policies on economic growth and compare the effectiveness of macroprudential and monetary policies as there is currently a wide range of macroprudential policy tools available, accordingly the studies and their results often differ with respect to the use of a particular instrument.

Basu et al. (2020) develop a model of optimal monetary policy, capital controls, foreign exchange intervention, and macroprudential policy. Authors built a model of a small open economy and mention that it is essential that instruments are considered jointly. Budnik (2020) studies 28 European Union countries in 1995 – 2017 and argues that optimal choice of macroprudential policies depends on the phase of the business cycle and on monetary policy stance. Ultimate effect of a macroprudential instrument on credit depends on monetary policy. This is an area that could be extensively researched, as the current set of macroprudential policy instruments is quite large. Cozzi et al. (2020) also draws attention to the interaction and effectiveness of macroprudential and monetary policies and finds that macroprudential policy diminishes the frequency and severity of financial crises thus eliminating the need for extremely low interest rates. Counter-cyclical capital measures reduce the neutral real interest rate in normal times.

Araujo et al. (2020) using meta-analysis techniques finds that a tightening of macroprudential policy has statistically significant effects on credit. For instance, tightening limits on loan-to-value (LTV) or debt-service-to-income (DSTI) ratios produce similar average effects on reducing household credit but have weaker effects on house prices. A result of the paper is to point to stronger effects from tightening than loosening actions. Bergant et al. (2020) studies emerging markets, notes that tighter level of regulation reduces the sensitivity of GDP growth to VIX (CBOE Volatility Index) movements and capital flow shocks. It also constrains economic activity when global financial conditions are buoyant.

Researchers draw attention to the positive results in increasing financial sustainability, while at the same time having a negative impact on economic growth and activity. Belkhir et al. (2020) argues that application of macroprudential policies have a statistically and economically direct negative effect on the probability of banking crises and the same time depress economic growth, and confirms this in the study. It seems to us important to continue research into the identification of signals for the optimal moment to apply macroprudential policy instruments. The moment at which it is possible to prevent an emerging financial crisis and at the same time to minimize the negative impact on economic growth.

Brandao-Marques et al. (2020) compare effectiveness of macroprudential and monetary policy using cost-benefit analysis. The paper evaluates net benefits of policies using quadratic loss functions, estimating policy effects on the full distribution of future output growth and inflation with quantile regressions. Tightening macroprudential policy is beneficial in net terms. By contrast, tightening monetary policy entails net losses. Buying foreign-exchange or tightening capital controls has small net benefits.

The application of macroprudential policy instruments does not always achieve the intended effect. Galati et al. (2020) study the effects of credit restrictions on the balance sheet structure of banks and other financial institutions. Banks mainly respond to credit restrictions by making adjustments to the liability side of their balance sheets, particularly by increasing the proportion of long-term funding rather than cutting lending. Cappelletti et al. (2020) argues that higher capital buffers have a positive disciplinary effect by reducing banks' risk-taking while having an adverse impact on the real economy through a decrease banks' lending activity.

The issue of efficiency of MaP is being widely discussed, Xu (2019) analyzes how bank profitability impacts financial stability. Author concludes that "effective and timely implementation of the Basel III framework, the need for well calibrated macro-prudential tools, and to ensure that banks' reliance on wholesale funding and leverage remains prudentially manageable". Poghosyan (2019) assesses effectiveness of lending restriction measures, such as loan-to-value and debt-service-to-income ratios, assess their dynamic association with house prices and credit for up to 16 quarters. He finds association between lending restrictions and target variables and argues that "macroprudential measures can be more effective if they are supported by monetary policy actions" (Poghosyan, 2019, 14).

Ferreira (2019, 8) highlights common weaknesses that can undermine the effectiveness of the supervisory process, such as inappropriate institutional setting, lack of skilled resources, insufficient forward-looking analysis, lax credit risk standards, inappropriate liquidity risk standards and monitoring, weak corporate governance and weak enforcement. The paper provides recommendations how countries that are not members of the Basel Committee could incorporate capital and liquidity standards into their frameworks.

A large set of macroprudential policy (MaP) instruments has been developed. Different instruments impact financial stability through different channels, based on capital requirements, liquidity-based, borrower-based. The question of the choice of macroprudential policy

instruments[2] and their effectiveness is relevant. Each paper reviewed above (Araujo et al., 2020; Basu et al., 2020; Belkhir et al., 2020; Brandao-Marques et al., 2020; Cappelletti et al., 2020; Ferreira, 2019; Galati et al., 2020; Poghosyan, 2019; Xu, 2019) discusses different MaP policy tools. This shows the diversity of the tools and importance of each of them. At the same time, none of the paper considers the interaction of the different MaP instruments.

1.11. Macroprudential policy and monetary policy interaction

The interaction of macroprudential and monetary policy is one of the most popular issues studied. Both policies use similar variables and channels connected with credit. There is limited experience in the use of macroprudential policy to compare with monetary policy. Monetary policy is wider and focuses on price stability, inflation, output gap and covers all sectors of the economy. Macroprudential policy is concentrated on the financial system's stability, smoothing the credit boom, increasing the resilience of the financial system and covers mostly banking sector.

Before the GFC, the monetary authorities (central banks) predominantly focused on monetary policy (through inflation targeting, i.e. maintaining price stability) without acting on systemic financial stability as a policy objective of the regulation framework. The GFC has pointed out the weaknesses of such a policy path and brought forward the role of authorities in monetary and financial stability as an integrated framework. The question then arises: if monetary authorities focus now on systemic financial stability issues through macroprudential policy, what should the appropriate monetary policy be. Should the authorities still prioritize anti-inflationary monetary policy, while the core issue is not the inflation anymore but rather depression and uncovered financial crisis. Researchers show that the two policies have a reciprocal influence on each other. Applying the policies together means that the right balance between them has to be determined.

Adrian et al. (2020) argues that monetary policy that focuses purely on inflation and output-gap stabilization can lead to instability. Macroprudential measures can mitigate the

[2] A classification of macroprudential instruments can be provided following Alam(2019, 25): Countercyclical Buffers (CCB), Conservation, Capital Requirements, Leverage Limits (LVR), Loan Loss Provisions (LLP); Limits on Credit Growth (LCG), Loan Restrictions (LoanR), Limits on Foreign Currency (LFC); Limits on the Loan-to-Value Ratio (LTV), Limits on the Debt-Service-to-Income Ratio (DSTI); Tax Measures, Liquidity Requirements, Limits on the Loan-to-Deposit Ratio (LTD), Limits on Foreign Exchange Positions (LFX), Reserve Requirements (RR), SIFI, Other.

intertemporal risk-return tradeoff created by the vulnerability channel. Authors extend the New Keynesian model to include endogenous risk. Corradin et al. (2020) using aggregate data, document that, prior to 2015, heightened financial market volatility coincided with worsening money market conditions, while higher central bank liquidity provision was associated with reduced money market stress. After 2015, the evidence is consistent with central bank asset purchases inducing scarcity effects in some money market segments, and with active securities lending supporting money market functioning.

Altavilla et al. (2020) argues that there are strong complementarities between monetary policy and macroprudential policy in shaping the evolution of bank credit. Further research in this area would be interesting in order to identify specific points in time when the policy instruments should be applied so that they can support each other's effectiveness as much as possible. Hoerova et al. (2020: 35) finds that liquidity tools are beneficial but cannot completely remove the need for Lender of Last Resort interventions by the central bank. Even if European banks had fully complied with the Basel III liquidity standards, they would have still required very substantial central bank liquidity assistance.

Some studies point to higher efficiency of macroprudential policy compared to monetary policy to provide financial stability. Martinez-Miera (2019, 3) argues that macroprudential policy should be the primary tool for addressing risks to financial stability. Kockerols (2019, 1) suggest that an active use of macroprudential policies targeting financial stability risks would alleviate the burden on monetary policy to "lean against the wind" and find that macroprudential policy has net marginal benefits in addressing risks to financial stability in the euro area, whereas monetary policy has net marginal costs". Aikman (2019: 2) shows how deploying the countercyclical capital buffer (CCyB) to adjust bank capital requirements in response to changing risks substantially improves outcomes relative to when the interest rate is the only cyclical policy tool.

Raising interest rates does not always reduce the risk of financial institutions. Tightening monetary policy may increase the risks of the financial system. Experts (Adrian et al., 2020; Aikman, 2019; Altavilla et al., 2020; Hoerova et al., 2020) agree that joint modelling of the two policies is important, because there is certainly an interaction of policies and each of them, individually and together, influence macroeconomic variables. In addition, their interaction is not completely understood at the moment. For example, Takáts (2019) argues that tighter macroprudential policy mitigates the lending impact of monetary policy (irrespective whether monetary policy tightens or eases) – whereas easier macroprudential policy amplifies

the lending impact of monetary policy. Kim (2019) argues that macroprudential policy shocks have effects on real GDP, the price level and credit that are very similar to those of monetary policy shocks, but the detailed transmission of the two policies is different. The response may vary from country to country.

Papers reviewed point to interaction between monetary and macroprudential policies. Both policies use similar variables and channels connected with credit. There is no clear understanding of the joint use of these two policies. This is also due to limited experience in the use of macroprudential policy to compare with monetary policy. We can say that the ultimate goal of both policies is targeting systemic financial stability that is a necessary condition for the smooth functioning of the economy. Monetary policy is wider, focuses on the price stability, inflation, output gap and covers all sectors of the economy. While macroprudential policy is concentrated on smoothing the credit boom, increasing the resilience of the financial system and covers banking sector. However, the aim of the macroprudential policy is to allow markets to function properly to support economic development. Therefore, macroprudential policies are often considered as complementary to monetary policy. There is no doubt that macroprudential and monetary policies influence each other. The design and application of policy instruments should take account this mutual interaction.

1.12. Conclusion (Macroprudential policy for financial stability)

Despite the fact that elements of counteraction to systemic financial crises have been applied for quite a long time, the issues of increasing financial stability still remain under multi-facet research programs. This is partly due to the change and complexity of the financial system and the emergence of new risks. Moreover, the systems that existed before 2008 have proved to be imperfect and there is no evidence that the macroprudential policy measures used are definitely effective. Thus, the first Basel Accords to support financial stability (developed by the Bank for International Settlements) were developed in the 1980s; Basel II appeared in the late 1990s, developing approaches to supporting financial stability (capital requirements, supervisory process, disclosure of information). Despite the indicated developments in the field of financial stability regulation, Lehman Brothers went bankrupt in 2008 and the subsequent GFC occurred.

In response to the GFC, financial stability regulation was developing, in particular, more attention is paid to controlling the liquidity of financial institutions, stress testing. The question remains whether the financial system is adequately protected from risks at the current moment, whether macroprudential policy is effective enough? Some studies point to the costs of MaPs in terms of reduced credit supply to the business sector (Laeven et al., 2022), increased financial sector stability through reduced efficiency in the non-financial sector (Belkhir et al., 2022), increased risks in the non-banking sector (Adrian et al., 2022), and reduced economic growth potential (Laeven et al., 2022).Financial stability and financial crisis are opposite concepts, so the same indicators are used to measure financial stability or crisis. Due to the broad interpretation of the concept of financial stability, many indicators can be used to determine it. The absence of a single indicator of financial stability makes it difficult to assess the effectiveness of macroprudential policy measures.

Most researchers agree on the effectiveness of macroprudential policies. However, many note the costs of such policies in terms of curbing credit, economic activity and economic growth. At the same time, monetary policy faces a number of difficulties, and many researchers agree that macroprudential policy can largely complement monetary policy. Although these are two different policies, they mutually influence each other.

To increase the effectiveness of macroprudential policy, it is necessary to determine the spectrum by the criterion of financial stability/crisis, and also adjust the calibration of macroprudential policy measures depending on the magnitude of the potential risk. It is obvious that both monetary and macroprudential policies are necessary for balanced economic development and protection from financial crises.

Chapter 2: Financial Stability, Macroprudential Supervision and Early Warning Signals (EWS): A Minskyian Interpretation

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- Endogenous financial instability hypothesis
- Financial crisis
- Hyman Minsky
- Macroprudential supervision

Abstract

This article draws upon a Minskyian perspective about the stability issues of the financial system and considers the effectiveness of macroprudential policy through an analysis of the literature on early warning signals (EWS). Exploring current approaches to macroprudential policy, we find similarities with the financial instability hypothesis of Hyman Minsky that mainly relied on the endogenous nature of the crisis, the danger of excessive credit, and the financial stability paradox, developed long before the 2007-08 global financial crisis. Reviewing the set of academic papers investigating the effectiveness of EWS, we find that most of the indicators recognized in the research as effective are consistent with Minsky's approach since they bring forward the endogenous nature of instabilities. Moreover, it is obvious that one indicator cannot be considered as a universal predictor of crises. A set of indicators is required to allow an effective macroprudential policy. We propose an EWS framework where crisis is the result of the occurrence of financial vulnerability and trigger events. The resulting EWS framework is consistent with Minsky's approach and points to the endogenous nature of the evolution of credit to finance market expectations as the main vulnerability of financial stability.

2.1. Introduction

The 2007-2009 global financial crisis (GFC) was, once again, an illustration of the structural fragilities and weaknesses of financial markets that often lead to systemic crises. This crisis was also interpreted by many observers (Lahart 2007; Davidson 2008; Palley 2010; Vercelli 2011; Whalen 2008; Wray 2016, 2018) as being related to Hyman Minsky's endogenous financial instability hypothesis (EFIH), and in some analyses as a Minsky moment that usually comes into the picture after a period of market expansion and boom. Although it is not obvious that the GFC can be called a Minsky moment (since the pre-GFC period was not an economic boom period but rather a financial speculative era over a few years), it is certain that the work of Minsky offers a relevant analysis of the structural instabilities of capitalist economies that is consistent with the specific features of an endogenous money economy. In such an economy, banking (and then financial) system provides credit money to finance entrepreneurial projects that are relying on the expectations of future profits. This continuously leads to debt accumulation that is a necessary (but not sufficient) condition for the private wealth accumulation and endogenous growth process. Debt accumulation, a crucial basic process of capitalist accumulation, is also a critical source of systemic fragilities that the market-led economy is naturally suffering from. The EFIH, as a "theory of the impact of debt on system behavior and (…) the manner in which debt is validated" (Minsky 1992, 5), focuses on the internal dynamics of the banking system and financial markets that tend to develop speculative operations far from the capacity of the real economy to generate sustainable profits. These operations are particularly exacerbated in loosely regulated environment (financial liberalization) and usually lead to economy wide turmoil. The market players continue to engage in speculative, then Ponzi, operations while the occurrence of a systemic crisis is within their field of vision. Such disaster myopia is also studied by Akerlof and Dickens (1982), Olsen (2008), Cartwright (2018) (to quote but a few) in terms of cognitive dissonance and cognitive biases, with market players taking pleasure in convincing themselves of the relevance of their strategies even though they know that such strategies are likely to lead to disaster. The EFIH, critical with regard to the liberal frame of financial markets, calls for a public hand-guided macro regulation and supervision in order to tame market ardors and lower the scope of speculative strategies.

In the aftermath of the GFC, Minsky and Minsky-like analyses of financial fragilities gained ground. A remarkable change operated through such theoretical and practical reflections about stronger financial supervision rules to rethink financial regulation from a macroprudential

perspective. Financial regulation is then reframed although in a non-radical way, according to a macroprudential approach along with the usual micro regulation policies, in force since the 1990s. Financial regulators have undertaken various measures and sought to develop new methods and tools in order to reduce the likelihood of systemic financial crisis. From 2010, the European Commission has proposed various sets of rules to strengthen the soundness of financial markets through a more integrated Europe-wide macro approach. The European System of Financial Supervision is now made up by macro and micro stability seeking agencies at European level.[3] The European Systemic Risk Board was established to assess the soundness of the whole financial system adopting a macroeconomic perspective to regulation and supervision. The European Banking Authority (EBA) was established on January 2011, framing the new regulation and supervision architecture. The EBA, the European Securities and Markets Authority (ESMA) and the European Insurance and Occupational Pensions Authority (EIOPA) are the main ways of gathering 28 national supervisors within a single regulatory framework. In the United States of America, the Dodd Frank Wall Street Reform and Consumer Protection Act of 2010 sought to establish new guidelines for banks, mortgage and credit rating agencies to fight against recurrent systemic crises[4].

After three decades of liberalization and free market ideology, the academic and political wisdom turned into a more critical direction. It is then admitted that the working of financial markets is likely to create very costly crises that are impossible to contain in a reasonable way when the markets are not supervised by appropriate regulatory rules and practices. Therefore, a macroprudential perspective to financial regulation is adopted as a common direction for regulators calling for specific supervision rules. Early warning signals (EWS) were one of the many points of interest of the new regulatory framework aimed at having artillery capable of fighting against the pressures generated by the functioning of financial markets. The regulatory motto is then “prevention”, more than “correction”, even if this new perspective is still modestly implemented. In line with this evolution of financial regulation, this article focuses on Early Warning Signals (EWS) that can be used as relevant “preventive” information for improving the intensity and efficiency of macroprudential policy measures. Following a Minskyian analytical framework, we question the conceptual and logical foundations of financial regulation with regard to the limits of the liberal organization of financial markets to ensure a stable and viable functioning of the economy at long run. The

[3] See https://www.bankingsupervision.europa.eu/about/esfs/html/index.en.html
[4] However, under the Trump administration in 2018, Dodd-Frank has undergone several rollbacks loosening bank regulation.

focus is put on the EWS and aims at assessing their relevance as appropriate informational tools to help regulation authorities in the implementation of the macroprudential regulation policies in an effective way.

The plan of the article is as follows. The first section describes the complexity of the application and success criteria of macroprudential policies and the role that EWSs play in this regard. It argues that financial regulation should consider the systemic framework through a multidimensional macro-approach. The second section examines Minsky's EFIH and argue that many post-2008 works about the roots of the GFC in particular and of capitalist financial crises in general put forward very similar ideas with the EFIH: the endogenous nature of crises, the twofold role of credit as a source of both economic growth and financial instability in a capitalist economy and the paradox of the financial system that may look strong when it is most vulnerable (the paradox of tranquility during the boom periods). In the third section, we review the results of academic papers that study models of EWS as effective informational tools about the soundness of financial markets. We then propose a classification of EWS, highlighting their endogenous nature, related to the cyclical development of the economy (expansion and contraction of lending, changes in asset prices). The fourth section is devoted to the study of the channels through which the crisis may spread. Since one EWS cannot cover all crisis situations, we propose that the authorities use a set of EWS to calibrate macroprudential policy that should reflect a combination of vulnerabilities and possible triggers. We propose to gather different EWS that provide effective results in various studies, into two group of indicators: vulnerability indicators and trigger indicators, taking into account some specific features on the borrower side, lender side, asset prices related, and others. This way of approaching the financial instability issues seems to be more comprehensive and macroeconomically apt to provide regulators with relevant supervision tools. The conclusion points to further research avenues in order to strengthen financial soundness through better regulation and supervision.

2.2. New regulatory approach: Macroprudential policy

In the wake of the GFC, the fragilities and weaknesses of liberalized financial markets had been brought to the fore. The micro-prudential and self-regulation-led supervision framework has proven to be inapt to provide economy with relevant stabilization mechanisms. The revival of Minskyian and the like analyses of financial instabilities allowed scholars and policy makers to call into question the relevance of financial market efficiency hypothesis and

more holistic macroprudential approaches to financial regulation and supervision have gained ground.

Macroprudential policy is a set of measures that aim to prevent systemic financial crises through macro-level measures that are mainly control mechanisms that seek at assessing the evolution of the whole financial system and not only the soundness of some peculiar (individual) institutions. It takes into account the interlinkages and interdependences among different market participants and considers risks at the level of the entire financial system and the economy, beyond the individual institutions soundness. This obviously requires specific information and data about the evolution of the overall financial system and also the linkages among different market players and market makers that may generate systemic concerns such as the "too-big-to-fail" or "systemically important financial institutions" (SIFI and G-SIBs)[5] (Bank for International Settlements (BIS) 2011, 2018; Financial Stability Board (FSB) 2022). Despite the extensive set of instruments and the large amount of research in this area, the issue of adjusting macroprudential policy measures depending on the likelihood of a crisis is not formalized at the international level and is entirely at the discretion of the authorities in each particular jurisdiction.

Various EWS are indicators to provide information about the evolution of financial markets as a whole (the financial system). They are intended to help regulators and supervisors to detect the potential for systemic crises in financial markets in order to prevent their occurrence or at least to be better prepared to mitigate their magnitude on the economy: "Finding a set of early warning indicators that can signal the vulnerability to financial turmoil has emerged as a policy goal of paramount importance in the aftermath of the global financial crisis." (Shin 2013).

[5] Systemically important financial institution (SIFI) are banks, insurance companies, or other financial institutions whose failure has a huge potential to trigger a systemic financial crisis. They are also called "too-big-to-fail" institutions. Another classification is given by G-SIBs, global systemically important banks. The assessment processes on such institutions are now framed by the Financial Stability Board (FSB) and the BIS that set up a list of such institutions to be supervised in a much attentive way as their market operations are assumed to represent the behaviour and the evolution of the whole financial markets. An annual revised list is published by the FSB and BIS, since 2014 (FSB, 2022, and the BIS dashboard at: https://www.bis.org/bcbs/gsib/). The EBA also publishes a complementary list within its supervision area, the Other Systemically Important Institutions (O-SIIs). The latest list is released on 12 June 2023 (see at: https://www.eba.europa.eu/eba-updates-list-other-systemically-important-institutions-1) according to its Guidelines on criteria to assess other systemically important institutions (O-SIIs), set up on December 2024 (see at: https://www.eba.europa.eu/sites/default/documents/files/documents/10180/930752/964fa8c7-6f7c-431a-8c34-82d42d112d91/EBA-GL-2014-10%20%28Guidelines%20on%20O-SIIs%20Assessment%29.pdf?retry=1). Therefore, one can assert that the micro and the macro prudential frameworks are converging towards the SIFI and G-SIBs as a reference informational point about the evolution of markets for supervision authorities.

The focus is rather placed on macro-regulation institutions even though there are various ways of framing possible EWS that take into account specific micro and macro variables. The core issue is then related to the instability of the financial system as a whole: “Micro- and macro-prudential policies share a number of instruments, but have a different, albeit related, focus. The focus of micro-prudential policy is the stability of individual financial institutions. By contrast, the focus of macro-prudential policy is the stability of the financial system as a whole.” (European Central Bank 2014, 135). The financial system continues to evolve and becomes more complex, generating new risks that require new regulatory mechanisms to deal with potential instabilities. Especially in a liberalized financial environment, instabilities generate inefficiency and excessive risk-taking (Basak and Zhao 2018). The regulatory measures have then to deal with growing instabilities and new issues such as the possible counter-productive effects of the regulatory measures on market behavior, the growing complexity of market operations harming market transparency, and dissemination of relevant information. At the same time, new rules thar are designed and implemented should prevent rigidities and counter-productive intervention. The EFIH argues that crises take place if the volatile market dynamics, i.e. the “endogenous destabilizing market forces”, succeed in defeating the thwarting devices and forces that should counter them (Ferri 2019, 3-4). The critical importance of financial regulation lies in the fact that it has to deal with an institutional, systemic and multifaceted issue that requires a multidimensional macro approach. The institutions and interventions that are aimed at regulating and limiting the crisis dynamics of the capitalist market process, in order to render the economy viable, are “thwarting systems” (Ferri and Minsky 1992, 79). To date, such systems are related to macroprudential rules and interventions -including EWS- as part of various supervision tools and technics that provide the authorities with preventive information about the evolution of financial markets.

Therefore, it seems necessary to develop an overall macroeconomic view with regard to the systemic dimension of the consequences of market behavior and to design appropriate and effective macroprudential policies. In this aim, this article is a contribution, albeit limited to the EWS, to the reflections on the conditions for developing macroprudential tools that could meet the critical role of thwarting mechanisms for systemic stability. It then focuses on a few well-developed works, representative of the research in the field of after-GFC preventive macroprudential framework. A comprehensive synthesis of different indicators to assess the resilience of financial markets to cumulated endogenous instability is conducted in order to evaluate the relevance of various EWS as appropriate supervision tools for strengthening systemic stability. We then argue that one EWS cannot provide efficient weapon to fight against

systemic financial instability. Starting from some relevant conclusions or directions offered by the research results we draw upon, we place the emphasis on some possible new avenues regarding systemic relevant EWS.

The stake behind is worth to be accurately stated. It is about the way to take all these different and complex aspects of the functioning of a monetary and financialized economy into account in order to design and implement a relevant financial regulatory framework that would be consistent with the characteristics of today's economies. Such a framework would provide us with possible rules for regulation and supervision policies in order to incite market players to adopt long-term expectations and strategies and tame speculative activities in favor of productive and sustainable engagements. In light of the GFC, it seems to be necessary to stop (at least, to reduce) the prevalence and the impact of speculative activities and related financial-profitability-based efficiency criterion on economic decisions of market players. In this aim, this analysis points out the major directions academic and policy research take and the way they are assumed to be used for reform purposes to stabilize financial markets. It could then be possible to precise the meaning of various indicators as well as their scope and relevance as information sources about the behavior and evolution of markets. This would allow us to give some directions for consistent and dynamic/smooth macro-regulation policies.

The GFC has highlighted the need to design appropriate regulation, not only for individual financial institutions (microprudential regulation), but also for the financial system as a whole (macroprudential regulation). Since then, the concept of macroprudential regulation has been actively promoted (Borio 2011; Claessens 2016; Hanson, Kashyap, and Stein 2011). Various tools of macroprudential policies (MaP) have been developed and the channels through which macroprudential policies could affect the economy have been explored over time. However, questions about the effectiveness of MaP still remain open since the interlinkages between market players as well as between markets and regulators are of the utmost importance for the effectiveness of MaP: "Optimal macroprudential policies are not always countercyclical; instead, they depend on the trade-off between the resilience effect and risk-taking effect. The inefficiency could also go in the other direction: a regulator who underestimates the resilience of the financial system may repress financial activities needlessly." (Basak and Zhao 2018).

A significant role in determining the effectiveness of MaP is the balance between risk mitigation and economic growth potential: "First, macroprudential policies can have a direct effect on the probability of banking crises if they happen to smooth financial cycles. Second, macroprudential policies can exert an indirect effect on the probability of banking crises by

weakening economic growth." (Belkhir et al. 2020).

The challenge for the authorities is to apply MaP in the most effective way possible. Macroprudential policies increase the resilience of banks and borrowers and can curb excessive credit growth when necessary (Ampudia et al. 2021). Financial stability affects long-run economic growth by controlling the depth of recessions and by affecting the duration of upturns, but tight credit constraints negatively affect the length of expansions. The main objectives of MaP are to increase system resilience and to smooth financial cycles since financial stability and is sine qua non for economic growth.

Borio (2011) provides a comprehensive description of MaP success criteria through the following criteria:

(1) Buffers in the system are high enough to cope with the downturn of the financial cycle, to avoid exacerbating it through fire sales and credit restrictions;

(2) Enough redundancy in capital and liquidity holdings above minima to prevent destabilizing behavior;

(3) Enough of a margin between the value of collateral and the amount lent against it to absorb any decline in asset prices without exhausting the protection.

Borio (2011) describes examples to the existing limitations of MaP such as: - measure of objectives; - assessment of systemic risks (through time dimension and cross-sectional dimension since no single measure could perform the two functions simultaneously); - lag of time between risk taking and consequences materialize; - extension of the macroprudential approach beyond the banking sector.

In the next section we consider the relationship between current macroprudential policy approaches and the Minsky approach. We focus on the endogenous nature of the crisis, the danger of excessive credit, and the financial stability paradox. We describe the application of Minsky's approaches in modern research.

2.3. Minsky approach and financial instability paradox

The scope and the effectiveness of MaP can be, at least partly, assessed by EWS. Early warning indicators and signal systems are the different names for the same concept. The implication is that there is a set of variables that could indicate an impending financial crisis. EWS provide informational criteria for the right timing of implementation of MaP measures and can contribute to improving the calibration of measures and enhance the effectiveness of

MaP: "To calibrate their policy response at a practical level, distinguishing the nature of the sources of asset price movements in real time is an extremely difficult task. For central banks it is important to have early indicators to assess the possible implications of large asset price movements and the building up of financial imbalances in the economy." (Gerdesmeier, Reimers, and Roffia 2009).

EWS can provide regulators with relevant information about the effective level of systemic risk. Thus, it is important to use EWS that provide warning information in a preventive way to calibrate MaP instruments: "One of the main counter-arguments to implement 'leaning against the wind' monetary and/or macro-prudential policies has been that the data do not provide a reliable signal to act in real time. This is particularly important as it is impossible to identify an asset price bubble with certainty and many booms simply burst without creating larger problems for the real economy. Thus policy-makers would need reliable indicators which identify harmful boom/bust cycles with sufficient lead time." (Alessi and Detken 2009).

However, the discussion about those instruments does not consider the first and crucial level of analysis that is related to the dynamics of the emergence of macro concerns and their very systemic roots. Indeed, risk arises at the moment when the situation seems to be the most favorable and less risky. This encourages market participants to seek higher returns and take more risks (Ferri and Minsky 1992; Borio 2011). Such a financial instability paradox requires close attention and further studies to set up relevant EWS models to strengthen MaP calibration. This schema was studied by Schumpeter, but it was Minsky who gave it an accueate analytical perspective (Ülgen 2014).

According to Minsky (1992), financial instability arises from within, as a result of the functioning of markets especially when government/public regulation is loosened. This means that instability is rather endogenous than caused by external shocks, as assumed in standard market (equilibrium) approaches. Without appropriate government regulation and continuous supervision (the *thwarting systems*), markets go through three phases:

(1) Hedge finance stage: debt obligations are covered by expected profits, this situation pushes actors to further risky operations;

(2) Speculative finance stage: the situation worsens, monetary flows do not provide net profits that can cover debt obligations, new loans are required to repay debts;

(3) Ponzi finance: no profit, debt obligations do not generate enough money to repay debts, debtor actors must borrow again to pay interest and dividends, but cannot repay capital. If the debt chain is interrupted, the debtor entities go bankrupt and can pull the whole banking

system down with them. This is a systemic crisis, which requires extra-market intervention, usually by central banks and governments.

In accordance with the EFIH of Minsky (1992), economy has financing regimes under which it is stable, and financing regimes in which it is unstable. Over periods of prolonged prosperity, the economy transits from "usual" stable financial relations toward fragile and short-sighted financial engagements that increase system's instability. Findings of Minsky's work, written long before the GFC but in light of many crises such as the Great Depression of the 1930s, the turmoil of the late 1960s in the US economy, the 1987 US stock market crash, etc., point to the unstable endogenous dynamics of capitalism that call for an appropriate public regulation of financial markets: "the path through time of a capitalist economy is best described as the result of the interaction between the system's *endogenous dynamics*, which if unconstrained would lead to complex paths that include periods of apparent growth, business cycles and economic instability" (Ferri and Minsky 1992). This is quite close to the conclusions drawn by the economics profession in the aftermath of the GFC with regard to the endogenous destabilizing dynamics of markets and the relevance of MaP since "macroprudential" means: "calibrating from a system-wide or systemic perspective, rather than from that of the safety and soundness of individual institutions on a stand-alone basis. It means following a top-down approach, working out the desirable safety standard for the system as a whole and, from there, deriving that of the individual institutions within it. It means taking explicitly into account the fact that drivers of risk depend on the collective behaviour of financial institutions (they are "endogenous"), and are not something outside their influence ("exogenous")." (Borio 2011, 2)[6].

Thus, the development of the financing system, described by Minsky (1982, 1986 [2008], 1992) from hedge financing to speculative financing and then to Ponzi financing is a relevant explanation of the paradox of financial instability:

(1) Low risks at the outset create an illusion of security, which encourages market participants to take greater risks, believing the situation to be stable (the main logic is the "natural" myope behavior of micro-rational individual players that seek at making rapid gains through present opportunities without being able to consider the macro-dynamics of economic evolution);

(2) The resulting excessive risks gradually lead to a crisis (pointing to the missing bridge between micro rational strategies and macro stability).

[6] However, it is worth noting that Borio's and the like studies do not mention Minsky's EFIH and its different analytical developments.

Very similar conclusions, in line with the "Paradox of tranquility" and the EFIH of Minsky, were reached after the occurrence of risks and the GFC, especially when it comes to the use of limited indicators to supervise market evolution: "These indicators work because they exploit the "paradox of financial instability" to the policymakers' advantage (…): the system looks strongest precisely when it is most vulnerable. Credit growth and asset prices are unusually strong, leverage measured at market prices artificially low, risk premia and volatilities unusually low precisely when risk is highest. What looks like low risk is, in fact, a sign of aggressive risk-taking." (Borio 2011, 7).

More recent studies (Brunnermeier and Sannikov 2014) have shown the so-called "volatility paradox": "low risk environments are conducive to greater buildup of systemic risk; decline in cash flow volatility encourages experts to increase their leverage by reducing their net worth buffer; in the absence of leverage restrictions, the system is prone to instabilities even and especially when the level of aggregate risk is low".

Minsky's approach is being used in current research (Kregel 2018; Nikiforos 2020; Papodimitriou, Nikiforos, and Zezza 2022) to describe processes taking place in the economy such as increasing corporate sector debt and rising prices of financial assets. These processes are seen as indicative of the emergence of a Ponzi scheme, among the research findings is an assessment of the effectiveness of measures in the event of a crisis. A case study that uses Minsky's analysis to determine the level of financial sustainability of firms, is conducted for energy distribution companies in Brazil (Torres Filho, Montani Martins, and Yukari Miaguti 2019). The research reveals an increase in financial instability among the studied companies in the period 2008-2013.

Nikifiros (2020) provides examples of EWS such as cyclically adjusted price-earnings (PE) ratio (the current level is similar to that of September 1929 and much higher than it was before the 2007–2009 crisis), gross debt over earnings before interest (sum of firms' debt and loan liabilities is now much higher compared to the period before the crisis), gross leverage of the corporate sector defined as gross debt over earnings before interest, tax, depreciation, and amortization (that is higher than its precrisis level and its previous peak at the end of the 1990s), share of issuers of corporate debt that issue BBB bonds[7] (in the United States, the share of issuers of corporate debt that have issued BBB bonds has increased from 25 percent in 2000 to

[7] Investment Grade. The obligor has sufficient capacity to meet its financial obligations. However, unfavourable economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.

36 percent recently. In Europe the increase is from 14 percent to 45 percent), has increased the share of BBB bonds in investment-grade corporate bond mutual fund portfolios (45 percent recently, compared to 18 percent in 2010) and number of Ponzi firms[8] (in the United States in 2015 it stood at 17,4 percent, which is above its precrisis level). Nikifiros (2020) concludes that the likelihood of a crisis is currently increased. Most of indicators used in the analysis are related to credit, which refers to Minsky's approach and allows us to confirm the idea that excessive credit, in a loosely regulated environment, should be seen as one of the main signals of an increased probability of a crisis.

In this vein, Torres Filho, Montani Martins, and Yukari Miaguti. (2019) identify two types of financial instability indices: First, a firm-level indicator for hedge, speculative and financial Ponzi units; and second, a sectoral financial instability index based on the frequency of speculative and Ponzi units in the industry sample. This gives us the idea that we need to consider crisis signals at different levels: from individual industry participants (lenders or borrowers) to the macroeconomic environment. Authors apply then this framework to a dataset on balance sheets from 64 electricity distribution companies in Brazil, during the period 2007–2015. In 2007, 48 companies (75 percent of the total) were in a hedge financing pattern, the remainder of the companies were divided almost equally between speculative and Ponzi structures. In 2015, 40 percent of the total were in a hedge financing pattern, 44 percent speculative and 16 percent Ponzi structures.

Torres Filho, Montani Martins, and Yukari Miaguti (2019) propose a liquidity index that compares the current financial inflows and outflows of a firm at a given point in time. In the stable case, all financial liabilities of the firm will be repaid without the need to undertake any refinancing. For a speculative unit, its current liquidity index is negative with the additional condition that interest payments are less than current inflows. The Ponzi unit would represent negative net inflows exceeding current inflows. Based on an index (with a scale from a minimum of zero to a maximum of 100) covering all companies in the sector, The Authors consider stability at the industry level through a sectoral indicator of financial fragility. The level zero indicates that all companies are engaged in hedge (or robust) finance. The level 100 indicates that all companies are engaged in Ponzi (or fragilized) finance. If the index assumes the level 50, the mixture of companies in the sector reveals a speculative (or exposed) financing structure. In the second approach, Torres Filho, Montani Martins, and Yukari Miaguti (2019) take into account the relative size of each company. The statistic used to measure the size of

[8] Firms whose cash flows are not sufficient to cover the interest payments on their debt.

each company is the accounting depreciation, which represents the minimum investment required to maintain the quality of the physical assets of the distribution companies. Between 2007 and 2015, the simple index evolved from 31 to 52, while the weighted index increased from 16 to 46.

The results obtained from a Minsky perspective prior to the GFC are in line with the findings of post-GFC analyses. The endogenous nature of crises indicates that even in the absence of external impulses the financial system can emerge from a state of resilience. This draws attention to the need to take account of such endogenous signals in EWS. The paradox of financial instability indicates that the same factors show both the evolution of the system and its pre-crisis state: an increase in the volume of capital market transactions, an increase in asset prices, a large inflow of new market participants, the emergence of innovative financial instruments, all contributing to what the literature calls "financial markets development" (Ülgen 2017). The paradox of financial instability adds further challenges to the effectiveness of MaP and the relevance of EWS, the need to distinguish between economic growth and financial development and pre-crisis conditions.

Indeed, financial fragility is defined (Tymoigne 2014) as the dependence of debtors on capital gains and debt refinancing to meet debt obligations, at the macroeconomic level; each of the Minsky steps (hedge, speculative, or Ponzi finances) reflect the propensity of financial problems to risk debt deflation. The expected safety margin in Minsky's financial fragility theory (Tonveronachi 2020) can be defined as the present value of cash flows less debt service, thus measuring the expected distance from financing to future solvency problems. In the same line, Stockhammer, Constantine, and Reissl (2020) argue that the crisis is due to the debt and export-led growth model in force that led to a rapidly increasing private debt ratio and current account imbalance. The dynamics of Minsky, systemic fragility as a debt-financed boom can also be described following Kapeller and Schutz (2012) as a chain of increase of the demand for credit, increase of credit supply, subsequent decrease in households' solvency, increase in interest rates, reduction of bank lending that triggers household bankruptcy and lead to further recession. Kapeller and Schutz (2012) argue that the cycle starts with an increase in income inequality, leading to a lower savings rate and higher debt levels. Any of these indicators can be considered as EWS. However, finding EWS is a difficult task especially when the economy is not stable (Tymoigne 2014). There are many sources of shocks, fluctuations in income or asset prices can lead to a crisis and it can be triggered by the sentiment of economic agents. In this regard, the dynamics of Minsky appears to be a good basis for creating an early warning

signal, as excessive lending pointing to the vulnerability of the financial system and the endogenous nature of the crisis.

In the following section, we analyze the current EWS used by financial supervision authorities or proposed in academic papers in order to understand how well the considered indicators describe the endogenous nature of the crisis in line with the Minsky approach.

2.4. EWS: looking for efficiency

Assuming that financial crises have different causes and different channels of transmission, different signals may be used to identify an approaching crisis. The pre-GFC studies focus more on the currency crisis in developing and emerging markets. Among the factors affecting exchange rate movements are debt composition, macroeconomic factors, external factors and speculative attacks (Frankel and Rose 1996), political instability, budget and current account deficits, rapid money supply growth (Eichengreen, Rose, and Wyplosz 1995), exports, deviation of the real exchange rates from their equilibrium trend, the ratio of broad money to gross international reserves, and equity prices (Kaminski, Lizondo, and Reinhart 1997). The research on the relationship between banking and currency crises (Glick and Hutchison 1999) showed that the occurrence of banking crises was a good predictor of currency crises in emerging markets, but not vice versa. Some pre-crisis work focuses on rapid credit growth, increase in assets prices, and bubbles (Borio and Lowe 2002).

The works presented after the GFC focus on the external crisis and take into account external factors such as countries' international reserves (Obstfeld, Shambaugh, and Taylor 2009) or the net foreign liabilities (Catao and Milesi-Ferretti 2013). All these factors are taken into account as a ratio to the GDP of a given country. Some works (Frankel and Saravelos 2011; Christofides, Eiher, and Papageorgiou 2015) are based on the study and comparison of a large number of different macroeconomic and financial variables, such as the level of reserves, the exchange rates, industrial production, and stock market movements. Current studies highlight the linkages between global and domestic financial crisis. They consider that US monetary policy has a significant effect on the leverage of US and European investors (Borio 2019; Miranda-Agrippino and Rey 2015; Rey 2018). The global financial cycle is formed by cross-border capital flows in addition to credit and asset prices. It turns out that changes in financing conditions in one country can spread to the rest of the world, especially when this country is a major player.

From a broader perspective, it is worth noting that since the 1980s, the evolution of economies with the real growth (GDP) slowing leads to increasing the credit gap. This requires a reflection on the new situation of capitalism. This evolution can be called a new regime of accumulation such that the real productive (and job-creating) activities are replaced by more speculative, short-term (and highly profitable) engagements. Industrial firms as well as financial institutions are more engaged in speculative financial operations than in long-term stable operations that could give the economy stable opportunities to create jobs and improve the income level of households. There is a sort of divorce between real growth (very low and irregular for many decades) and financial profitability (financial operations provide more rapid gains than productive real activities). In this context, the evolution of asset prices is of crucial interest and points to a specific market behavior in a way studied by Minsky (1982, 1986) through "hedge, speculative and Ponzi finance" schema.

The review of various studies on EWS provides different estimates of the effectiveness of the considered indicators. Below are the examples of the results obtained in these studies with respect to the effectiveness of the indicators. First, the indicators that point to the boom stage of the financial cycle are taken into account. But not every stage of the fall of the cycle has serious economic and social consequences such as disruptions in settlements between counterparties, a decrease in the growth rate of the GDP, and an increase in unemployment. Therefore, the indicators in relation to the high cost of the fall of the financial cycle (i.e. the emergence of a financial or an economic crisis) should also be considered.

Different kinds of variables can be considered with regard to their respective role of relevant information in the evolution of markets. Three specific relationships might be brought forward:

(1) Often credit growth and credit-related variables are powerful signals of a high probability of crisis. Schularick and Taylor (2009) demonstrate that credit growth (loan-money ratio, ratio of bank credit to non-monetary liabilities on banks' balance sheets) is a relevant predictor of financial crises. Drehmann and Juselius (2013) found that credit-to-GDP gap is the best indicator at longer horizons, whereas the Debt-Service-Ratio (DSR)[9] is relevant at shorter horizons and consistently outperforms other measures (real credit growth, growth rates and gaps of property prices and equity prices, non-core liability ratio). Many authors draw attention to some shortcomings of these indicators due to the complexity of measurement. First, credit-to-

[9] Debt service ratio is the share of income used for interest payments and amortisations.

GDP gap depends on the stability of the results of the filter (proposed by Hodrick and Prescott (1981), the HP filter) as new data points become available. Second, structural breaks in the underlying series can have an important effect on the calculation of the trend. Another difficulty also arises from the fact that credit and GDP growth rates vary over the cycle, so that their correlation can sometimes give misleading signals (Drehmann and Tsatsaronis 2014; Hyun Song Shin 2013). For DSR, the main difficulty is to obtaining aggregate data. Amortisation data are generally not available. The interest rate should reflect the average interest rate environment for the entire debt stock, which consists of a mix of new and old loans with various fixed and floating nominal interest rates. It is difficult to estimate average remaining maturities because data are generally not available and because of rollovers and other forms of refinancing (Drehmann, Borio, and Tstasaronis 2012). It is worth noting that Credit-to-GDP gap is the only EWS implemented in the Basel Committee guidelines (BCBS 2010, BCBS 2019).

Borio and Lowe (2002) maintain that the credit gap is the best indicator of episodes of financial instability. Real credit growth may also be used as a good proxy, but it contains more noise (an additive or multiplicative component of a signal that is random in nature and carries no useful information) than the credit gap. Credit growth, combined with large increases in asset prices, appears to increase the probability of financial instability. At the same time, the authors note the lower informative value of asset price gap and investment gap, where asset price and investment booms are periods in which real asset prices and the ratio of investment to GDP respectively deviate from their trends by specified amounts. A credit boom (and indirectly rising asset prices) increases the probability of financial problems, but only the combination of factors significantly increases the potential for instability. This supports the view that credit growth alone is not a negative factor, but when combined with other factors can lead to a crisis under some circumstances.

(2) Another indicator of high probability of a crisis is **asset price changes**. Borio and Drehmann (2009) show that, on average, credit, property and equity price gaps tend to be large and positive in the run-up to crises. The property and equity price gaps peak well before the crisis, with those of equity prices peaking before property prices and being much larger, the credit gap exhibits more inertia.

Borio, Drehmann and Xia (2019) focus on financial cycle measures such as the credit-to-GDP gap, the property price gap and medium-term growth rates in the credit-to-GDP ratio and state that they have significant forecasting power to recession risks. Financial cycle proxies outperform the term spread, i.e. the difference between the 10-year government bond rate and

the three-month money market rate, in nearly all specifications. Following Drehmann, Borio, and Tstasaronis (2012), the authors consider that the best prognostic indicator is a composite financial cycle indicator (real credit, the credit-to-GDP ratio and real property prices are then averaged to derive a composite measure of the financial cycle) or the DSR.

At the same time, Shin (2013) explores three types of EWS for financial instability – based on financial market prices; -normalized measures of total credit, and -related to liabilities of financial intermediaries. Shin notes that prices are not suitable as EWS; total credit and liabilities would perform better as EWS. Gerdesmeir (2010) maintains that credit aggregates (either in terms of annual changes or growth gap), changes in nominal long-term interest rates and the investment-to-GDP ratio jointly with developments in either house prices or stock prices turn out to be the best indicators which could help to forecast asset price busts up to 8 quarters ahead.

Rey (2018) also notes that asset price bubbles and excess credit creation are the best predictors of financial crises. At the same time, Rey (2018, 9) argues that volatility index (VIX) is an indicator of the phase of the financial cycle "low value of the VIX, in particular for long periods of time, are associated with a build up of the global financial cycle: "more capital inflows and outflows, more credit creation, more leverage and higher asset price inflation". Eberhardt and Presbitero (2018) study prices of commodities and find a negative and robust association between commodity price growth and the likelihood of a banking crisis. But these results are only relevant for low-income countries. Countries with relatively high export-to-GDP ratios are significantly affected by commodity price fluctuations. The results of the logit model obtained by the ROC[10] curves show that the inclusion of aggregate commodity price increases the predictive power of the model significantly as AUROC (*Area under the ROC curve*) increases from 0.851 to 0.882.

(3) Hatzius et al. (2010) note that a representative sample of available financial conditions indexes typically outperformed the single-variable indicators (yield curve, credit spreads, and so on), but some did not outperform the stock market index. The range of potential financial measures that can be included in financial indices is wide. Some (neoclassical) transmission channels relate to indicators affecting the user cost of capital, including the interest rates that firms pay to borrow and the price at which they could raise new equity capital. Prices affecting household welfare, including stock and house prices, or consumer interest rates, which

[10] A ROC curve (receiver operating characteristic curve) is a graph showing the performance of a classification model at all classification thresholds.

affect the trade-off between today's consumption and consumption. Other (non-neoclassical or) credit channels point to measures of liquidity, borrower risk, and the ability and willingness of intermediaries to lend, the prices of assets included as collateral, and the volatility of the prices of those assets. Intermediaries' propensity to lend is also affected by liquidity conditions (including the ability to roll over debt and easily sell assets) and the state of equity capital.

Alessi and Detken (2009) subdivided variables into two categories, which can be used as price-boom signals which could have relatively serious real economic consequences: real variables and financial variables. Real variables are: GDP, consumption, investment and housing investment. Financial variables are: consumer price-deflated equity, housing and aggregate asset prices, the term spread, real effective exchange rates, real and nominal 3-months interest rates and 10-year bond yields, real M1, real M3, real private credit and real domestic credit. The Authors conclude that financial variables contain more information for predicting costly asset price booms than the real indicators. They also find out that the global variables are more informative than domestic variables. The study shows that the most informative indicators are private credit gap and global credit.

Ng (2011) compares the predictive power of three indicators: HHMSW (offered by Hatzius et al., 2010), DN (offered by Domanski and Ng 2011), and credit-to-GDP gap. HHMSW is a composite indicator which includes intermediated credit growth, equity prices, property prices, corporate credit spreads, commodity prices, short-term spread, lending standards, securities issuance, aggregate money, exchange rate, VIX[11], TED spread[12], idiosyncratic bank stock price volatility, Libor-OIS spread[13], bank CDS spread[14]. DN is a composite indicator which includes intermediated credit growth, equity prices, property prices, corporate credit spreads, commodity prices, term spread – medium- to long-term, lending standards, loan states-to-deposit ratio. The study states that HHMSW has a good predictive ability on short-term; credit-to-GDP gap is relevant on medium-term, while DN proves to be the least effective

Most indicators that seem to be effective in different researches can be divided into two groups: credit-related indicators and asset price-related indicators. There are also EWSs that are

[11] The Volatility Index or VIX is the annualized implied volatility of a hypothetical S&P 500 stock option with 30 days to expiration.
[12] The TED spread is the difference between the three-month Treasury bill and the three-month LIBOR based in U.S. dollars.
[13] The Libor-OIS spread is the difference between Libor – the floating rate at which banks lend to each other – and overnight index swap rates, which are set by central banks.
[14] The price of a CDS (credit default swap) is referred to as its spread.

a mixture of different indicators, which may include monetary variables or variables related to the real economy. In the table below we propose a classification of indicators and point out the relationship between endogenous and exogenous signal variables.

Table 2.1. Classification of EWS (by the author)

Type of EWS	Examples on EWS	References	Minskyian nature of variables
Credit-related	credit growth credit gap credit-to-GDP gap Debt to service ratio	Schularick and Taylor (2009) Drehmann and Juselius (2013) Borio and Lowe (2002) Frankel and Sarsvelos (2011)	Endogenous
Asset price-related	property price gap equity price gap VIX (volatility index) commodities price	Borio and Drehmann (2009) Borio, Drehmann, and Xia (2019) Gerdesmeir (2010) Rey (2018) Eberhardt and Presbitero (2018)	Endogenous
Mixed (including monetary and real factors)	financial conditions indexes	Hatzius et al (2010) Alessi and Detken (2009) Ng (2011)	mixed

Following Borio (2019), Miranda-Agrippino and Rey (2015), and Rey (2018), we point out that the factors taken into account may be domestic as well as global. It is then appropriate to state that the global factors would be exogenous to the economy as defined by Minsky. We see that different studies give different results and quite a large range of EWS are mentioned as effective, obviously one indicator cannot fit all situations. In order to identify a limited set of EWS that can be recommended to the authorities for policy use to determine the likelihood of financial crisis, we look at the nature of financial crisis and their specific channels in the following section.

2.5. EWS as indicators of financial crisis channels

Financial instability arises from within, as a result of the functioning of markets when government regulation is loosened. This means that instability is endogenous and not caused -

in a global sense - by external shocks, as assumed in standard market equilibrium approaches:

"The path through time of a capitalist economy is best described as the result of the interaction between the system's endogenous dynamics, which if unconstrained would lead to complex paths that include periods of apparent growth, business cycles and economic instability…" (Ferri and Minsky 1992, 79)

At the "technical" level, the emergence of financial crises is studied according to the area in which they occur as a currency crisis, a fiscal crisis or a banking crisis (Claessens and Kose (2013, 2018). Depending on its location, a crisis can be defined as a local or a global crisis. Nevertheless, whatever its origins, the crisis can be characterized by an algorithm. The occurrence of a crisis can be described as a combination of vulnerabilities (risks) and triggers (events) (Basu, Chamon, and Crowe 2017; Claessens and Kose 2013).

Therefore, we put the emphasis on excessive lending and on the insolvency of participants[15] . This choice is related to the concept of macroprudential policy; many instruments are linked to controlling the volume of lending (leverage limits, loan loss provisions, limits on credit growth, loan restrictions, limits on foreign currency, limits on the loan-to-value ratio, limits on the debt-service-to income ratio, limits on the loan-to-deposit ratio). However, excessive lending does not obviously lead to insolvency. In order for insolvency risk to materialize, which can spread across all elements of the system, a certain trigger (one or more events) must occur to affect the solvency of the agents.

A wide variety of events can act as triggers such as the changes in asset prices (stock prices, commodities, real estate prices) and monetary factors (inflation, exchange rates, interest rates). More accurately, we argue that, financial crises must be regarded as a combination of events related to the relationships between: V (vulnerability, i.e. excessive credit) and T (trigger, i.e. sharp correction in asset prices) such as: V & T => FC (financial crisis). Financial crises are often preceded by asset and credit booms. This is the boom period of the FIH of Minsky: "The first theorem of the financial instability hypothesis is that the economy has financing regimes under which it is stable, and financing regimes in which it is unstable. The second theorem of the financial instability hypothesis is that over periods of prolonged prosperity, the economy transits from financial relations that make for a stable system to financial relations that make for an unstable system" (Minsky 1992, 7-8).

[15] Ongena and Peydro (2011) argue that lower interest rates stimulate riskier banking operations by banks with lower capital and greater exposure to liquidity risk. Lower rates make banks with lower capital more likely to lend to applicants with worse credit histories and give them larger loans or loans with a longer maturity.

Asset price corrections are linked to the concept of the financial cycle. Asset prices are subject to falls and rises as a result of various economic factors. As mentioned above, one of the objectives of macroprudential policy is to smooth the financial cycle. The financial history of the 20th century points to recurrent financial cycles (i.e. periods of ups and downs in the economy) (Borio and Lowe 2002; Gerdesmeir 2009; Alessi and Detken 2009; Rey 2018). Financial cycles are correlated with business cycles, and more strongly correlated with risk-taking by economic agents (Borio, Drehmann, and Tsatsaronis 2012; Potjagailo and Wolters 2020). In good times (the tranquil periods), risk sensitivity is reduced and there is an expectation of higher returns. As a result of speculation, asset prices rise and more participants enter the market, looking for profitable opportunities. They are confident in the light of the evolution of prices and profits. Furthermore, they do not have (or willingness to have) information about the long-term evolution of markets. New high-risk instruments emerge to meet the demand for higher returns and incite market participants to take new (often open) positions. Speculative fever then becomes the main driving force behind economic activities. Indeed, market participants can assess their own (personal) risks, but they are unable to know macro-level (systemic) risks because they cannot know the connections between their micro/individual situation and the macro situation. There are several reasons for this: (1) they do not have enough knowledge about the macro situation; (2) they do not have the tools or time to gather relevant information about the world around them; and (3) their goal is not to manage macro risks, but to manage the individual risks they think they know. This determines the need for regulation at different levels: macro and micro. It is important to understand which indicators show the growth zone of the cycle, because this is at the same time an indicator of the increased probability of a crisis. Given that markets cannot handle such a preventive approach through their micro-rationality founded strategies, the task of macroprudential regulation is to prevent the economy from overheating through the lens of macro-stability, i.e. the stability of the whole financial (and then economic) system.

Claessens and Kose (2013) points to the importance of identifying channels of crisis transmission. The first channel, operating mainly on the borrower side of finance, describes how changes in borrower balance-sheets can amplify macroeconomic fluctuations. The second channel, on the supply side of finance, emphasizes the importance of the balance-sheets of banks and other financial institutions to provide liquidity to the real economy. Based on the above concept of crisis generation that we use (V & T => FC), the trigger can be classified according to the channel of risk transfer (the borrower side or the balance sheet side of the financial institution).

Changes on the borrower's side are related to the inability to repay the loan (this applies to both individuals and firms). In Minsky's approach, this corresponds to the stage of speculative finance or Ponzi scheme. This situation can be associated with a fall in the borrower's income or borrower's expenses. It can occur as a result of a wide range of external or internal factors. Changes on the lender's side are also a significant factor as they may lead to changes in the terms of the loan, like early demand for repayment of the loan. It is also an important factor that banks are the largest lenders, therefore it is a matter of trust and stability of the banking system.

Assuming that the crisis situation has endogenous, Minskyian roots, the process leading to the turmoil can be represented as a combination of vulnerability and trigger variables. We then suggest a system of different EWSs to complement existing macroprudential policy approaches. Vulnerabilities are indicators related to excessive credit (credit growth, credit gap, credit-to-GDP gap). Triggers can be represented as several groups: on the borrower side, on the lender side, prices of different asset groups, other factors, including monetary factors.

The indicators that we consider above and that have been found to be effective in various studies can be distributed in the proposed system. Based on their effectiveness, they can be used as vulnerability and trigger indicators. The only group to which we propose to add new indicators corresponds to lender-side triggers. We assume that Liquidity coverage ratio (LCR) and Net stable funding ratio (NSFR), which have been used for quite a long time in bank regulation and supervision as indicators of banks' solvency and liquidity (micro prudential regulation), could be used for this purpose.

In Minsky analysis, credit insolvency leads to speculative finance and then to Ponzi finance. Indicators related to credit growth and excessive credit point to an increase in assets at risk of insolvency situations. Credit defaults can arise for a variety of reasons, so we categorise the indicators of triggers that activate vulnerability into several groups: the borrower side, the lender side, the asset price, and other reasons. Borrower side indicators show the insolvency of individuals and companies as a consequence of a drop in income or an increase in expenses for individuals or a change in business processes and market conditions for companies. The creditor side indicators point to the risk of the financial institutions themselves being unable to meet their liabilities. The decline in asset prices is reducing the value of collateral held by banks, depreciating personal savings, and depreciating assets in insurance and pension fund reserves. Other indicators may also indicate changes in cash flow patterns and a reduced ability to pay credit.

Table 2.2. EWS system as a combination of vulnerability and triggers (by the author)

Part	Type	Indicators (examples)	Relationship to crisis
Vulnerability	Excessive credit	Credit growth (Schularick and Taylor 2009)	Lagged credit growth turns out to be highly significant as a predictor of financial crises, but the addition of other variables adds very little explanatory power. Credit growth indicates the Minsky boom stage and may indicate excessive risk taking by economic agents.
		Credit gap (Borio and Drehmann 2009)	The shock absorption capacity of the system is proxied by credit gaps, in terms of the ratio of private sector debt to GDP – a coarse measure of leverage for the economy as a whole. The imbalances manifest themselves in the coexistence of unusually rapid cumulative growth in private sector credit.
		Credit-to-GDP gap (Borio and Lowe 2002)	Vulnerabilities tend to accumulate over a long period rather than in a single year. To capture this idea, a credit boom is defined as a period in which the ratio of credit to GDP deviates from its trend. It reflects the build-up of leverage of private sector borrowers
Trigger	Borrower side	Debt service ratio (Drehmann and Juselius 2013)	The DSR is a measure of the proportion of interest payments and mandatory repayments of principals relative to income for the private non-financial sector as a whole and can be interpreted as capturing incipient liquidity constraints of private sector borrowers. If DSRs are high, it is a clear sign that households and firms are overextended, so that even small income shortfalls prevent them from smoothing consumption or making new investments.
Trigger	Supply side	Liquidity coverage ratio, Net stable funding ratio	These indicators have not been used in works previously as EWSs. However, we believe that they can be included in the framework as they are developed by Basel Committee (2010) and show the loss of resilience on the lender side.
Trigger	Asset-price	Property and equity price gaps (Borio and Drehmann 2009)	Asset price misalignments are captured by asset price gaps, in inflation-adjusted terms. The imbalances manifest themselves in the coexistence of

Part	Type	Indicators (examples)	Relationship to crisis
			unusually rapid cumulative growth in asset prices.
		VIX (volatility index) (Rey 2018)	Low VIX values as an indicator of low volatility are associated with the phase of Minsky's financial boom and the build-up of the crisis: more capital flows, more credit creation, increased leverage.

We then propose to complement existing macroprudential policy approaches by systematizing existing EWS into vulnerability-related signals (credit-related), trigger signals (borrower-side, lender-side, asset price-related and others) and use them as a system in determining the likelihood of financial crisis. In particular, credit growth, credit gap, credit-to-GDP gap can be used as vulnerability indicators. The debt service ratio can be used as a borrower-side trigger; liquidity coverage ratio and net stable funding ratio as a lender (supply) side trigger; property and equity price gaps, VIX (volatility index) as an asset-price trigger.

According to the MaP success criteria proposed by Borio (2011) we can note the high compliance of the proposed indicator system with these criteria.

(1) Adequate capital and liquidity reserve above the minimum show indicators on the lender and borrower side.

(2) Sufficient difference between the value of the collateral and the amount provided against it show indicators related to the change in asset prices.

(3) Changes in credit volumes and asset prices are both indicators of the financial cycle and indicate the need to increase capital buffers in the system in anticipation of a down cycle.

Other indicators in particular those of a monetary or investment related (current account/savings rates, changes in nominal long-term interest rates, investment-to-GDP ratio) can complement the EWS system. In our opinion, the listed indicators take into account the propensity to save or invest, and can be interpreted as investor sentiment according to Minsky's theory (hedge, speculative and Ponzi finance). However, risk appetite and propensity to consume or save are not identical and require further research.

Given that a crisis is caused by a combination of vulnerabilities and triggers, a combination of signals should be used to determine the probability of a crisis.

2.6. Conclusion

In this chapter, we studied the nature of a systemic financial crisis and the channels through which it can spread. We considered the EWSs that are used in macroprudential policy over the last decades and the wide range of EWSs that are proposed for use by scholars. We propose a systematization of EWSs by channel of crisis through a synthesis of different works that have been conducted since the GFC and that represent various approaches used in this field. We conclude that there is a wide variety of variables that can be used as EWS. However, we cannot argue that EWSs are sufficiently well implemented in macroprudential policies. Drawing upon the Minskyian analysis of the endogenous character of systemic financial crises, we maintain that the variety of variables proposed as EWSs needs to be reviewed in order to find stronger and most proactive criteria that could be used by authorities to enhance the effectiveness of macroprudential policies.

The success of macroprudential policy implementation is largely determined by the balance between the subsequent costs and the benefits, i.e. the decrease in the probability of a systemic crisis in the economy, and the dampening effect that macroprudential policy measures can have on economic growth. Therefore, the issues of improving the effectiveness of macroprudential policies still remain relevant decades after the GFC. We regard EWS as an element of macroprudential policy that could allow authorities to identify the right moment ant the appropriate way to apply or modify macroprudential policy measures.

The conclusions drawn after the GFC coincide with those drawn by Minsky in the 1990s: the endogenous nature of financial crises and their credit-sensitive character in capitalist evolution, leading to the paradox of tranquility (the calmest market situation can be the most risky). We analyze a number of research to identify examples of EWS indicators that could point to the boom stage of the financial cycle. The indicators studied can be divided into three groups: credit-related, asset price-related and mixed (financial condition indices). According to Minsky's approach, credit-related and asset price-related indicators are endogenous and fully reflect Minsky's crisis origination scheme (hedge financing, speculative financing and Ponzi finance).

Various indicators proved to be effective under specific assumptions, but one indicator does not fit all likely channels of crisis. Thus, it is important to use a system of indicators to

implement effective macroprudential policy. As Rocha and Perrelli (2023:109) maintains: "One of the main contributions of EWS is to inform governments and policymakers about the vulnerabilities in the underlying economic system and its macro-financial links that could eventually lead to a currency crisis." In order to identify the necessary limited set of EWS that can be offered to the authorities to determine the likelihood of a crisis, we look at the possible channels of spread of the financial crisis. A financial crisis can be seen as a combination of vulnerability and trigger events. By vulnerability we mean excessive lending. However, credit itself does not cause a crisis if there is no insolvency of the participants in the lending process. We consider the causes of insolvency of market participants to be triggers. The channels for spreading the crisis (triggers) can be on the side of the borrower as well as on the side of the lender. Asset prices (capital market, real estate, others) can also be a channel for the emergence of a crisis. High asset prices correspond to the boom stage in Minsky's sense, a subsequent price correction can be the trigger of a crisis (as in the GFC). Market participants can assess their individual risks, but cannot correctly assess macroeconomic risks. For this reason, macro-prudential regulation by the authorities plays a leading role in preventing financial crises. The "Agenda for Reform" of Minsky (1986) advocates a "Big Government" that would seek, through appropriate financial regulation and thwarting systems, at stabilizing the markets. EWS could be regarded as part of the framework the thwarting systems may use in this aim.

We then propose to complement existing macroprudential policy approaches by systematizing existing EWS into vulnerability-related signals (credit-related), trigger signals (borrower-side, lender-side, asset price-related and others) and use them as a system in determining the likelihood of financial crisis. In particular, credit growth, credit gap, credit-to-GDP gap can be used as vulnerability indicators. We suggest the debt service ratio as a borrower-side trigger; liquidity coverage ratio and net stable funding ratio as a lender (supply) side trigger; property and equity price gaps, VIX (volatility index) as an asset-price trigger. Other indicators, in particular those of a monetary or investment related (current account/savings rates, changes in nominal long-term interest rates, investment-to-GDP ratio) can complement the EWS system. A further development of the study could be firstly to test each of the triggers (borrower-side, lender-side, asset price-related and others) for significance in determining the likelihood of a crisis; secondly, to identify one best indicator for each of the indicator groups.

Chapter 3: Macroprudential policies in the light of the development of information technologies: a synthesis on the effective early warning signals

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- Cost of regulation
- Early warning signals
- Financial crisis
- Financial stability
- Macroprudential policy
- Deep learning
- Machine learning

Abstract

In the wake of recent recurrent crises, innovative macroprudential policies (MaPs) have been framed and implemented to deal with the weaknesses of market-led microprudential mechanisms and to strengthen the stability of financial systems. However, the effectiveness of different tools to implement successful MaPs is still a critical matter of research. Early warning signals (EWS) are used as indicators of the likelihood of future crisis. The aim of this paper is to examine approaches to identify EWS to maximize the effectiveness of MaPs in the light of the developments of information technologies. The paper presents a comprehensive and synthetic analysis of academic work that determine effective EWS by analyzing numerical information using econometric and machine learning (ML) methods or extracting economic information from text based on deep learning (DL) techniques that may be regarded as innovative approaches to financial supervision and regulation. The results obtained, taking into account current regulatory practices, suggest the advantages of identifying effective EWSs by machine learning approaches to analyzing numerical data, as it allows simultaneous processing

of a large number of variables; and the potential for developing the application of methods for extracting economic information from textual data to determine expectations.

3.1. Introduction

In the wake of the 2007-2008 global financial crisis (GFC), financial supervision and regulation authorities sought at designing more preventive macro-level policies to reframe markets in a stable way. The MaPs and the related tools such as the Early Warning Signals (EWS) models that are the major supervision and regulation mechanisms in use over the last decades may be regarded as specific innovative practices compared with the previous market-led microprudential rules that were in force over 1990s-2000s. A large number of recent studies (Adrian et al., 2022, Laeven et al., 2022, Belkhir et al., 2022, Laeven et al., 2022a, to quote but a few) argue for the effectiveness of MaPs. In particular, Adrian et al., (2022) note the positive role of MaP measures introduced during the COVID-19 pandemic, and the strong policy framework in place in the aftermath of the GFC in containing the financial impact of the pandemic.

At the same time, several studies point to the costs of MaPs in terms of reduced credit supply to the business sector (Laeven et al., 2022a), increased financial sector stability through reduced efficiency in the non-financial sector (Belkhir et al., 2022), increased risks in the non-banking sector (Adrian et al., 2022), and reduced economic growth potential (Laeven et al., 2022a).

Research usually points out these effects as a result of MaP measures. At the same time, the contribution of other factors such as the effects of economic crises, falling demand and income, and other financial shocks cannot be ignored. Nevertheless, if we consider the task of MaP to reduce the probability of a financial crisis, then among all approaches the one with the least side effects can be considered the best.

In confirming the effectiveness of MaPs, the costs of their activation have been little studied (Laeven et al., 2022). Reaching a trade-off between the benefits and the costs of applying MaPs is an important challenge for the authorities (Laeven et al., 2022, Laeven et al., 2022a, Borio et al., 2022) and can be achieved by calibrating policy instruments. Moreover, proper calibration of MaP instruments can reduce the amount of intervention during the cycle (Laeven et al., 2022a, p.4).

There are few tools available to assist policy makers in identifying the right measures and timing of policy implementation (Barbieri et al., 2022, p.18). Barbieri et al. (2022) propose the splitting of credit growth into three components (an overall component that captures average credit growth across individual banks/firms, and idiosyncratic demand and supply components that measure how heterogeneous and asymmetric the distribution of credit growth is among borrowers and lenders). The model suggested regresses bank and firm credit growth on the full set of bank time and firm time fixed effects. The "common component" is then defined as the median fixed effects across all banks and firms over the period. Finally, as the "demand" (supply) component, it represents the median-decomposed firm- and bank-level fixed effects over the same period. Schmitz et al. (2022) prioritize the removal of regulatory duplication and the flexible use of the capital buffer, while drawing attention to the time lag in data, data and model uncertainty, and note that most countries use to calibrate MaP measures. European Systemic Risk Board (ESRB, 2014) recommends six categories: private-sector credit developments and debt burden, overvaluation of property prices, external imbalances, mispricing of risk, and strength of bank balance sheets.

Effectiveness of MaPs is rather relying on the efficiency of the measures and on the costs of their implementation that almost depend on the tools (indicators, assessment models, mechanisms) that have to be designed and calibrated according to data and information available (and treatable). Identifying signals for MaP calibration is an important task for policy makers. In the innovative macroprudential supervision and regulation framework in force since the GFC, EWS are used as appropriate tools to calibrate MaPs.

In this paper, we seek at identifying relevant EWS and approaches to be used by policymakers to efficiently calibrate instruments and improve policy effectiveness. We identify similarities and differences between several EWS approaches, based on a comprehensive analysis and synthesis of several works in the field in order to contribute to the assessment of the most effective EWS for better calibration of MaP tools.

There is a widespread opinion that A. Smith was in favour of market self-regulation, while many economists of the later period, especially after the crisis of the 1930s, were in favour of state intervention and regulation of markets. This position is only partially true (Toporowski, 2005). And Smith supported the idea of free trade and non-interference in business. At the same time, both Smith and Quesnay favoured control over finance, particularly restrictions on interest rates, because both noted the tendency for money and credit markets to be captured by the interests of non-productive or speculative economic activity.

A new stage of development of views on the need to regulate finance was reached after the crisis of the 1930s. Keynes believed that the reason for the dependence on subjective estimates of market value is uncertainty, the speculator cannot know the future value of his investments. Expectations tend to become overly optimistic as a boom develops and overly pessimistic as a recession develops. In a recession, lender and borrower confidence must be restored in order to attract investment and hence profits. Keynes recognised that this could not be done through the banking system alone. There must be a combination of lowering short-term interest rates, open market operations and restoring the attractiveness of illiquid assets.

More recent research also supports the need for financial stability. Hyman Minsky advocated a policy of government economic stabilisation. He believed that uncontrolled credit expansion could lead to financial collapse.

The plan of the article is as follows. The second section is an analysis of approaches to identify effective EWS. The third section develops on the models that extract economic information from numerical data for EWS identification and way for improvement. The fourth section describes features of artificial intelligence (AI) and machine learning (ML) for EWS identification as major specific process innovations in the financial supervision and regulation area. The fifth section studies AI as a tool to extract economic information from text data. The sixth section analyses practical aspects: we consider a set of indicators that are used by the regulator (ECB) to assess financial stability and analyze the dynamics of risk assessment indicators in conjunction with MaP measures after 2008. The last section concludes on the practice of EWS identification methods used by the central banks and draws conclusions about their practical effectiveness based on measures of systemic risk and other indicators of MaP effectiveness since 2008 onwards.

3.2. Analysis of approaches to identify effective early warning signals

There is no a single approach to defining a good EWS. Signaling norms are usually not enshrined in MaP regulations and are still the subject of academic research. Since macroprudential policy is responsible for dealing with systemic crises, the definition of a good

measure of systemic risk as a measure of EWS seems relevant. As Liu and Pun (2022) note, a good measure of systemic risk should provide an early signal reflecting the likelihood that the system will experience a crisis within a certain period of time.

The lack of clear signals that warned of a crisis indicates the difficulty in identifying relevant signals. This is partly due to the fact that the financial environment is constantly evolving, financial innovations are emerging and information about previous crises does not always reflect the current situation. As Vrontos et al. (2021) note, the nature and causes of recessions are different, they are not caused by the same events. In addition, there are a number of other reasons for the difficulty of defining a good EWS (Bluwstein et al., 2023), such as the existence of a relatively small set of observed crises which makes reliable modelling difficult. Crisis indicators are often triggered when it is too late to intervene since "Knightian uncertainty" does hold, some events are not known in advance. Moreover, it is not easy to translate complex early warning models into simple and understandable indicators.

The analysis of various sources has shown that approaches to signal identification can be divided into approaches related to *numerical analysis of economic information* (they are the majority), the methods of such analysis are econometric approaches (probit and logit models, signal approach) or ML approaches. The second group of approaches (few in number) is related to obtaining *economic information from text* (analysis of news, social networks). This approach is still few in number of studies and is based on deep learning (DL) approach.

The key difference between AI technologies and conventional software is AI's ability to learn (ML, DL). Conventional information systems assume a programmer's and algorithm's laid down way of achieving an outcome, whereas AI systems learn from data and pre-described learning rules, extracting patterns from the data and tuning the internal hidden parameters required to produce a solution (Bonaccorsi di Patti et al., 2022).

ML is an AI technology that involves the use of mathematical models that, based on data, help a computer to learn without direct instruction from a human. The use of ML tools allows identifying hidden, non-obvious for humans' relationships in a data sample and forming the relationships in a data sample and form predictions and recommendations based on them and recommendations.

DL is a type of ML based on Artificial Neural Networks - AI models that represent a multilayer system of connected and interacting logical computing units (artificial neurons). The goal of creating artificial neural networks was to imitate the process of human thinking.

Table 3.1. **Classification of directions and approaches to EWS identification**

Direction of analysis	Approach	Examples
Extracting economic information from numerical data	Econometric	Borio et al., 2019 Eberhardt and Presbitero, 2018 Chen and Svirydzenka, 2021
	Machine learning (ML)	Bluwstein et al, 2023 Vrontos et al., 2021 Alessi and Detken, 2018
Extracting economic information from text data	Deep learning (DL)	Li et al., 2019 Fulo and Kocsis, 2023 Gu and Kurov, 2020

Sections below present a comprehensive discussion on each of these approaches to defining EWS specifically. A comparative characterization of standard econometric approaches and ML in identifying economic patterns by analyzing numerical information is the first step of this survey.

3.3. Extracting economic information from numerical data for ews identification and way for improvement

Approaches for extracting economic information from quantitative data are the most common approaches for identifying EWS. The methods can be divided into two broad classes: econometric approaches and ML approaches. Quantitative approaches for EWS identification can be categorized (Chen and Svirydzenka, 2021; Casabianca et al. 2019) into three groups:

1. **Probit/logit models.** Regression models with a restricted dependent variable in which the probability of a crisis is estimated as a function of a number of variables. The outcome variable is binary (crisis/non-crisis) and the probability that an event (crisis) will occur is estimated as a function of factors. Borio, Drehman and Xia (2019), and Eberhardt and Presbitero (2018) use this kind of models to show that the methodology has the advantage of estimating the relative importance of variables jointly, even though it is difficult to consider a large number of indicators simultaneously.

2. **Signal approach.** The non-parametric approach involves setting a threshold above which the likelihood of a crisis increases. However, the signal

approach uses each indicator in isolation, and the model does not allow aggregation of individual warnings. The simplest solution is to count the number of leading indicators signaling a distress. A variant of this approach is presented by Chen and Svirydzenka (2021).

3. **Machine learning.** More recent non-parametric approaches such as artificial neural networks, which are complex non-linear multi-level and fully data-driven inference procedures that focus on predictive accuracy. It is a data mining tool capable of analyzing complex data sets. The two previous approaches considered (logit/probit models and the signal approach) are standard econometric techniques. ML is part of artificial intelligence. ML approaches, as recent debates in the AI community highlighted, can be biased by inputs and reinforce existing biases[16].

The analysis of the approaches to identify the best/relevant EWS have been done by Eberhardt and Presbitero (2018), Borio et al. (2019), Chen and Svirydzenka (2021), and Alessi and Detken (2018), among others. These papers provide a comprehensive and empirical analysis of the issue over the last decades on large groups of countries (Advanced economies (AEs) as well as Emerging market economies (EMEs)). The papers are from the International Monetary Fund and the Bank for International Settlements that are directly involved in the creation of MaP tools in countries around the world, meaning that the opinions presented in these papers have a broad geographical scope and practical focus. The results are presented in Table 3.2 below:

Table 3.2. **Analysis of approaches to identifying effective EWS**

Source	**Borio, Drehman, Xia 2019**	**Eberhardt, Presbitero, 2018**	**Chen, Svirydzenka, 2021**	**Alessi, Detken, 2018**
Methodology	Panel probit model	Logit model	Non-parametric signal extraction approach, Logit model (robustness check to EWS)	Binary classification tree, Random Forest (machine learning technique)

[16] In this article, we do not consider examples of using AI to identify the best EWS. In addition, the advantage of standard econometric techniques is the ability to estimate the statistical relationship between an indicator and the probability of a crisis event.

Source	Borio, Drehman, Xia 2019	Eberhardt, Presbitero, 2018	Chen, Svirydzenka, 2021	Alessi, Detken, 2018
Time horizon and countries	16 AEs (1985-2017), 14 EMEs (1996-2000)	60 low-income countries (1981-2015)	34 AEs, 25 EMEs (1960-2014)	28 EU members from 1970Q1 till 2013Q4
Indicator prediction time	3 years	Up to 11 years	Up to 5 years	Not specified
How to identify a recession	Business cycle (output, employment, real GDP)	Systemic banking crisis	Financial cycle	Banking crisis episodes in EU countries over 1970–2010 presented by Babecky et al. (2014), aggregating the information about crisis occurrence coming from other works and an ad-hoc survey among country experts mainly in national central banks.
Explanatory variables	Term spread (10 years and 3 months), Composite financial cycle indicator (CFCI)[17], Debt service ratio (DSR)[18]	44 primary commodity prices – aggregate commodity price (ACP)[19], control variables. Other macroeconomic variables	Many variables, including credit, equity and property prices, leverage	Credit-related indicators (broad credit aggregate compiled by the BIS, narrower bank credit aggregate, debt service ratio, Macroeconomic indicators (real GDP growth, current account in percentage of GD, M3 money aggregate, and the real effective exchange rate), house price to income ratio and the house price to rent ratio, Market-based indicators (the long (10 years) and short (3 months) interest rates, both deflated by subtracting the CPI changes). More than 30 variables

A distinctive feature of the Alessi and Detken (2018) study is the use of a very large set of explanatory variables compared to studies based on standard econometric approaches. This confirms the ability of ML techniques to process larger amounts of data to identify patterns between multiple variables.

Based on the analysis, we can say that the methodology used in the studies is similar - empirical analysis, the time horizon of the studies ranges from 30 to 54 years, with samples

[17] Medium-term cyclical fluctuations in real (inflation-adjusted) credit, the credit-to-GDP ratio and real property prices, which are then averaged to derive a composite measure of the financial cycle (Drehmann et al (2012))
[18] Interest payment and amortisation of the private non-financial sector relative to income (Drehmann et al (2015))
[19] Monthly data for 44 global primary commodity prices from the IMF Primary Commodity Price Database, in combination with annual information on country-specific net export/GDP and export/GDP for each primary commodity (Gruss, 2014; Bazzi and Blattman, 2014).

from 30 to 60 countries. There is a significant difference in indicator prediction time, with different papers having time horizons of 3, 5 and 11 years. The question remains as to what time horizon is sufficient for MaP to respond to prevent (or mitigate a crisis), at which time horizon it is appropriate to look for indicators.

The papers differ in the way the moment of recession is defined. Two papers (Borio et al., 2019; Chen and Svirydzenka, 2021) use bases related to the financial and business cycle, including those related to output, employment, and real GDP. Two (Eberhardt and Presbitero, 2018; Alessi and Detken, 2018) use precisely the moments of a banking crisis. Assuming that not every banking crisis (deterioration) leads to an economic crisis and deterioration in living standards, the first approach seems more appropriate. Developing this consistency, we can assume that the use of social and person-centered indicators such as wellbeing and life satisfaction, happiness levels can be additional indicators of the significance of the effects of the crisis.

None of the methods studied consider the relationship between the depth of recession and the level of the EWS indicator. Thus, there is no assessment of the possible effects of risk situations in relation to the levels of the indicator. Establishing such a relationship could be useful for calibrating MaP measures in order to strengthen their operational scope as well as their effectiveness.

Each of the studies tests several or many explanatory variables as suggested by the EWS. The result is the identification of the best indicators for the studied sample of the coming crisis. However, the results obtained in different studies for the same group of countries are not the same. For example, for AEs, Borio et al. (2019) identify the best financial cycle indicators, which include credit, credit-to-GDP, property prices and partially DSR; Chen and Svirydzenka (2021) focus on equity prices and output gap.

Given that the results of the reviewed works show that there is no a single indicator that can be used as an EWS even for a homogeneous group of countries, the approach that a system of indicators should be considered for the management of MaP measures seems tenable.

The study of Alessi and Detken (2018), based on ML method, shows the possibility of simultaneous analysis of a large dataset. In the next section, we analyze the practice of applying AI methods, including those based on ML methods, to identify EWS.

3.4. Features of artificial intelligence and machine learning for EWS identification

Following the scientific and technological developments over the last decades, an increasing amount of academic research on AI and its possible implementation in financial studies is gaining ground. Indeed, AI technologies are getting more and more developed in the financial sector and helping risk managers, financial institutions and financial authorities improve analyses and forecasting of behavior and possible evolution of markets. For instance, corporate default forecasting (Fraisse and Laporte, 2022), credit risk modeling (Brezigar-Masten et al., 2021), assessment of the credit quality of banks' customers (Krivorotov, 2023), and estimating and predicting default losses (Kellner et al., 2022) are the fields within which the use of AI algorithms and approaches proves to be valuable.

According to Danielsson et al. (2022), AI is a computational algorithm that makes decisions that would otherwise be made by humans. It more often obtains information using machine learning.

ML is a fundamental component of most AI applications (Danielsson et al., 2022), it is the process of gaining knowledge about the environment that the AI needs to control. The available methodological approaches and accuracy depends on the quantity and quality of data. Learning can be supervised or unsupervised. Unsupervised learning involves discovering patterns in the data without requiring any a priori knowledge of the structure of the problem. These patterns are then translated into mathematical logic.

Many authors are unanimous in their positive assessment of the predictive power of machine learning models compared to standard econometric approaches (Bluwstein et al, 2023, Baret et al, 2023, Vrontos et al, 2021, Liu and Pun, 2022). The high results of machine learning models, in particular, are attributed to some advantages such as:

- Machine learning models can easily and flexibly learn a variety of signals from data such as nonlinearities and interactions compared to regression-based models (Bluwstein et al, 2023),
- Machine learning methods are generally not susceptible to reverse causality (Baret et al., 2023).

However, some disadvantages of this approach are also worth to be noted although further research is underway to find ways to overcome these disadvantages. With the high

predictive power of ML models, the data problem stands out acutely. Machine learning methods identify patterns in existing data. Several difficulties in data collection and utilization that are critical for the effectiveness of the applied models, are also highlighted (Danielsson et al., 2022) such as:

1. Measurement problems, fragmentation and hidden relationships limit the information that can be collected.
2. The financial system is constantly undergoing structural changes, new types of market participants appear, others drop out, and financial innovations open new opportunities. This reduces the value of historical data for modeling.
3. The algorithm can make decisions based on statistical patterns in the data that are either false or change when the AI tries to exploit them.

Although early ML algorithms required extensive datasets, many new ML architectures (support vector machines, random forests, and various boosting-based methods) have more accessible data requirements (Baret et al., 2023). Some other difficulties in the application of ML mechanism are described in the academic literature, while ways to address these shortcomings are proposed. Bluwstein et al. (2023) note that “Black box” predictions are difficult to interpret and explain. The Authors suggest solutions through separating ML predictions into contributions from individual variables, using a system of Shapley values and regression, helps identify the key economic drivers of the models. Baret et al. (2023) remark that ML methods are prone to overfitting, which is a common error that causes the model to learn to describe the training data rather than the underlying phenomenon. They maintain that errors can be avoided by performing a withholding check or a more powerful k-fold cross-validation. In holdout validation, the data set is divided into a "training" set and a "test" set. The model is trained on the training set and the test set is used to evaluate the model performance on unknown data.

Examples of research based on the application of ML (Bluwstein et al., 2023, Vrontos et al., 2021) to identify pre-crisis situations indicate the high predictive power of such models.

Bluwstein et al. (2023) forecast financial crises one or two years ahead. To do so, they examine macroeconomic and financial variables from 17 advanced economies over more than 140 years and the result contains a binary financial crisis variable. The study compares the performance of logistic regression with a number of ML models: decision trees, random forests, extremely randomized trees, support vector machines (SVMs) and artificial neural networks.

Results lead to state that, with the exception of individual decision trees, all ML models have strong predictive power and outperform logistic regression.

Vrontos et al. (2021) use ML techniques to predict a recession in the United States. The predictability of the recession is estimated for the period 1979-2019. The introduction of various ML techniques further improves accuracy. Binary logit models with penalized likelihood (LASSO and Elastic Net) and k-nearest neighbors (k-nn) method are the most consistent at short-, medium-, and long-term forecasting horizons, followed by regularized discriminant analysis and Bayesian analysis as well as by random forests, especially for short-term forecasts. The predictive power of the yield curve at 12 months ahead horizon is confirmed in the study.

There are a number of other similar studies in recent times that apply ML techniques to analyze. Liu and Pun (2022) note that ML algorithms improve the predictive power of a measure of systemic risk, using US and Hong Kong companies as examples. Ari et al. (2021) present a new dataset on the dynamics of problem loans during 92 banking crises since 1990. The data show similarities across crises in the accumulation of problem loans, but significant heterogeneity in the rate of resolution of problem loans. Kamruzzaman et al (2022) estimate systemic risk in financial markets. The study proposes a new AI-based model that relies on several inputs: portfolio data, trading data, market data, financial reports, market conditions, and industry data.

The application of ML technologies is nowadays widespread for analyzing numerical financial and economic information in order to find EWS of high probability of financial crisis. The vast amount of textual information created by economic agents is also considered by some academic researchers as a source of economic information that can be transformed, for example, into an index. In the next section, we explore examples of using AI to extract economic information from textual data.

3.5. Artificial intelligence for extracting economic information from text data

A special area of AI application in the financial sphere is the application of technology for extracting economic information from text data (application of deep learning technologies

for text analysis). In this area, the authors of academic studies find the following advantages as indicated in Table 3.3. below:

Table 3.3. **Advantages of extracting economic information from textual data**

Description	**Source**
Information on the Internet is published more often than official statistics, contains a lot of unused qualitative information that can be used to improve forecasting.	Li et al., 2019
Textual data tells predictive expectations, including perceptions of different risk scenarios, while traditional micro and macroeconomic data reflect the recent past.	Fulo and Kocsis, 2023
Information from social media is more timely than information from traditional media and is more likely to be relevant.	Gu and Kurov, 2020

One can point to many valuable works that apply DL techniques to analyze text to extract economic information such as Li et al. (2019), Fulo and Kocsis (2023), and Fulo and Kocsis (2023). Below, a brief characterization of each of these approaches is suggested.

Li et al. (2019) predicts crude oil prices based on analyzing online media texts to identify more immediate market antecedents of price fluctuations through DL techniques, extracting hidden patterns in online media using a convolutional neural network (CNN). Sentiment features in news text extracted using CNN model show a significant relationship with price changes. A feature clustering method based on topic latent distribution model (LDA) is proposed. Text analysis techniques are used to classify text, sentiment analysis and topic models to convert unstructured text into a representative format that is structured and can be processed by a machine. It is shown that textual and financial features complement each other in making more accurate crude oil price forecasts.

Fulo and Kocsis (2023) propose a method for extracting textual information about macroeconomic fundamentals. The technique is applied to the Reuters news corpus for 2007-2022 from Factiva, containing about 1.8 million news articles (88 countries and 11 regions), to create news indices of country fundamentals. The approach to determining tone in economics and finance is to use large predefined dictionaries that categorize adjectives into positive/negative categories, then assign a tone score to the document. The word lists are either selected manually or through a supervised learning approach. Creation of time-series text indices on key macro topics at the country level that aggregate information: topic (what the text

is about) and tone (whether the text reflects optimism/pessimism). Incorporating the derived news indices alongside traditional macro variables significantly increases the explanatory power attributed to fundamentals (for example, explain about half of the changes in sovereign spreads by changes in fundamentals).

Gu and Kurov (2020) study the information content of firm-specific sentiment extracted from Twitter. Tweets represent information not yet reflected in stock prices (analysts' recommendations, analysts' target prices, quarterly earnings). They study tweets about specific types of events, perform textual analysis using existing word classifications, and use the relative frequency of bullish or bearish terms to modify investor sentiment. On average, the returns of firms with the most positive sentiment over the next 24 hours are 0.27% higher than the returns of firms with the most negative sentiment. This difference is significant if transaction and exchange trading volumes are high.

Table.3.**4**. **Examples of extracting economic information from textual data**

Source	**Li et al. (2019)**	**Fulo and Kocsis (2023)**	**Gu and Kurov (2020)**
What's forecast	Crude oil prices	Macroeconomic variables	Stock prices
Source of information	Online media texts	Reuters news for 2007-2022 from Factiva, containing approximately 1.8 million news articles (88 countries and 11 regions)	Tweets devoted to specific types of events
What is done	Text analysis using convolutional neural network (CNN) for text classification, sentiment analysis and topic patterns.	Creation of news indices of the country's main indicators on key macro topics. Used: a set of predefined regular expressions and a Bayesian model of feature selection.	Analyze using existing word classifications (use the relative frequency of bullish or bearish terms) for changes in investor sentiment.

The existing amount of information requires sophisticated methods of studying and analyzing it. Despite the different predicted variables and sources of textual information, the methods of extracting economic information from textual data are similar: certain dictionaries of words and phrases are used to determine the sentiments of economic agents and, consequently, the probable changes in the studied indicators. The results obtained by analyzing

the test are proposed to be used together with financial characteristics. The application of methods for extracting economic information from text has some difficulties that require solutions.

Table 3.5. **Difficulties in the application of text analysis and solutions**

Description	Solution proposed	Source
Different topics within a single transaction day are likely to have different effects on the price of crude oil. Crude oil news can usually be categorized into several topics such as "oil stocks", "stock market", "foreign exchange market", "political events", etc.	It is necessary to group textual features (quantitative variables extracted from news texts, including sentiment characteristics) into different topics for each transactional day.	Li et al., 2019
Document-level tonality becomes ambiguous if there are multiple themes in the text; expression dependency (for example, GDP growth or unemployment).	Extracting features from text using regular phrases; extracting them from text when they appear at the maximum spacing between words.	Fulo and Kocsis, 2023
Social media contains more noise than information. It is difficult, if not impossible, to detect and analyze all tweets.	Many firms are using social media to communicate with investors and clients.	Gu and Kurov, 2020

The application of textual information analysis technologies to economic data looks prospective and complements quantitative data analysis technologies, which can be used, among other things, to identify EWS of a probable financial crisis.

3.6. Practical aspects of the effectiveness of MaPs and applied EWS

We consider the practice of assessing financial stability (ECB, 2023) by regulatory authorities. The report presents more than 100 indicators that characterize the financial stability of the region. This supports the view that financial stability is a complex phenomenon and early warning signals about possible vulnerabilities in financial stability should describe different

characteristics. The authors of the report divide financial stability indicators into groups: macro-financial and credit environment, financial markets, banking sector and non-bank financial sector.

It seems to be appropriate to gather the indicators according to two criteria: **simulation and expectations**[20] and **achieved values** (which make up most of the indicators and include stock market, real estate, corporate debt, government debt, banking profit, lending etc.). In the case of any grouping of financial stability indicators, a large set of variables is used for analysis, which increases the importance of applying machine learning methods to the analysis of large amounts of data.

We will try to answer the question of whether MaP is effective. To do this, we analyze the dynamics of risk assessment indicators, which are represented at the ECB data portal[21]. We consider eight types of indicators, which are presented for individual countries using France as an example. The dynamics are presented from 2003 to 2024 (or 2023), Table 3.6.

The first stage of our task is to study the indicator values from 2003 to 2008. It is known that after the GFC, measures were taken to strengthen macro-prudential policy measures (in particular Basel III). Of interest is the fact whether the indicator values have changed after 2008 until today. Based on this, we can make a judgment: 1. Do the applied macroprudential measures reduce financial risks, 2. Which indicators turned out to be the most indicative of the results of MaP.

MFIs (Monetary Financial Institutions) lending margins[22] on loans for house purchase declined sequentially from 2.0354 in 2003 to 0.8044 in 2008. Immediately after the GFC in 2009 it reached 2.431. Then the index consistently decreased to 0.9974 in 2022. In 2023 and 2024 it reached negative values. The changes are likely due to changes in real estate prices.

[20] Estimated changes in nominal bond holdings after a 1 percentage point increase in yields; estimated changes in nominal bond holdings after a 1% increase in financial market uncertainty; model prediction of sectoral absorption and yield changes after higher issuance announcement and financial market volatility shock; stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options, by time to expiry; stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options with one day to expiry, by moneyness; stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options with one day to expiry, by put/call ratio.

[21] https://data.ecb.europa.eu/data/datasets/RAI?dataset%5B0%5D=Risk%20Assessment%20Indicators%20%28RAI%29&filterSequence=dataset&advFilterDataset%5B0%5D=Risk%20Assessment%20Indicators%20%28RAI%29

[22] Margin - highly liquid collateral required in order to cover adverse market price movements. The initial margin is calculated on the basis of a formula set by the counterparties to a trade or by a central counterparty (CCP).

Loans to deposits ratio (MFIs excluding ESCB) has a tendency to increase from 2003 (117.8761) to 2008 (139.2491). An increase in the indicator indicates an increasing volume of loans and a lower propensity to save (deposits). This is consistent with the position that credit growth contributes to the emergence of crisis situations. The indicator maintained high values in 2009 – 2012 (140.259 – 131.18), then consistently decreased until 2022 (100.6494) and showed an increase in 2023 (103.041). Based on the values of this indicator, we can draw a conclusion about the effectiveness of MaP measures.

MFIs lending margins on loans to non-financial corporations (NFC) does not have clearly directional dynamics in the period 2003-2008, and also in subsequent years until 2024.

MFIs lending margins on new loans to households and non-financial corporations also does not have clearly directed dynamics either before 2008 or after. It is worth noting that the indicator fluctuates between 0.80 - 1.64 in 2003 - 2022, recently the indicator decreased to 0.6782 (2023) and 0.5992 (2024). In 2008 it was 0.9083.

Annual growth rate of new loans to households and non-financial corporations had high values in 2005 and 2006 (20.4968 and 24.3556), but in 2008 the increase was negative (-7.7478). The negative growth persisted until 2013-2015, with the maximum value in 2016 (42.7897). In 2024 the value is -22.1949. Despite significant changes in indicators during the observed period, the relationship in its changes is not obvious with the application of MaP measures after the GFC.

Share of variable rate loans in total loans to households and non-financial corporations decreased from 2003 or 2006 (was 69.93 and 70.58, respectively) to values of 40 – 27, starting in 2011. Share of variable rate loans in total loans for house purchase decreased significantly from the values of 26 – 36 in 2003 – 2006. In 2017 it was 1.01 or in 2024 3.32. The impact of MaP measures on potentially risky loans for borrowers with variable rates is clear.

MFIs lending margins on outstanding loans to households and non-financial corporations decreases from the period before the GFC (in 2003 it was 2.1168), from 2013 it does not exceed 0.9711, in 2023 and 2024 it is -0.0167 and -0.4048, respectively.

Indicator values MFIs lending margins on loans for house purchase, loans to deposits ratio, share of variable rate loans in total loans to households and non-financial corporations, share of variable rate loans in total loans for house purchase, MFIs lending margins on outstanding loans to households and non-financial corporations show a change in dynamics

after the GFC period (2008), which can be regarded as a sign of the effectiveness of MaPs. We note that five of the eight risk asessment indicators examined showed persistent change after the GFC. Also, taking into account the more stable changes in these indicators after strengthening MaP measures, we can consider them EWS for the authorities, which will indicate an increase in risks, and thanks to the known data for the time period, as well as the macroprudential policy measures introduced at the same time, these indicators can be used to calibration of proposed policies.

Table 3.6. Dynamics of risk assessment indicators (by the author, using data compilated from the ECB data portal)

MFIs lending margins on loans for house purchase - France, France, Monthly			Loans to deposits ratio (MFIs excluding ESCB) - France, France, Quarterly			MFIs lending margins on loans to non-financial corporations (NFC) - France, France, Monthly			MFIs lending margins on new loans to households and non-financial corporations - France, France, Monthly		
2003-01-31	Jan 2003	2,0354	2003-03-31	Q1 2003	117,8761	2003-01-31	Jan 2003	0,6775	2003-01-31	Jan 2003	0,8548
2004-01-31	Jan 2004	2,156	2004-03-31	Q1 2004	112,6543	2004-01-31	Jan 2004	1,2797	2004-01-31	Jan 2004	1,5493
2005-01-31	Jan 2005	1,7417	2005-03-31	Q1 2005	114,7766	2005-01-31	Jan 2005	1,1162	2005-01-31	Jan 2005	1,2781
2006-01-31	Jan 2006	1,2043	2006-03-31	Q1 2006	124,2403	2006-01-31	Jan 2006	0,7126	2006-01-31	Jan 2006	0,8076
2007-01-31	Jan 2007	0,6643	2007-03-31	Q1 2007	128,3211	2007-01-31	Jan 2007	1,032	2007-01-31	Jan 2007	0,9229
2008-01-31	Jan 2008	0,8044	2008-03-31	Q1 2008	139,2491	2008-01-31	Jan 2008	0,9438	2008-01-31	Jan 2008	0,9083
2009-01-31	Jan 2009	2,431	2009-03-31	Q1 2009	140,259	2009-01-31	Jan 2009	0,8027	2009-01-31	Jan 2009	1,0571
2010-01-31	Jan 2010	2,719	2010-03-31	Q1 2010	136,7306	2010-01-31	Jan 2010	1,173	2010-01-31	Jan 2010	1,6432
2011-01-31	Jan 2011	1,8484	2011-03-31	Q1 2011	135,6758	2011-01-31	Jan 2011	1,0507	2011-01-31	Jan 2011	1,3678
2012-01-31	Jan 2012	1,8881	2012-03-31	Q1 2012	131,18	2012-01-31	Jan 2012	1,2096	2012-01-31	Jan 2012	1,4591
2013-01-31	Jan 2013	1,9911	2013-03-31	Q1 2013	126,3099	2013-01-31	Jan 2013	0,8629	2013-01-31	Jan 2013	1,2382
2014-01-31	Jan 2014	1,9853	2014-03-31	Q1 2014	122,0164	2014-01-31	Jan 2014	1,1282	2014-01-31	Jan 2014	1,4653
2015-01-31	Jan 2015	1,347	2015-03-31	Q1 2015	118,332	2015-01-31	Jan 2015	0,6028	2015-01-31	Jan 2015	0,8837
2016-01-31	Jan 2016	1,5674	2016-03-31	Q1 2016	115,1723	2016-01-31	Jan 2016	0,9332	2016-01-31	Jan 2016	1,1711
2017-01-31	Jan 2017	1,2442	2017-03-31	Q1 2017	111,2309	2017-01-31	Jan 2017	1,2795	2017-01-31	Jan 2017	1,2599
2018-01-31	Jan 2018	1,4457	2018-03-31	Q1 2018	109,7676	2018-01-31	Jan 2018	1,2591	2018-01-31	Jan 2018	1,3311
2019-01-31	Jan 2019	1,2496	2019-03-31	Q1 2019	109,1974	2019-01-31	Jan 2019	1,1802	2019-01-31	Jan 2019	1,2066
2020-01-31	Jan 2020	1,0599	2020-03-31	Q1 2020	107,7828	2020-01-31	Jan 2020	1,2929	2020-01-31	Jan 2020	1,1894
2021-01-31	Jan 2021	1,0789	2021-03-31	Q1 2021	101,0424	2021-01-31	Jan 2021	1,0946	2021-01-31	Jan 2021	1,0884
2022-01-31	Jan 2022	0,9974	2022-03-31	Q1 2022	100,6494	2022-01-31	Jan 2022	1,1519	2022-01-31	Jan 2022	1,0907
2023-01-31	Jan 2023	-0,179	2023-03-31	Q1 2023	103,041	2023-01-31	Jan 2023	1,0924	2023-01-31	Jan 2023	0,6782
2024-01-31	Jan 2024	-0,3153				2024-01-31	Jan 2024	0,9183	2024-01-31	Jan 2024	0,5992

Annual growth rate of new loans to households and non-financial corporations - France, France, Monthly			Share of variable rate loans in total loans to households and non-financial corporations - France, France, Monthly			MFIs lending margins on outstanding loans to households and non-financial corporations - France, France, Monthly			Share of variable rate loans in total loans for house purchase - France, France, Monthly		
			2003-01-31	Jan 2003	69,93	2003-01-31	Jan 2003	2,1168	2003-01-31	Jan 2003	27,57
			2004-01-31	Jan 2004	54,41	2004-01-31	Jan 2004	1,8819	2004-01-31	Jan 2004	26,31
2005-01-31	Jan 2005	20,4968	2005-01-31	Jan 2005	64,84	2005-01-31	Jan 2005	1,7034	2005-01-31	Jan 2005	36,54
2006-01-31	Jan 2006	24,3556	2006-01-31	Jan 2006	70,58	2006-01-31	Jan 2006	1,4369	2006-01-31	Jan 2006	28,09
2007-01-31	Jan 2007	6,6833	2007-01-31	Jan 2007	49,93	2007-01-31	Jan 2007	1,331	2007-01-31	Jan 2007	17,5
2008-01-31	Jan 2008	-7,7478	2008-01-31	Jan 2008	46,16	2008-01-31	Jan 2008	1,2211	2008-01-31	Jan 2008	12,53
2009-01-31	Jan 2009	-5,314	2009-01-31	Jan 2009	59,06	2009-01-31	Jan 2009	1,0604	2009-01-31	Jan 2009	6,25
2010-01-31	Jan 2010	-14,0003	2010-01-31	Jan 2010	45,34	2010-01-31	Jan 2010	1,3156	2010-01-31	Jan 2010	12,82
2011-01-31	Jan 2011	19,7628	2011-01-31	Jan 2011	40,88	2011-01-31	Jan 2011	1,2447	2011-01-31	Jan 2011	8,5
2012-01-31	Jan 2012	-2,4528	2012-01-31	Jan 2012	37,24	2012-01-31	Jan 2012	1,1208	2012-01-31	Jan 2012	7,71
2013-01-31	Jan 2013	-12,8439	2013-01-31	Jan 2013	46,31	2013-01-31	Jan 2013	0,9711	2013-01-31	Jan 2013	6,8
2014-01-31	Jan 2014	4,5368	2014-01-31	Jan 2014	38,38	2014-01-31	Jan 2014	0,8705	2014-01-31	Jan 2014	6,56
2015-01-31	Jan 2015	-9,4418	2015-01-31	Jan 2015	39,78	2015-01-31	Jan 2015	0,8155	2015-01-31	Jan 2015	3,8
2016-01-31	Jan 2016	42,7897	2016-01-31	Jan 2016	40,77	2016-01-31	Jan 2016	0,7052	2016-01-31	Jan 2016	3,26
2017-01-31	Jan 2017	23,2233	2017-01-31	Jan 2017	27,7	2017-01-31	Jan 2017	0,5576	2017-01-31	Jan 2017	1,01
2018-01-31	Jan 2018	2,7606	2018-01-31	Jan 2018	37,82	2018-01-31	Jan 2018	0,4441	2018-01-31	Jan 2018	2,34
2019-01-31	Jan 2019	-5,4536	2019-01-31	Jan 2019	38,45	2019-01-31	Jan 2019	0,3661	2019-01-31	Jan 2019	2,3
2020-01-31	Jan 2020	9,8028	2020-01-31	Jan 2020	32,35	2020-01-31	Jan 2020	0,3251	2020-01-31	Jan 2020	1,89
2021-01-31	Jan 2021	13,2448	2021-01-31	Jan 2021	32,67	2021-01-31	Jan 2021	0,2523	2021-01-31	Jan 2021	2,48
2022-01-31	Jan 2022	-7,4038	2022-01-31	Jan 2022	36,25	2022-01-31	Jan 2022	0,2507	2022-01-31	Jan 2022	2,57
2023-01-31	Jan 2023	4,2026	2023-01-31	Jan 2023	38,77	2023-01-31	Jan 2023	-0,0167	2023-01-31	Jan 2023	3,99
2024-01-31	Jan 2024	-22,1949	2024-01-31	Jan 2024	40,63	2024-01-31	Jan 2024	-0,4048	2024-01-31	Jan 2024	3,32

3.7. Conclusion

MaPs have proven to be an effective tool to mitigating the scope and the effects of financial crises (Adrian et al., 2022, Laeven et al., 2022, Belkhir et al., 2022, Laeven et al., 2022a), especially in the aftermath of the GFC.

At the same time, there are costs of MaPs in terms of reduced credit supply in the business sector (Laeven et al., 2022a), increased financial sector stability through reduced efficiency in the non-financial sector (Belkhir et al., 2022) and increased risks in the non-banking sector (Adrian et al., 2022), and reduced economic growth potential (Laeven et al., 2022a).

MaP is not static, requiring calibration or new tools depending on the likelihood of a financial crisis. EWS serve this purpose. However, through the different works presented in this article, one can obviously note that there is not one or even a few universal signals. Many indicators, including aggregate indices (Eberhardt and Presbitero, 2018, Borio et al., 2019, Chen and Svirydzenka, 2021) can be considered as EWSs; it is clear that any model that aims at determining the likelihood of financial crisis should involve a system of best indicators from different areas, and probably focus on individual characteristics when it comes to the cases of different groups of countries.

This article draws a few major conclusions upon the study of various papers on EWS:

1. There is no common understanding of the time horizon of EWS, perhaps looking at time horizons should be based on the action of MaP tools (how long it takes from calibration or the start of the tool to the effect).
2. The studies do not deal with the calibration of the MaP tools, but with the relationship between EWS and whether a crisis has occurred.

The research papers used in this article are similar in terms of methodology (empirical analysis). They consider moments of crisis and test a number of indicators as explanatory variables. However, both the definition of crisis moments and the set of explanatory variables themselves differ.

Existing methods for determining EWS can be divided into two large groups: using numerical data or using textual data for analysis. The use of numerical data is much more

widespread and includes two directions econometric analysis and machine learning. Machine learning allows processing a larger amount of data, which is relevant for determining financial stability parameters and early warning signals. This is confirmed by the ECB's experience in the Annual Financial Stability Report 2023, which presents more than 100 parameters characterizing financial stability.

Deep learning techniques are well established for text analysis, this can be complementary to the assessment of a potential crisis, as one can judge the signals/expectations of a crisis by assessing sentiment in news or social media postings. The relevance of such indicators is indirectly supported by the ECB *Financial Stability Report* of a number of indicators that are categorized as simulation/expectation.

Despite the abundance of methods for determining EWS and the indicators themselves, the question remains open as to how exactly MaP is calibrated depending on the signals received. We propose to address this question by using those signals that have shown a correlation with measures of MaP. We have studied the evolution of the Risk assessment indicators that are presented on the ECB website on the example of France from 2003 to today. Five of the eight indicators examined showed a steady change in trend after 2008 and the tightening of MaP measures. On the one hand, we can confirm the effectiveness of MaP measures. On the other hand, we can suggest that these particular indicators (whose correlation has already been measured according to the change in MaP) may be good indicators for calibrating MaP.

ANNEX 1 - Indicators represented at Financial Stability Review (ECB), November 2023

1. Composite funding costs, by economic sector Financial conditions index and manufacturing PMIs
2. Geopolitical risk index and oil price volatility
3. Global equity and bond market prices
4. Distribution of VSTOXX, by PMI signal
5. Distribution of funds' HQLA stock and historically high outflows
6. Financing flows of nonfinancial corporations, by funding instrument
7. Maturity wall for euro area non-financial firms, by type of industry
8. Corporate EDFs in the euro area, by rating category
9. Euro area real GDP growth, and RRE and CRE prices
10. Stock prices of real estate firms versus the overall market
11. Real estate price index and cost of household mortgage borrowing in the euro area
12. Net issuance of government debt securities in the euro area

13. General government debt, budget balance and rating outlooks across the euro area
14. Euro area banks' return on equity, cost of equity and price-to-book ratios
15. Default rates on banks' corporate and retail exposures
16. New and existing rates on bank deposits and bonds
17. Euro area inflation
18. Headline inflation forecasts
19. EU natural gas storage levels
20. Euro area sovereign composite indicator of systemic stress
21. Ten-year government bond yields by rating group
22. Average yield and residual maturity on the outstanding debt of euro area governments
23. Spread between current and average yields on outstanding government bonds and gross debt service due in one year
24. Newly issued debt securities by euro area sovereigns and purchases by sector
25. Bank holdings of euro area sovereign bonds relative to total Tier 1 capital, by holder country
26. Estimated changes in nominal bond holdings after a 1 percentage point increase in yields
27. Estimated changes in nominal bond holdings after a 1% increase in financial market uncertainty
28. Coefficients of a regression of quarterly nominal bank holdings at the group-bond-portfolio level on selected variables
29. Model prediction of sectoral absorption and yield changes after higher issuance announcement and financial market volatility shock
30. Profit margins across EURO STOXX Sectors
31. Growth in gross value added
32. Borrowing costs, yearly cumulative net flows of bank borrowing and debt security issuance of euro area NFCs
33. Share of variable-rate lending and interest coverage ratios
34. Corporate bankruptcies
35. PMIs across sectors and countries
36. Consumer confidence, households' expectations about their financial situation, and unemployment rate
37. Composite indicator of household vulnerabilities
38. Interest debt service-to-income (IDSTI) ratio
39. Share of illiquid households, by income quintile
40. Wall of fixed-rate mortgage debt expiration
41. High-frequency RRE prices in selected countries
42. Change in number of tenancy enquiries in three months
43. PMI for construction sector input prices and output
44. Headline inflation and longer-term inflation swap forward rates
45. Market-implied short-term interest rate expectations
46. Real return and risk metrics for eurodenominated asset classes
47. Changes in gross issuance of securities by euro area entities
48. High-yield bond issuance characteristics
49. Average remaining maturity on outstanding high-yield bonds
50. Sovereign financing costs, by rating, and ECB deposit facility rate
51. Spreads for euro area sovereigns, by average rating and rating outlook
52. Average daily trading volumes for options on equity indices and 0DTE options share
53. Leverage ratios and hedge ratio sensitivities in call options on the EURO STOXX 50, by time to expiry
54. Stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options, by time to expiry

55. Stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options with one day to expiry, by moneyness
56. Stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options with one day to expiry, by put/call ratio
57. Equity market-implied volatility and corporate bond spread around the end of hiking cycles in the euro area
58. Equity market-implied volatility and corporate bond spread around the end of hiking cycles in the United States
59. Risk premium in the euro area corporate bond market and Composite PMI
60. Risk premium in the euro area equity market and Composite PMI
61. Spreads in the Chinese corporate bond Market
62. Equity market correlations between China and advanced economies
63. Relative performance of equity markets and macroeconomic surprises in the United States and the euro area
64. Valuation of the S&P 500 against long-term real risk-free rates
65. Equity market composite valuation metric relative to the ten-year average
66. Volatility indices and correlations between equity markets in the euro area and the United States
67. Distribution of P/E and P/B ratios for members of the NASDAQ 100
68. P/E ratios for euro area and US sectors versus expected earnings growth rate
69. Share of retail investors in the US equity trading volume and revenue of a leading mobile trading app provider
70. Share of euro area and US population using online banking Share of retail investors in US equity market turnover and debit in US margin accounts
71. GameStop share price and Twitter coverage
72. Twitter coverage and correlation with stock
73. returns and deposit flows of euro area banks
74. ROE, COE and market valuation of euro area banks
75. Decomposition of changes in significant institutions' ROE, operating profits and net interest income
76. Change in total NIM of euro area banks and NIM for lending to households and NFCs
77. Share of variable-rate lending and deposit betas vs NIM across euro area countries
78. Change in ROE projections for euro area
79. Banks ROE projections for euro area banks across countries
80. NPL and Stage 2 ratios for total loans; euro area default rates on corporate and retail exposures
81. Share of NFC loans that are less than one year past due
82. NPL ratio, by firm size; quarterly NPL flows for CRE loans
83. Share of variable-rate mortgage lending and change in mortgage NPL ratios across euro area countries; quarterly NPL flows for consumer loans
84. NPL coverage ratios
85. Provisioning, by ICR
86. Credit standards and loan demand for lending to NFCs and household mortgages
87. Change in aggregate deposit rates since start of tightening cycle; deposit betas across euro area countries
88. Cumulative flows of bank deposits, money market funds and bonds
89. Bond yields of euro area banks across seniorities and average bond funding costs
90. Monthly and year-to-date bond issuance volumes of euro area banks
91. High-quality liquid assets and liquidity ratios; cumulative changes in TLTROs of euro area banks
92. Dispersion of liquidity ratios across euro area banks
93. Change in actual CET1 ratios and EBA 2023 stress test results for euro area banks

94. Decomposition of changes in euro area banks' CET1 ratio and capital distributions
95. Bank stock price performance across global regions; bank stock price performance relative to the broader market
96. Change in NIM and bank stock price performance at the country level relative to euro area aggregate
97. Drivers of changes in euro area NBFI sector bond portfolios, by credit rating
98. Euro area NBFI sector purchases of newly issued bonds, by credit rating
99. Euro area NBFI sector net purchases of debt and equities issued by euro area banks
100. Downgrades in euro area NBFI sector bond Portfolios
101. Holdings in NBFI sector bond portfolios with negative and positive rating outlooks
102. Euro area investment funds' debt securities transactions, by rating and issuer sector
103. Revaluations of euro area investment funds' debt securities portfolios, by rating and issuer sector
104. Inflows and revaluations in real estate funds in the euro area
105. Cumulative flows into euro area-domiciled bond and equity funds, by type
106. Cash buffers and recent fund flows as a share of total net assets
107. Distribution of investment funds' financial leverage from repo borrowing
108. Distribution of investment funds' synthetic leverage in equity derivatives portfolios, by quintiles of HQLA and cash holdings, and credit risk level of their portfolios
109. Return on common equity
110. Solvency Capital Requirement ratio
111. Combined ratio (non-life)
112. Ratio of claims incurred and acquisition expenses to premiums written
113. Lapse rates on life business of large euro area insurance groups
114. ICPFs' debt securities transactions, by rating and issuer sector
115. ICPFs' real estate assets, by type and region of exposure
116. Median HQLA stock, redemption shock and fund group size
117. Weighted average HQLA holdings and stock, by liquidity level
118. Distribution of fund-level RCR, by fund type
119. Share of funds with RCR < 1 and a high liquidity shortfall, by fund type
120. Estimated lending impact of a 1 percentage point increase in capital requirements, depending on ROA and voluntary capital buffers
121. CCyB rates in participating banking union countries and latest policy action

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Macroprudential Policies in the Light of the Development of Information Technologies: A Synthesis on the Effective Early Warning Signals[1]

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Abstract. In response to recent recurrent crises, innovative macroprudential policies (MaPs) have been framed and implemented to address the weaknesses of market-led microprudential mechanisms and enhance the stability of financial systems. However, the effectiveness of the tools used to implement MaPs remains a critical research question. Early warning signals (EWS) serve as indicators of potential future crises. This paper explores approaches for identifying EWS to optimize the impact of MaPs, particularly in light of advances in information technology. It provides a comprehensive review of academic studies that identify effective EWS by analyzing numerical data through econometric and machine learning (ML) methods or by extracting economic insights from text using deep learning (DL) techniques — innovative methods for financial supervision and regulation. The findings, considering current regulatory practices, highlight the benefits of ML-based approaches for processing large sets of numerical data and the growing potential of text-based methods for assessing economic expectations.

Keywords: cost of regulation, early warning signals, financial crisis, financial stability, macroprudential policy

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ИССЛЕДОВАТЕЛЬСКАЯ СТАТЬЯ

Макропруденциальная политика в свете развития информационных технологий: изучение эффективных сигналов раннего предупреждения

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Аннотация. Инновационные меры макропруденциальной политики (MaPs) были разработаны и реализованы в ответ на недавние повторяющиеся кризисы для устранения рыночных микропруденциальных уязвимостей и укрепления стабильности финансовых систем. Однако эффективность различных инструментов макропруденциальной политики по-прежнему остается критически важным вопросом исследований. Сигналы раннего предупреждения (EWS) используются в качестве индикаторов вероятности будущего кризиса. Целью данной статьи является изучение подходов к определению EWS для максимизации эффективности MaPs в свете развития информационных технологий. В статье представлен всесторонний анализ академических работ, которые определяют эффективные EWS путем анализа числовой информации с использованием эконометрических методов и методов машинного обучения (ML) или путем извлечения экономической информации из текста на основе методов глубокого обучения (DL), которые можно рассматривать как инновационные подходы к финансовому надзору и регулированию. Полученные результаты с учетом текущей практики регулирования указывают на преимущества определения эффективных EWS с помощью подходов машинного обучения для анализа числовых данных, поскольку этот подход позволяет одновременно обрабатывать большое количество переменных; и потенциал развития применения методов извлечения экономической информации из текстовых данных для определения ожиданий.

Ключевые слова: издержки регулирования, сигналы раннего предупреждения, финансовый кризис, финансовая стабильность, макропруденциальная политика

1. Introduction

In the wake of the 2007–2008 global financial crisis (GFC), financial regulators developed more preventive, macro-level policies to stabilize markets. Macroprudential policies (MaPs) and related tools like Early Warning Signals (EWS) have become the main regulatory mechanisms over the past few decades, replacing the market-driven microprudential rules of the 1990s and 2000s. Numerous recent studies (Adrian et al., 2022; Laeven et al., 2022; Belkhir et al., 2022) highlight the effectiveness of MaPs. For instance, Adrian et al. (2022) emphasize the positive impact of MaP measures during the COVID-19 pandemic and the strong policy framework established after the GFC in mitigating the financial impact of the pandemic.

However, other studies point to the costs of MaPs such as reduced credit supply to businesses (Laeven et al., 2022a), increased financial stability at the expense of efficiency in the non-financial sector (Belkhir et al., 2022), greater risks in the non-banking sector (Adrian et al., 2022), and a potential decline in economic growth (Laeven et al., 2022a).

Research often attributes these effects to MaP measures. However, the impact of other factors, such as economic crises, declining demand and income, and financial shocks, should not be overlooked. Ultimately, if the goal of MaP is to reduce the likelihood of a financial crisis, the most effective approach would be the one that minimizes side effects.

The costs associated with activating MaPs have been underexplored despite their confirmed effectiveness (Laeven et al., 2022). Finding a balance between the benefits and costs of MaPs is a key challenge for authorities (Laeven et al., 2022; Borio et al., 2022) and can be achieved through careful calibration of policy instruments. Proper calibration can also reduce the need for intervention throughout the cycle (Laeven et al., 2022a, p. 4).

There are few tools that assist policymakers in selecting the right measures and timing for MaP implementation (Barbieri et al., 2022). Barbieri et al. (2022) propose a model that breaks down credit growth into three components: overall credit growth, idiosyncratic demand, and supply components. The model regresses bank and firm credit growth on a full set of time-fixed effects, defining the "common component" as the median of these effects. Schmitz et al. (2022) emphasize reducing regulatory overlap and using the capital buffer flexibly, while acknowledging the challenges posed by data lags and uncertainties. European Systemic Risk Board (ESRB, 2014) recommends six categories: private-sector credit developments and debt burden, overvaluation of property prices, external imbalances, mispricing of risk, and strength of bank balance sheets.

This paper aims to identify relevant EWS and approaches to help policymakers calibrate MaP instruments more efficiently. Through a detailed analysis and comparison of various EWS models, we highlight the most effective methods for improving MaP calibration and policy outcomes.

There is a widespread opinion that A. Smith was in favour of market self-regulation, while many economists of the later period, especially after the crisis of the 1930s, were in favour of state intervention and regulation of markets. This position is only partially true (Toporowski, 2005). And Smith supported the idea of free trade and non-interference in business. At the same time, both Smith and Quesnay favoured control over finance, particularly restrictions on interest rates, because both noted the tendency for money and credit markets to be captured by the interests of non-productive or speculative economic activity.

A new stage of development of views on the need to regulate finance was reached after the crisis of the 1930s. Keynes believed that the reason for the dependence on subjective estimates of market value is uncertainty, the speculator cannot know the future value of his investments. Expectations tend to become overly optimistic as a boom develops and overly pessimistic as a recession develops. In a recession, lender and borrower confidence must be restored in order to attract investment and hence profits. Keynes recognised that this could not be done through the banking system alone. There must be a combination of lowering short-term interest rates, open market operations and restoring the attractiveness of illiquid assets.

More recent research also supports the need for financial stability. Hyman Minsky advocated a policy of government economic stabilisation. He believed that uncontrolled credit expansion could lead to financial collapse.

The article is structured as follows. The second section analyzes approaches for identifying effective Early Warning Signals (EWS). The third section explores models that extract economic information from numerical data for EWS identification and proposes improvements. The fourth section examines the role of artificial intelligence (AI) and machine learning (ML) in identifying EWS as key innovations in financial supervision and regulation. The fifth section investigates AI as a tool for extracting economic information from text data. The sixth section focuses on practical aspects,

evaluating indicators used by the European Central Bank (ECB) to assess financial stability and the dynamics of risk indicators alongside MaP measures post-2008. The final section concludes with an evaluation of EWS methods used by central banks and their effectiveness in measuring systemic risk and other MaP outcomes since 2008.

2. Analysis of Approaches to Identify Effective Early Warning Signals

There is no single approach to defining a good EWS. Signaling norms are usually not enshrined in MaP regulations and are still the subject of academic research. Since macroprudential policy is responsible for dealing with systemic crises, the definition of a good measure of systemic risk as a measure of EWS seems relevant. As Liu and Pun (2022) note, a good measure of systemic risk should provide an early signal reflecting the likelihood that the system will experience a crisis within a certain period of time.

The difficulty in identifying clear crisis signals stems from the constantly evolving financial environment, the emergence of financial innovations, and the fact that past crises may not reflect current conditions. As Vrontos et al. (2021) argue, recessions vary in nature and causes, making them hard to predict with the same triggers. Bluwstein et al. (2023) highlight other challenges, such as the limited number of observed crises, which complicates reliable modeling. Additionally, crisis indicators often appear too late, and "Knightian uncertainty" means that some events can't be predicted. Moreover, it is not easy to translate complex early warning models into simple and understandable indicators.

The literature review shows two main approaches to signal identification: numerical analysis of economic data and text analysis. The first, more common, uses econometric methods like probit, logit models, or ML approaches. The second, less studied, focuses on extracting information from text sources like news or social media using deep learning (DL). The key difference between AI technologies and conventional software lies in AI's ability to learn. Unlike traditional systems, which rely on predefined algorithms, AI systems learn from data, adjusting internal parameters to produce solutions (Di Patti et al., 2022).

Machine learning (ML) is an AI technology that uses mathematical models to help computers learn from data without direct human instruction. ML tools identify hidden, non-obvious relationships in data, enabling predictions and recommendations.

Deep learning is a type of ML based on Artificial Neural Networks — AI models that represent a multilayer system of connected and interacting logical computing units (artificial neurons). The goal of creating artificial neural networks was to imitate the process of human thinking.

Table 1

Classification of Approaches to EWS Identification

Type of analysis	Approach	Examples
Extracting economic information from numerical data	Econometric	Borio et al. (2019) Eberhardt and Presbitero (2018) Chen and Svirydzenka (2021)
	Machine learning (ML)	Bluwstein et al. (2023) Vrontos et al. (2021) Alessi and Detken, 2018)
Extracting economic information from text data	Deep learning (DL)	Li et al. (2019) Fulo and Kocsis (2023) Gu and Kurov (2020)

Source: Compiled by the author.

The following sections provide a detailed discussion of various approaches to defining EWS. The survey begins by comparing standard econometric methods with ML in identifying economic patterns from numerical data.

3. Extracting Economic Data from Numerical Data for EWS Identification and Improvement

Approaches for extracting economic information from quantitative data are the most common methods for identifying early warning signals (EWS). These methods can be broadly categorized into two classes: econometric approaches and machine learning (ML) approaches. According to Chen and Svirydzenka (2021) and Casabianca et al. (2019), quantitative approaches for EWS identification can be further divided into three groups:

1. Probit / logit models. Regression models with a restricted dependent variable in which the probability of a crisis is estimated as a function of a number of variables. The outcome variable is binary (crisis/non-crisis) and the probability that an event (crisis) will occur is estimated as a function of factors. Borio, Drehman and Xia (2019), and Eberhardt and Presbitero (2018) use this kind of models to show that the methodology has the advantage of estimating the relative importance of variables jointly, even though it is difficult to consider a large number of indicators simultaneously.

2. Signal approach. The non-parametric approach involves setting a threshold above which the likelihood of a crisis increases. However, the signal approach uses each indicator in isolation, and the model does not allow aggregation of individual warnings. The simplest solution is to count the number of leading indicators signaling a distress. A variant of this approach is presented by Chen and Svirydzenka (2021).

3. Machine learning. More recent non-parametric approaches such as artificial neural networks, which are complex non-linear multi-level and fully data-driven inference procedures that focus on predictive accuracy. It is a data mining tool capable of analyzing complex data sets. The two previous approaches — logit/probit models and the signal approach — are standard econometric techniques. In contrast, machine learning (ML) is a subset of artificial intelligence. Recent debates within the AI community have highlighted that ML approaches can be influenced by biased inputs, potentially reinforcing existing biases[1].

The analysis of the approaches to identify the best / relevant EWS have been done by Eberhardt and Presbitero (2018), Borio et al. (2019), Chen and Svirydzenka (2021), and Alessi and Detken (2018). These studies provide a comprehensive and empirical overview of the issue over the last few decades, covering large groups of countries, including both advanced economies (AEs) and emerging market economies (EMEs). The research, conducted by the International Monetary Fund and the Bank for International Settlements — organizations directly involved in developing MaP tools globally — offers broad geographical scope and practical insights. The results are presented in Table 2 below.

A distinctive feature of the study by Alessi and Detken (2018) is its use of a significantly larger set of explanatory variables compared to those in standard econometric studies. This underscores the capacity of ML techniques to process extensive data and identify patterns among multiple variables.

[1] In this article, we do not consider examples of using AI to identify the best EWS. In addition, the advantage of standard econometric techniques is the ability to estimate the statistical relationship between an indicator and the probability of a crisis event.

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Table 2

Analysis of Approaches to Identifying Effective EWS

Source	Borio, Drehman, Xia (2019)	Eberhardt, Presbitero (2018)	Chen, Svirydzenka (2021)	Alessi, Detken (2018)
Methodology	Panel probit model	Logit model	Non-parametric signal extraction approach, Logit model (robustness check to EWS)	Binary classification tree, Random Forest (machine learning technique)
Time horizon and countries	16 AEs (1985–2017), 14 EMEs (1996–2000)	60 low-income countries (1981–2015)	34 AEs, 25 EMEs (1960–2014)	28 EU members from 1970Q1 till 2013Q4
Indicator prediction time	3 years	Up to 11 years	Up to 5 years	Not specified
How to identify a recession	Business cycle (output, employment, real GDP)	Systemic banking crisis	Financial cycle	Banking crisis episodes in EU countries from 1970 to 2010 were discussed by Babecky et al. (2014), who aggregated information on crisis occurrences from various studies and conducted an ad-hoc survey among country experts, primarily from national central banks.
Explanatory variables	Term spread (10 years and 3 months), Composite financial cycle indicator (CFCI)[1], Debt service ratio (DSR)[2]	44 primary commodity prices — aggregate commodity price (ACP)[3], control variables. Other macroeconomic variables	Multiple variables, including credit, equity and property prices, leverage	The analysis includes a range of credit-related indicators, such as broad credit aggregates compiled by the BIS, narrower bank credit aggregates, and the debt service ratio. It also examines macroeconomic indicators like real GDP growth, the current account as a percentage of GDP, M3 money aggregate, and the real effective exchange rate, along with the house price-to-income ratio and the house price-to-rent ratio. Additionally, market-based indicators are considered, including long-term (10 years) and short-term (3 months) interest rates, both adjusted for CPI changes. In total, more than 30 variables were analyzed.

Source: Compiled by the author.

[1] Medium-term cyclical fluctuations in real (inflation-adjusted) credit, the credit-to-GDP ratio and real property prices, which are then averaged to derive a composite measure of the financial cycle (Drehmann et al. (2012))

[2] Interest payment and amortisation of the private non-financial sector relative to income (Drehmann et al. (2015))

[3] Monthly data for 44 global primary commodity prices from the IMF Primary Commodity Price Database, in combination with annual information on country-specific net export/GDP and export/GDP for each primary commodity (Gruss, 2014; Bazzi & Blattman, 2014).

The methodology employed in these studies is notably similar, characterized by empirical analysis, with time horizons ranging from 30 to 54 years and samples encompassing 30 to 60 countries. However, there is a considerable variance in the prediction time for indicators, with different papers adopting time horizons of 3, 5, and 11 years. This raises the question of what time frame is adequate for macroprudential measures to respond effectively in preventing or mitigating a crisis, as well as which time horizons are most suitable for identifying indicators.

The studies also differ in their definitions of the onset of recession. Two papers (Borio et al., 2019; Chen & Svirydzenka, 2021) base their definitions on financial and business cycles, considering factors such as output, employment, and real GDP. In contrast, Eberhardt and Presbitero (2018) and Alessi and Detken (2018) focus specifically on the moments of a banking crisis. Given that not every banking crisis necessarily leads to an economic downturn or a decline in living standards, the first approach appears more appropriate. Therefore, we can suggest that incorporating social and person-centered indicators — such as well-being, life satisfaction, and happiness levels — could enhance the assessment of the crisis's impact.

None of the methods examined address the relationship between the depth of a recession and the levels of early warning signal indicators. Establishing such a relationship could be valuable for calibrating macroprudential measures, thereby enhancing their operational scope and effectiveness.

Each study evaluates multiple explanatory variables suggested by EWS, resulting in the identification of the best indicators for forecasting crises in the studied samples. However, the findings across different studies for the same group of countries often vary. For instance, Borio et al. (2019) identify credit, credit-to-GDP ratios, property prices, and partially debt service ratios as the best financial cycle indicators for advanced economies, while Chen and Svirydzenka (2021) focus on equity prices and the output gap.

Since the reviewed literature indicates no single indicator that can serve as an effective early warning signal even for a homogeneous group of countries, it seems reasonable to adopt a system of indicators for managing macroprudential measures.

Alessi and Detken (2018), employing ML methods, demonstrate the feasibility of a simultaneous analysis of large datasets. In the next section, we will explore the application of AI methods, including those based on ML, for identifying EWS.

4. Features of Artificial Intelligence and Machine Learning for EWS Identification

Recent scientific and technological advancements have led to a growing body of academic research on AI and its potential applications in financial studies. AI technologies are increasingly being developed in the financial sector, assisting risk managers, financial institutions, and regulatory authorities in enhancing their analyses and forecasting of market behavior and trends. For example, AI algorithms have proven valuable in areas such as corporate default forecasting (Fraisse & Laporte, 2022), credit risk modeling (Brezigar-Masten et al., 2021), assessing the credit quality of bank customers (Krivorotov, 2023), and estimating and predicting default losses (Kellner et al., 2022).

As noted by Danielsson et al. (2022), AI refers to computational algorithms that make decisions typically made by humans, often leveraging ML for information retrieval. Machine learning is a fundamental component of most AI applications (Danielsson et al., 2022) and involves acquiring knowledge about the environment the AI needs to

control. The effectiveness of available methodological approaches and their accuracy depend on the quantity and quality of data. Learning can be categorized as supervised or unsupervised. Unsupervised learning focuses on discovering patterns in data without any prior knowledge of the underlying problem structure, with these patterns then being translated into mathematical logic.

Many authors agree on the positive predictive power of ML models compared to standard econometric approaches (Bluwstein et al., 2023; Baret et al., 2023; Vrontos et al., 2021; Liu & Pun, 2022). The high performance of ML models is attributed to several advantages. First, these models can easily and flexibly learn a variety of signals from data, including nonlinearities and interactions, unlike regression-based models (Bluwstein et al., 2023). Additionally, ML methods are generally not susceptible to reverse causality (Baret et al., 2023).

However, some disadvantages of this approach warrant consideration, even as research continues to find ways to overcome them. While ML models demonstrate high predictive power, issues related to data remain prominent. Machine learning methods rely on identifying patterns in existing data, but several difficulties in data collection and utilization can hinder the effectiveness of these models (Danielsson et al., 2022):

1. Measurement problems, fragmentation and hidden relationships limit the information that can be collected.

2. Measurement problems, fragmentation, and hidden relationships limit the information that can be gathered. Furthermore, the financial system is constantly undergoing structural changes; new types of market participants emerge, while others exit, and financial innovations create new opportunities, diminishing the value of historical data for modeling.

3. Algorithms may make decisions based on statistical patterns that are either misleading or change as the AI attempts to exploit them.

Although early ML algorithms required extensive datasets, many new ML architectures (support vector machines, random forests, and various boosting-based methods) have more accessible data requirements (Baret et al., 2023). Some other difficulties in the application of ML mechanism are described in the academic literature, while ways to address these shortcomings are proposed.

Bluwstein et al. (2023) highlight that predictions made by "black box" models are often difficult to interpret and explain. The authors propose solutions, such as separating ML predictions into contributions from individual variables using Shapley values and regression techniques, which can help identify the key economic drivers of the models. Baret et al. (2023) point out that ML methods are susceptible to overfitting, a common error where the model learns to describe the training data rather than the underlying phenomenon. They suggest that such errors can be avoided by employing a withholding check or more robust k-fold cross-validation. In holdout validation, the dataset is divided into a "training" set for model training and a "test" set for evaluating model performance on unseen data.

Research applying ML techniques (Bluwstein et al., 2023; Vrontos et al., 2021) to identify pre-crisis situations demonstrates the high predictive power of these models. For instance, Bluwstein et al. (2023) forecast financial crises one to two years in advance by analyzing macroeconomic and financial variables from 17 advanced economies over more than 140 years, resulting in a binary variable indicating financial crises. Their study compares the performance of logistic regression with several ML models, including decision

trees, random forests, extremely randomized trees, support vector machines (SVMs), and artificial neural networks. The findings indicate that, except for individual decision trees, all ML models exhibit strong predictive power and outperform logistic regression.

Vrontos et al. (2021) apply ML techniques to predict recessions in the United States, estimating recession predictability from 1979 to 2019. They find that the introduction of various ML techniques significantly improves accuracy. Among these, binary logit models with penalized likelihood (LASSO and Elastic Net) and the k-nearest neighbors (k-nn) method consistently perform well across short-, medium-, and long-term forecasting horizons, followed by regularized discriminant analysis, Bayesian analysis, and random forests, particularly for short-term forecasts. The study also confirms the predictive power of the yield curve for a 12-month horizon.

Several recent studies have similarly employed ML techniques for analysis. Liu and Pun (2022) note that ML algorithms enhance the predictive power of systemic risk measures, using examples from U.S. and Hong Kong companies. Ari et al. (2021) present a new dataset detailing the dynamics of problem loans across 92 banking crises since 1990, revealing commonalities in the accumulation of problem loans but significant heterogeneity in their resolution rates. Kamruzzaman et al. (2022) estimate systemic risk in financial markets using an AI-based model that incorporates various inputs, including portfolio data, trading data, market data, financial reports, market conditions, and industry data.

Currently, the application of ML technologies for analyzing numerical financial and economic information to identify EWS of potential financial crises is widespread. Additionally, the vast amount of textual information generated by economic agents is increasingly recognized by academic researchers as a valuable source of economic data that can be transformed, for instance, into an index. In the next section, we explore examples of using AI to extract economic information from textual data.

5. Artificial Intelligence for Extracting Economic Information from Text Data

A specialized area of AI application in finance is the use of technology for extracting economic information from text data, particularly through deep learning technologies for text analysis. Research literature highlights several advantages of this approach, as summarized in Table 3 below:

One can point to many valuable works that apply DL techniques to analyze text to extract economic information such as Li et al. (2019), Fulo and Kocsis (2023), and Fulo and Kocsis (2023). Below, we provide a brief outline for each of these approaches.

Table 3

Advantages of Extracting Economic Information from Textual Data

Description	Source
Information on the Internet is published more often than official statistics, contains a lot of unused qualitative information that can be used to improve forecasting.	Li et al. (2019)
Textual data convey predictive expectations, including perceptions of various risk scenarios, whereas traditional micro and macroeconomic data reflect recent history.	Fulo and Kocsis (2023)
Information from social media is more timely than information from traditional media and is more likely to be relevant.	Gu and Kurov (2020)

Source: Compiled by the author.

Li et al. (2019) predict crude oil prices based on analyzing online media texts to identify more immediate market antecedents of price fluctuations through DL techniques, extracting hidden patterns in online media using a convolutional neural network (CNN). Sentiment features in news text extracted using CNN model show a significant relationship with price changes. A feature clustering method based on topic latent distribution model (LDA) is proposed. Text analysis techniques are used to classify text, sentiment analysis and topic models to convert unstructured text into a representative format that is structured and can be processed by a machine. It is shown that textual and financial features complement each other in making more accurate crude oil price forecasts.

Fulo and Kocsis (2023) propose a method for extracting textual information about macroeconomic fundamentals. The technique is applied to the Reuters news corpus for 2007–2022 from Factiva, containing about 1.8 million news articles (88 countries and 11 regions), to create news indices of country fundamentals. The approach to determining tone in economics and finance is to use large predefined dictionaries that categorize adjectives into positive/negative categories, then assign a tone score to the document. The word lists are either selected manually or through a supervised learning approach. Creation of time-series text indices on key macro topics at the country level that aggregate information: topic (what the text is about) and tone (whether the text reflects optimism/pessimism). Incorporating the derived news indices alongside traditional macro variables significantly increases the explanatory power attributed to fundamentals (for example, explain about half of the changes in sovereign spreads by changes in fundamentals).

Gu and Kurov (2020) study the information content of firm-specific sentiment extracted from Twitter. Tweets represent information not yet reflected in stock prices (analysts' recommendations, analysts' target prices, quarterly earnings). They study tweets about specific types of events, perform textual analysis using existing word classifications, and use the relative frequency of bullish or bearish terms to modify investor sentiment. On average, the returns of firms with the most positive sentiment over the next 24 hours are 0.27 % higher than the returns of firms with the most negative sentiment. This difference is significant if transaction and exchange trading volumes are high.

Table 4

Examples of Extracting Economic Information from Textual Data

Source	Li et al. (2019)	Fulo and Kocsis (2023)	Gu and Kurov (2020)
What is forecast	Crude oil prices	Macroeconomic variables	Stock prices
Source of information	Online media texts	Reuters news for 2007–2022 from Factiva, containing approximately 1.8 million news articles (88 countries and 11 regions)	Tweets devoted to specific types of events
What is done	Text analysis using convolutional neural network (CNN) for text classification, sentiment analysis and topic patterns.	Creation of news indices for the country's main indicators on key macro topics using a set of predefined regular expressions and a Bayesian feature selection model.	Analysis of changes in investor sentiment using word classifications based on the relative frequency of bullish and bearish terms.

Source: Compiled by the author.

Table 5

Difficulties in the Application of Text Analysis and Possible Solutions

Description	Solution	Source
Different topics within a single transaction day are likely to have different effects on the price of crude oil. Crude oil news can usually be categorized into several topics such as “oil stocks”, “stock market”, “foreign exchange market”, “political events”, etc.	It is necessary to group textual features (quantitative variables extracted from news texts, including sentiment characteristics) into different topics for each transactional day.	Li et al. (2019)
Document-level tonality becomes ambiguous if there are multiple themes in the text; expression dependency (for example, GDP growth or unemployment).	Features can be extracted from text using regular phrases or by identifying them when they appear with the maximum spacing between words.	Fulo and Kocsis (2023)
Social media contain more noise than information. It is difficult, if not impossible, to detect and analyze all tweets.	Many firms are using social media to communicate with investors and clients.	Gu and Kurov (2020)

Source: Compiled by the author.

The vast amount of information available today requires advanced methods for effective analysis. Although the predicted variables and sources of textual data may differ, the techniques for extracting economic insights remain similar. These methods rely on specialized dictionaries of words and phrases to gauge the sentiments of economic agents and predict potential shifts in key indicators. The findings from this analysis can be integrated with financial data to enhance accuracy. However, applying these methods comes with certain challenges that need to be resolved.

The application of technologies of text analysis to economic data is promising and complements quantitative data analysis methods, which can also be used to identify EWS of potential financial crises.

6. Practical Aspects of the Effectiveness of MaPs and Applied EWS

We examine the practice of financial stability assessment by regulatory authorities (ECB, 2023). The report outlines more than 100 indicators that describe the region’s financial stability, emphasizing the complexity of this phenomenon. It highlights the need for early warning signals to capture various aspects of financial stability. The report divides the indicators into four groups: the macro-financial and credit environment, financial markets, the banking sector, and the non-bank financial sector.

It seems appropriate to classify the indicators into two main categories: simulate and expected values[1] and achieved values (which include the stock market, real estate, corporate and government debt, banking profits, and lending). Regardless of the grouping, analysis of financial stability involves a large set of variables, making machine learning methods essential for processing vast amounts of data.

[1] Estimated changes in nominal bond holdings after a 1 percentage point increase in yields; estimated changes in nominal bond holdings after a 1 % increase in financial market uncertainty; model prediction of sectoral absorption and yield changes after higher issuance announcement and financial market volatility shock; stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options, by time to expiry; stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options with one day to expiry, by moneyness; stylised simulation of hedging flows from a €1 million investment in EURO STOXX 50 options with one day to expiry, by put/call ratio.

We also aim to determine whether MaP is effective. To do this, we analyze the dynamics of risk assessment indicators available on the ECB data portal[1]. We focus on eight types of indicators, using France as an example, with data spanning from 2003 to 2024 (or 2023).

The first stage of our analysis focuses on studying the indicator values from 2003 to 2008. Following the GFC, macroprudential policy measures, particularly Basel III, were introduced to strengthen financial stability. Our aim is to assess whether these indicator values changed after 2008, and from this, we can draw two conclusions: (1) whether macroprudential measures effectively reduce financial risks, and (2) which indicators are the most reliable for evaluating the impact of these measures.

The lending margins of MFIs (Monetary Financial Institutions)[2] on loans for house purchases steadily declined from 2.0354 in 2003 to 0.8044 in 2008. However, immediately after the GFC in 2009, the margin jumped to 2.431, then consistently decreased to 0.9974 by 2022. In 2023 and 2024, the margins even turned negative, possibly reflecting changes in real estate prices.

The loans-to-deposits ratio (MFIs excluding ESCB) showed an upward trend from 2003 (117.8761) to 2008 (139.2491), indicating rising loan volumes and a lower propensity to save. This aligns with the view that rapid credit growth can lead to financial crises. The ratio remained high from 2009 to 2012 (140.259–131.18) but declined steadily until 2022 (100.6494), before showing an increase in 2023 (103.041). This trend provides insights into the effectiveness of MaP measures.

MFIs lending margins on loans to non-financial corporations (NFC) did not exhibit clear trends during from 2003 to 2008, nor in subsequent years through 2024.

Similarly, lending margins on new loans to households and non-financial corporations showed no distinct pattern before or after 2008. However, it is worth noting that the indicator fluctuated between 0.80 and 1.64 from 2003 to 2022, recently dropping to 0.6782 in 2023 and 0.5992 in 2024. In 2008, it stood at 0.9083.

The annual growth rate of new loans to households and non-financial corporations was high in 2005 and 2006 (20.4968 and 24.3556), but in 2008, it fell sharply to –7.7478. Negative growth continued until 2013–2015, with a peak rebound in 2016 (42.7897). However, by 2024, the value had dropped to –22.1949. Despite these substantial fluctuations, the relationship between indicator changes and the application of MaP measures after the GFC is not immediately apparent.

The share of variable-rate loans in total loans to households and non-financial corporations decreased significantly, from 69.93 % in 2003 and 70.58 % in 2006, to values between 40 % and 27 % starting in 2011. The share of variable-rate loans for house purchases also dropped sharply, from 26 % to 36 % in 2003–2006 to just 1.01 % in 2017 and 3.32 % in 2024. This indicates the impact of MaP measures on reducing the risk associated with variable-rate loans for borrowers.

MFIs lending margins on outstanding loans to households and non-financial corporations declined significantly after the GFC. In 2003, the margin was 2.1168, but

[1] https://data.ecb.europa.eu/data/datasets/RAI?dataset%5B0%5D=Risk%20Assessment%20Indicators%20%28RAI%29&filterSequence=dataset&advFilterDataset%5B0%5D=Risk%20Assessment%20Indicators%20%28RAI%29 (Date of access: 13.06.2024).

[2] Margin is a highly liquid collateral required in order to cover adverse market price movements. The initial margin is calculated on the basis of a formula set by the counterparties to a trade or by a central counterparty (CCP).

by 2013, it fell below 0.9711. In 2023 and 2024, the margins turned negative, reaching –0.0167 and –0.4048, respectively.

Key indicators such as MFIs lending margins on loans for house purchases, the loans-to-deposits ratio, the share of variable-rate loans to households and non-financial corporations, and MFIs lending margins on outstanding loans all show significant shifts in dynamics after the GFC, which can be interpreted as evidence of the effectiveness of MaP measures. Five of the eight risk assessment indicators examined showed persistent changes post-GFC. Given the stability of these indicators following the implementation of stronger MaP measures, they can be considered EWS for regulators. These indicators, combined with historical data and corresponding macroprudential policy interventions, can be used for policy calibration.

7. Conclusion

MaPs have proven to be an effective tool in mitigating the scope and impact of financial crises, particularly after the Global Financial Crisis (Adrian et al., 2022; Laeven et al., 2022; Belkhir et al., 2022). However, MaPs also come with certain costs, including a reduction in credit supply to the business sector (Laeven et al., 2022a), improved financial sector stability at the expense of reduced efficiency in the non-financial sector (Belkhir et al., 2022), increased risks in the non-banking sector (Adrian et al., 2022), and a decrease in economic growth potential (Laeven et al., 2022a).

MaP is not static and requires calibration or new tools based on the likelihood of a financial crisis, with EWS serving this purpose. However, as demonstrated in the various studies discussed in this article, no single or universal set of signals exists. Many indicators, including aggregate indices (Eberhardt and Presbitero, 2018; Borio et al., 2019; Chen & Svirydzenka, 2021), can be considered EWS. It is clear that any model aiming to predict the likelihood of a financial crisis should integrate a system of optimal indicators from multiple areas and likely focus on specific characteristics for different groups of countries.

Our literature review has led us to the following key conclusions regarding EWS:

1. There is no consensus on the time horizon for EWS. It may be more appropriate to base the time horizon on the action of MaP tools, considering how long it takes from calibration or the introduction of a tool to its effects;

2. The studies do not focus on calibrating MaP tools but rather on the relationship between EWS and the occurrence of a financial crisis.

The research papers examined in this article are methodologically similar, relying on empirical analysis. They assess crisis moments and test various indicators as explanatory variables. However, both the definitions of crisis moments and the specific sets of explanatory variables differ across studies.

Methods for identifying EWS can be broadly categorized into two groups: those using numerical data and those using textual data. Numerical data analysis is more common and typically involves two approaches: econometric analysis and machine learning. Machine learning enables the processing of larger datasets, which is especially valuable for assessing financial stability and detecting early warning signals. This is supported by the European Central Bank's 2023 Annual Financial Stability Report, which includes more than 100 parameters characterizing financial stability.

Deep learning techniques are well established for text analysis and can complement the assessment of potential crises. By evaluating sentiment in news and social media

postings, we can gauge signals and expectations of a crisis. The relevance of such indicators is indirectly supported by the European Central Bank's Financial Stability Report, which categorizes several indicators as simulation/expectation.

Despite the abundance of methods for identifying EWS and the indicators themselves, questions remain about how to effectively calibrate macroprudential policies based on the received signals. We propose to address this issue by using signals that have demonstrated a correlation with MaP measures. Our study examines the evolution of risk assessment indicators presented on the ECB website, focusing on France from 2003 to the present. Five of the eight indicators analyzed showed a consistent change in trend after 2008, coinciding with the tightening of MaP measures. On the one hand, this confirms the effectiveness of MaP measures. On the other, it suggests that these specific indicators, which have already shown a correlation with changes in MaP, may serve as valuable benchmarks for calibrating MaP.

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Chapter 4: In search of relevant financial regulation: Some lessons from the gift-economics

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A copy can be found in the Appendix.

Keywords:

- Financial regulation
- Gift-economics
- Macroprudential supervision

4.1. Introduction

The purpose of this essay is to determine whether gift-economics can provide a relevant analytic direction for an institutional framework in order to design an alternative financial regulation that could strengthen systemic stability in market-based capitalist economies. We regard "gift-economics" as a proxy for different terms such as gift-economy, gift-exchange, gift-transactions, gift-giving, etc. However, there could be crucial differences among them; some concepts relying on neoclassical transactional approaches while some others might mean alternative non-utilitarian perspectives. For instance, Akerlof (1982) argues, from a neoclassical perspective of efficiency-seeking incentive mechanisms, that gift rules might affect employer-employee relations, and assumes that when they are better (more poorly) paid, workers would feel an obligation (an incentive) to produce a higher (lower) value of output per unit of time even if this "implicit cost equivalence" criterion is not an element of the work contract. In a similar vein, Mercier Ythier (2006) gives a comprehensive analysis of gift-giving as an element of equilibrium redistribution of wealth. With regard to the transaction cost issue but developing on the informational and cultural characteristics of gift relations, Dolfsma, van der Eijk and Jolink (2009, p. 325) consider gift-exchange as a complement to legal contractual arrangements and argue that "Gift exchange can lead to lower transaction costs since it allows individuals to trade with one another without relying solely on formal mechanisms such as legal contracts and litigation." From a more holistic perspective, Sahlins (1972) regards the economy as a category

of culture and politics related to the material life process of society and focuses on reciprocity as a social common denominator that could enable society to stabilize inter-individual relations. This way of embedding economic relations within a more general societal framework that would be resting on reciprocity as a social cement/social glue is very close to the Polanyi's approach to the capitalist economy (Polanyi, Arensberg and Pearson, 1957).

This essay seeks to assess the relevance of the gift rules, to name (mainly), *reciprocity and mutual engagement*, as possible references that could contribute to frame stabilization rules in the working of financial markets whether these rules could be interpreted in an individualistic way or in a holistic way. Using a well-known Maori proverb, *Ko Maru kai atu Ko Maru kai mai Ka ngohe ka ngohe*[i], one can regard the rule of reciprocity in the organization of society as a central element of "time-consistency", i.e. capacity to allow social relations to develop in a sustainable way and then stabilize the functioning of society. This reciprocity can be considered as the immediate expression of a gift economy.

However, this essay argues that in a capitalist society, reciprocity cannot be organised *spontaneously* through decentralized market relations between individuals since the latter is mainly resting on selfish private individual decisions that seek private performance (capital accumulation). In a non-cooperative environment, market incentives rely on opportunistic possibilities that might impede collective stability. In the absence of some cooperation mechanisms able to direct players to trust one another, the economic relation (the transaction, the game) would result in defection and suboptimal outcomes as players might implement strategies that would potentially give them the best payoff without regard for what would be the optimum for the overall system (Harsanyi, 1976, p. 158). This could mean that as a relevant "alternative" solution to suboptimal non-cooperative frameworks, reciprocity can be considered as a rule of institutionalized coordination provided that it is framed and managed by the institutions of collective action in order to become effective. In this case, reciprocity-including regulation can be regarded as a holistic mechanism enlarging the scope of collective action in markets, going beyond the usual opposition between constraint-imposing public regulator and social-restriction-avoiding opportunistic private interests. This assertion will be studied in this essay with regard to financial market regulation.

Many institutionalist economists focus on the crucial role of institutions to design financial structures that are consistent with regard to the characteristics of a capitalist economy. Hyman Minsky (1986a) is one of them and points to the endogenous instability of a monetary/finance-based capitalist economy. In this tradition, socio-cultural norms, habits,

group-membership, societal rules, etc. may all influence individuals' strategies. These elements also contribute to the complexity of the individual decision-making process, while individuals are assumed to be rational profit-maximisers or not. Parallel to this, works on economic psychology, in relation with cognitive psychology, also develop on some similar assumptions and place the emphasis on group-centred rules, goals and behaviour in society (Baddeley, 2019; Katona, 1975).

In this line, reciprocity might be a relevant angle of reflection when it comes to the design of an institutional regulatory framework consistent with the characteristics of monetary capitalist economies. However, a specific study of a possible contribution of gift-economy dynamics to an institutional reflection on an alternative financial regulation aiming at dealing with recurrent financial instabilities of capitalism has not yet been done.[ii] This essay aims at exploring the possibility to fill this gap between a rich analytical tradition on the gift-economics and the research done on financial instability and regulation. We suggest an institutional analysis of the possible corrective effects of gift-rules as determining social and cognitive factors, on the recurrent financial instabilities in capitalist economies. The departure hypothesis is that a gift-economics approach may provide a social rules-related guide to shape individuals' behaviour within society. The core purpose is then to investigate how to match reciprocity and the macro-prudential approach, both resting on the idea that the organization of society should rely on some social/collective constraints in order to lead to social stability and coherence. In the gift-based environment, those constraints are usually implicit and conventional while in a market-based capitalist society, written rules are needed and a constraint-related macro-regulatory framework is required.

For this aim, the second section presents the major features of a monetary capitalist economy and the concerns that arise from its financialisation in a loosely regulated institutional environment since the late 1970s. The third section presents some of the characteristics of gift-economics and questions the possibility of considering alternatives to liberal and micro-prudential financial regulation that could be based on the reciprocity rule of gift-economics and then lead to a consistent institutional environment able to provide a sustainable financial regulation. Although some directions are suggested in terms of relevant alternative financial regulation, we do not give a list of collective actions that should be implemented to reframe financial markets, but rather indicate the necessary institutional analysis of financial regulation. The last section concludes.

4.2. An institutionalist analysis of financialisation and liberal financial regulation

Capitalism as a monetary economy

Capitalism is a historically identifiable social structure where economic relations are resting on some specific features. One of these features that determine the reproduction possibilities of the economy is the monetary and financial system and the underlying institutional structure. The institutionalist approach (Veblen, 1904; Mitchell, 1916; Dillard, 1987; among others) develops a relevant analysis of capitalism as a "money economy" where money plays a central role in economic evolution. Minsky (1982, p. 92) states that the mode that actually rules at any time depends upon institutions, the structure of financial linkages, usages and policies. In a capitalist economy, the monetary and financial structure is at the heart of the economy since all economic relations require the use of money and generate financial operations (Ülgen, 2018). This framework displays some features resting on a specific schema called a payments system that allows private individuals to set up multiple relations in society and develop their plans in a decentralized way. Money is the name of the payments system, a set of rules that permits the creation-circulation-repayment process of debts within the economy. These debts flow through the entire economy as money.

Consequently, a core feature of such an economy lies in the financing process of decentralized private plans without any central (external) decision control mechanism. In this "endogenous money" environment, all economic activities need to be financed to become effective. This usually results in private debt contracts between the spending units (mainly the enterprises) and the banking system. Debts generated through these operations must be repaid according to their maturity. The debt-financing process and resulting financial operations enable private economic units to undertake their own plans according to their expectations (the Keynesian animal spirits of entrepreneurs) once they are financed by the banking and/or financial system (Ülgen, 2019).

In such a social institutional framework, money has two core characteristics: ambivalence and transversality.

First, money is ambivalent, private and public. On the one hand, it is generated through decentralized private decisions and actions as a means of financing profit-seeking activities. On the other hand, it is public since its threefold use - as a general unit of account, a means of

payment, and the only society-wide means of settlement of debts - rests on its publicness that gives it its supra-individual power[iii]. Although created in a private (endogenous) way, money stands as a public system of accounts through payment-repayment relations and draws its objective validity from public (nonmarket) power (such as an extra-market central bank, public rules and constraints imposed on private debt operations, obligation to repay debts, limited access to money and credit, etc.).

Second, money is transversal to all economic relations whether they directly or indirectly involve individuals in these operations. Everyone uses money, contributes to financial operations, and is affected by the systemic consequences of these operations (and related policies) without being necessarily directly engaged in monetary and financial transactions in markets.

The efficiency of the working of a capitalist economy is then related to the relevance of its monetary and financial institutional framework in force. Given this crucial role of the payments system, "… money and finance can be seen as capitalism-specific public utilities. Without their regular provision, a capitalist society cannot develop. At the same time, their sustainable provision cannot rest on decentralized market mechanisms that evolve through uncertainty in a non-ergodic world. The provision of money and finance often requires policies and intervention by a public power." (Ülgen, 2018, pp. 543-544).

However, two major concerns arise in the "normal" working of a capitalist economy and depend on the aforementioned specific characteristics of money: the tendency to financial instability and the tendency too loose regulation. These two concerns recurrently provoke systemic instabilities and crises and call for corrective measures to calm down market's ardour and potential to generate imbalances.

Financial instability and financialisation

Minsky (1982, p. 66) states that in a private debt-financing economy instability is an endogenous feature since serious business cycles are due to the financial attributes that are essential to capitalism: "the fundamental instability of a capitalist economy is upward. The tendency to transform doing well into a speculative investment boom is the basic instability in a capitalist economy."

This idea follows Keynes's Chapter 12 of *The General Theory* where the development of the exchange market is assumed to be mainly relying on speculation that often results in

instability: “When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done” (Keynes, 1936, p. 159).

This “Financial Instability Hypothesis” (FIH), developed by Minsky, is very close to Polanyi’s disembedded economy analysis where capitalist evolution may destroy the sustainability of the social environment through its incentive-mechanism, the accumulation process (Polanyi, 1944). Therefore, the principle of entropy may enter into the picture as “Economic activity cannot create energy and thus produces negentropy. In essence, it destroys environmental resources and biodiversity” (O’Hara, 2007, p. 31). Here are some of the consequences of the inability of market mechanisms to operate in a stable path of evolution. This would require public interventions to counterbalance the tendency of individual behaviours to generate systemic crises. This propensity to generate endogenously instability is exacerbated through the financialisation process that major market economies experienced during the last four decades, displaying some features of Minsky’s FIH. Indeed, the financialisation of capitalist economies from the 1980s onwards rested on the transformation of the capital development into a by-product of casino-like activities that developed on financial efficiency criteria seeking rapid speculative rents.

Financialisation can be identified as the evolution of economies when financial relations and aims become increasingly important and dictate how decisions should be assessed as efficient choices over the whole economy. This results in the implementation of short-sighted financial efficiency criteria[iv] as the best way of improving the economy’s performances. Then the money manager capitalism of Minsky (Minsky, 1991; Wray, 2009) can emerge through complex new financial vehicles. Epstein (2005, p. 5) argues that some of the effects of financialisation “in concert with neo-liberalism and globalization – have been highly detrimental to significant numbers of people around the globe”. Such a process resulted in a worldwide catastrophe in 2007-2008 (henceforth “the crisis”), “the worst in modern history” (Bernanke, 2010), that began in the United States and then spread to the entire planet. This turmoil continues to threaten, twelve years later in 2020, the viability of globalized and interdependent economies.

This crisis obviously challenges the efficient financial market ideology (Lepper, 2011) and liberal financial regulation, still in force in major advanced and emerging market economies. Financialisation is a systemic result of the implementation of market individualist ideology that resulted in the worldwide catastrophe (Hodgson, 2009). At the roots was the belief that liberalized market mechanisms could not only allocate resources efficiently, but also

redistribute risks among those better prepared to bear them. Not only the international organizations but also scholars and policy makers did share the same belief: the "good" institutions should be market-friendly, and private-interests-incentive mechanisms could contain self-adjusting dynamics. Numerous works draw attention to the possible consequences of such an evolution over the real economy and point to various analytical weaknesses that played a role in the failure to identify risks and give clear warnings. To point to the weaknesses of this approach, Galbraith (2008, p. 5) maintains that nothing in this consensus could lead to a correct and relevant anticipation of the ongoing financial crisis since what one could find in this approach is: "a resolute, dogmatic, absolutist belief that monetary policy should not—should never—concern itself with such problems." Indeed, the irrelevance of such a synthesis stems from the fact that it cannot allow questions about financial instability since it does not allow questions about booms and busts, about insolvency and illiquidity to be asked (Buiter, 2009).

The Independent Evaluation Office of the International Monetary Fund (2011, p. 17) states that:

"The prevailing view among IMF staff -a cohesive group of macroeconomists- was that market discipline and self-regulation would be sufficient to stave off serious problems in financial institutions. They also believed that crises were unlikely to happen in advanced economies, where "sophisticated" financial markets could thrive safely with minimal regulation of a large and growing portion of the financial system."

Minsky (1991, p. 17) underlines the fragile working of liberalized markets that evolve through subjective transformation of uncertainty into mere risk calculations: "The way markets price capital and financial assets often reflects an heroic assumption that the unknowable can be known: that propositions about fundamentally uncertain situations can be derived by assuming that what happens can be viewed as if it is a sample from a well-defined probability distribution."

As Keynes (1936) remarks, that it is mass psychology which allows individuals to take heroic decisions and then enter into fragile financial positions. But this heroism develops on financial markets in an uncertain world which are fundamentally precarious: "Day-to-day fluctuations in the profits of existing investments, which are obviously of an ephemeral and non-significant character, tend to have an altogether excessive, and even an absurd, on the market" (ibid., pp. 153-154). Harvey (2010, p. 4) states then that such behaviour "while this enables economic activity to take place despite uncertainty, it also inspires agents to anticipate

increasingly favourable economic outcomes in times of plenty," contributing to increase fragilities and preparing the roots of the future instability.

The environment in which the current crisis occurred is partly the outcome of some regulatory changes supported by the New Classical/New Keynesian synthesis (Arestis, 2009; Buiter, 2009). This synthesis theoretically relies on the assumption that free markets are globally self-stabilizing without restrictive exogenous public intervention and active monetary and financial policies (Ülgen, 2017). Greenspan (1997) assumes, for instance, that detailed rules and standards have become both burdensome and ineffective, if not counterproductive. He then asserts that a consistent regulatory rule must be to make that effective risk management systems are in place in the private sector (accountability, compliance and disclosure of information) in order to foster financial innovation without imposing rules that inhibit it. Such a perspective gained strength and became a common ground of agreement among policymakers in major capitalist economies.

Liberal regulation as a crisis generator

The regulatory structure that frames the behaviour of economic units plays a crucial role in economic evolution. The way of functioning of markets is determined by the way financial systems are organized by the authorities of regulation. The regulatory framework provides markets and agents with collective rules and means of acceptable actions in order to maintain separate individual strategies within a viability zone. The very issue is to find the right way (e.g. a relevant way with regard to the objectives and consistent with regard to the constraints and capabilities) to make decentralized private actors' plans compatible with systemic stability of society within which these plans could be built up and implemented.

In major market economies, regulatory reforms were designed and implemented in favour of a loose regulation of financial markets from the 1980s with a large retreat of public supervisors from macro-prudential mechanisms for the benefit of the models of self-regulation of markets[v]. This resulted in a sharp reduction of the public regulatory power over the financial markets (Hake, 2005; Wray, 2011). Such an evolution of financial systems during the last decades was a conscious and voluntary institutional orientation resting on the hypothesis of financial market efficiency. The dominant approach of regulation assumes that self-control mechanisms can globally ensure the stability of financial systems and maintains that the individual safety of banks and financial institutions at the micro level is the major concern with regard to systemic stability. Therefore, it is argued that if relevant micro-prudential measures

can be framed, markets would not require restrictive public supervision. This (dominant) liberal regulatory approach builds systemic stability on individual risk instruments through the mechanisms of self-control. This phenomenon, also called the deregulation process, is actually a specific liberal financial regulation that reframed the working conditions and incentive-mechanisms of markets.[vi]

Such a process failed to result in a more stable and time-consistent financial system able to answer to the needs of the real economy. The crisis pointed to the weaknesses of micro-prudential and market mechanisms-related regulatory framework. Several concerns can be pointed out in such an approach. We will only develop a few of them specifically related to the limits of micro-rationality with regard to systemic stability.

One of the analytic explanations of the malfunctioning of the market-based regulation models is that these models rely on the assumptions that the decisions and actions of decentralized units (e.g. micro-rational strategies) would result in social harmony (the so-called Pareto-optimum), thanks to the self-adjustment capacity of market mechanisms (usually summarized by the encounters between private individuals' supply and demand through market prices)[vii]. However, there is a crucial difference between micro-rationality and macro-stability. The former is limited as it is based on private information about the microeconomic environment while macroeconomic stability seeks at assessing the situation of the whole system and then to evaluate its possible deviation from the sustainability/viability range through time. In this sense, microeconomic rationality-based behaviour transforms, in the private decision process, the Knightian authentic uncertainty into risk though this does not reduce the potential systemic instability at a macroeconomic level. In the absence of macro regulation there is no other mechanism that could prevent decentralized private decisions from resulting in a general crisis. The macro-regulatory structure lies in a specific institutional structure built on some collective principles aimed at the sustainable reproduction of the economic system. Liberal regulation ignores, by its own logic, the missing bridge between micro-coverage of risks and systemic stability concerns, skipping parts of necessary prevention-based prudential policies.

Another point of interest is the cognitive bias (Janis, 1982) which is the tendency among homogeneous, cohesive groups to consider issues only within a certain paradigm and not challenge its basic premises. This can be related to what Akerlof and Dickens (1982) call the *cognitive dissonance* such that people who are able to exercise some choice about belief given available information, can also manipulate their own beliefs by selecting sources of information likely to confirm "desired" beliefs. Economic actors usually believe that their speculative

strategies are safe, but in this line, they do not experience the unpleasant feelings of constant fear or unsettling doubts about how wise it was to take such dangerous direction. When they convince themselves their decisions are safe, they potentially make judgment errors due to the discrepancy between their beliefs and the true state of the world. But at the individual (microeconomic) level the true state of the world (e.g., the systemic macro situation) cannot be observed but *a posteriori*. One may also add to this picture of human decision complexity the *planning fallacy* such that the market players (the insiders) are inclined to assume that they are always right and overestimate their ability to overcome obstacles and neglect to look at contingencies that are opposite or contrary to their beliefs (Kahneman, 2011).

Such a complex decision process may obviously generate macular degeneration that is permitted by the absence of collective constraints and lack of social reference. The result is a new regime of (financial) accumulation that generates speculation-oriented financial products and processes, and transforms financing relations into Ponzi schemes (Minsky 1982; 1986b; 1992). In the period before the crisis, the economy turned out to a bubble environment based on real-estate-related debt leveraging in search of capital gains: "The annual rise in land prices has far outstripped growth in national income since the late 1960s, becoming the driving force in today's financialized mode of "wealth creation" (Hudson 2010, p. 4). The regime of accumulation therefore moved towards more short-term criteria. Financial operations, and new products and processes were directed towards speculative opportunities that became the main helm of not only the private decisions but also public policies. This evolution was obviously related to a specific institutional environment that allowed actors and markets, and especially banks, to adopt fragile strategies. With the financial liberalization-liberal regulation in financial markets, banks were more incited to enter into competition for the collection of deposits by offering higher interest rates to the expenses, often, of their balance-sheet stability and thus entered into excessively optimistic and short-sighted positions by financing holding companies' LBO operations without questioning their financial and economic soundness at the long-run. Obviously, accompanied by the limited liability of banks in the (de)regulatory system, such a situation creates an environment dominated by the moral hazard; the highly risky investments -the cost of bankruptcy of which is partially transferable on public funds- becoming more attractive.

Ahearne et al. (2005) then remark that:

"Financial deregulation has often been pointed to as a possible culprit for the large run-up in house prices experienced by many countries in the late 1980s. Indeed, (…) in the 1980s a

large portion of the countries in our sample experienced some sort of mortgage market deregulation. By the end of the 1980s, most constraints in most industrial countries had been lifted. Much of the deregulation eased constraints on household borrowing. In the United Kingdom, the United States, France, Canada, and Denmark, the deregulation increased the pool of potential lenders by lifting constraints on eligible lenders. In Australia, Denmark, Finland, Japan, Sweden, and the United States, removing the regulations pertaining to the interest rates paid by borrowers and the interest rates paid to lenders increased the willingness and ability of borrowers and lenders to arrange mortgages. These changes may also have boosted competition in the lending market as financial institutions sought to establish or protect market share."

In a similar way, the *Special Report on Regulatory Reform* of the U.S. Congress (2009, p. 10) documents that unregulated and weakly regulated financial markets have historically shown a tendency toward excessive risk taking and instability. The reasons for this are many:

"To begin with, financial actors do not always bear the full consequences of their decisions and therefore are liable to take (or impose) more risk than would otherwise seem reasonable. For example, financial institutions generally invest other people's money and often enjoy asymmetric compensation incentives, which reward them for gains without penalizing them for losses. Even more troubling, the failure of a large financial firm can have systemic consequences, potentially triggering a cascade of losses, which means that risk taking by the firm can impose costs far beyond its own shareholders, creditors, and counterparties. The freezing up of the credit markets in 2008–09, because even healthy banks are afraid to lend, is an especially serious example of this phenomenon."

Therefore, in the aftermath of the crisis, Bernanke (2010) asks what policy implications should we draw. Bernanke argues:

"… the best response to the housing bubble would have been regulatory, not monetary. Stronger regulation and supervision aimed at problems with underwriting practices and lenders' risk management would have been a more effective and surgical approach to constraining the housing bubble than a general increase in interest rates."

In this vein, it is maintained that the roots of the crisis mainly rest on the institutional regulatory structure of financialised capitalism. Economic instability is a result of cumulative euphoric expectations in the absence of consistent institutional-policy framework. Dugger (2005) states that a market is the result of collective action backed by the state. The role that policy makers play in market economies should be reconsidered with the aim of strengthening

the resilience of macroeconomic structures to possible negative consequences of private micro decisions.

4.3. Gift-economics: elements for an alternative regulatory framework?

Financial regulation after the crisis: some directions

In the aftermath of the crisis, scholars as well as central bankers called for a necessary "revision" of financial regulation and maintained that a more macro-prudential approach would be suitable to strengthen financial stability. However, after more than one decade of reforms, relevant regulatory structures are not in place to ensure the systemic resilience of banks and financial markets: "eight years after the passage of Dodd–Frank, and nearly a decade after the banking agencies began to work on stronger capital and liquidity regulation, the new regulatory framework in place is still not completed, with numerous proposed regulations not having been finalized" (Tarullo, 2019, p. 70).

Major remarks that are brought forth are mainly related to increasing debt positions and the persistency of risky practices that feed vulnerabilities while an appropriate regulation of liquidity and short-term finance is still not in place (Tarullo, ibid., p. 62). Tarullo (ibid., pp. 70-71) also argues that the relative resilience that large banks recovered during the last years thanks to new regulatory measures does not rest on long-term sustainable change and may become degraded over time. It is worth noting that while US Congress legislated some changes to the Dodd–Frank Act in early 2018 that eliminated regulatory requirements for small and mid-sized banks, the banking agencies have moved toward relaxing regulation for the largest banks as well. Tarullo (ibid., p. 71) reports that these agencies have proposed reductions in the leverage ratio surcharge for the eight banks designated as being of global systemic importance and effective reduction in capital requirements for the three "super-regional" banks. Tarullo (ibid., p. 70) then maintains that: "The future degradation of the resiliency of large banking organizations is by no means foreordained…"

Moreover, Clark and Large (2011, p. 25) insist that sources of systemic financial vulnerability that stem from unsustainable evolution in financial aggregates over time still reinforce an unstable pattern of financial exposures, and structural weaknesses. Even though some significant progress has been made in the field of bank capital and liquidity regulation

during the last decades, new sources of risk are emerging. Financial innovations keep on developing also outside the perimeter of regulated banking organizations; notably from forms of shadow banking, and new financial instruments, practices and forms of business activity may become the impetus for another crisis (Tarullo, ibid., p. 63).

It is worth noting that technologies and financial market participants are transforming, and this can lead to new risks: "Technology is transforming the payments and banking industry and, together with opportunities, it brings with it new risks" (Saporta, 2018, p. 8). In addition, market participants trying to reduce the cost of regulation change their behaviour and adapt to regulation. Therefore, "core capital and liquidity regulations need continual refinement, both to combat arbitrage efforts by the banks and to adapt to new financial products and conditions" (Tarullo, ibid., p. 70). Monitoring the creation and development of new instruments and the emergence of new forms of business activity can give important clues to potential sources of risk. From this perspective, the macro-prudential approach should seek to identify systemic vulnerabilities and sources of risk. It is important to maintain the results achieved in reducing the risks of the banking sector while it is clear that the regulation approach should be system-wide. An important feature of macro-prudential regulation is to fix the rules in normative legal acts in order to make their implementation mandatory for financial system participants.

Various tools are currently being used to prevent future financial crisis, smooth the financial cycle, and mitigate the effects of the financial crisis. Risk-weighted requirements, minimum capital ratios, stress tests, tail risks, etc. can lead to identify globally and systemically important banks: "Three significant accomplishments seem reasonably apparent: tiering of bank regulations by size of institution, greater financial resiliency for bank-related financial institutions, and movement toward an orderly resolution mechanism for failing banks" (Tarullo, ibid., p. 64). From this perspective, Saporta (ibid., p. 12) notes that "horizon scanning draws on supervisory and market intelligence, macroeconomic analysis, and thematic analysis of trends in key financial markets".

The use of such tools has contributed to the increase of financial system's stability. Saporta (2018, p. 4) reports, for instance, that: "UK banks' buffers of liquid assets have increased by over 40 percent since 2010". Tarullo (ibid., p. 64) argues that "the post-crisis regulatory regime has led to a dramatic increase in the resiliency of the prudentially regulated part of the financial system, as measured by 1) the quality and quantity of capital both required and actually maintained by banks; 2) the greater stability of funding sources for banks; and 3) the risk management capacities and practices of banks".

When making adjustments of regulation in response to emerging risks, it is important to remember the main goal of the reforms and verify compliance with this goal: "It is important to remember the aim of these reforms. Their aim was to reduce excessive variability of banks' risk-weighted assets, and in doing so making banks' risk-based capital ratios more transparent and comparable" (Saporta, ibid., p. 4). The selection and implementation of an appropriate tool is an important foundation for successful macro-prudential policies. However, it is important to understand that the financial environment is actively changing and new sources of risks arise. Therefore, it is important to adapt the tools to current conditions: "It is by making dynamic adjustments that we can ensure the regulatory framework continues to deliver on the reforms' objectives and ensures that the resilience that policy makers injected into the system post-crisis endures" (Saporta, ibid., p. 9). [viii]

To implement successful macro-prudential policy, institutions are needed: "Macroprudential regulation advocates were able to present practical policy proposals that promised to limit future potential market losses, to reduce future calls on public finances and to minimise the loss to macroeconomic output that came with episodes of financial distress. This increased the appeal of these ideas to both public and private sector representatives" (Baker, 2013, p. 18). It is clear that a successful framework requires the input and engagement of a number of institutions, with a shared objective of delivering financial stability.[ix]

An interesting question is to consider the possibility of imagining an institutional regulatory framework based on the rules of gift-economics in that the latter is based on social constraints that would act as social institutions and link individual choices to societal constraints and choices required for the social recognition of each community member.

Institutions and gift-economics

The research on financial regulation points to the crucial role of the institutional framework but also to the micro-macro relationship and the coherence between micro-rationality and macro-systemic results. Such an opposition is one of the issues studied within the alternative monetary models of capitalism that bring forth endogenous instability of capitalist finance. From this perspective, Iwai (2010, pp. 6-7) argues:

"The key point here is that bubbles and busts look totally irrational at the macroscopic level. Yet the behaviour of individual speculators—buying when they expect prices to rise and selling when they expect them to fall—is perfectly rational on the individual level, and indeed profitable—at least in the short term. Contrary to Milton Friedman's claim, macroscopic

irrationality is not necessarily a reflection of individual irrationalities but often an unintended aggregate outcome of individual rationalities."

This "natural feature" of a capitalist economy, the "fallacy of composition" that Iwai terms "the paradox of rationality", is accentuated by the financialisation of economic society since the development of financial markets increase the speed and scale of operations that reinforce the speculative character of rational economic strategies of individuals. In a 2000 book published in Japanese (quoted in Miyazaki, 2013, p. 134), Iwai argues that in a market economy, each individual who produces, consumes and exchanges is naturally a speculator and such behaviour should involve the economy in recurrent crises. A relevant question is therefore: could the use of gift-rules through reciprocity that is mainly resting on societal constraints and that should aim at strengthening macro stability be a possible direction to make both sides of financial regulation, micro and macro, consistent with each other?

To answer this question one should fix the role of institutions in the organization of markets. Whatever the (many) shades of capitalism, in economics, markets are considered as an environment (price mechanisms, competition rules, private property and individualistic values) that could lead separate individuals to enter into economic and social transactions in a coherent manner while institutions are usually regarded as social-constraint-structures that are given and aiming at supporting/improving/correcting market transactions (Baumol, Litan and Schramm, 2007; Hall and Soskice, 2001, to quote but a few).

Institutions provide the frame in which society evolves in a consistent and "rational" direction. In this, institutions contribute to shape the operating way of societies. Neale (1987, p. 1180) states that institutions "allow people to act with a high degree of confidence in their expectations of how other people will respond to their actions, and that allow other people to interpret actions and to respond intelligently." From this perspective, institutions are the framework that contains written and unwritten rules[x] that should allow a given social group to function in a "normal" and predictable way. Group members would then be enabled to adopt behaviours that would more likely be consistent with each other. This could lead members of society to avoid conflict situations that could provoke crises and challenge the values and references that constitute the societal cement. Consequently, the analysis of economic relations among decentralized individuals is the analysis of an 'instituted economy in evolution' (e.g., system-consistent institutional development). Gift-rules, as extra-individual rules, imposed to market participants have then, to be fixed on an institutional framework in order to give a consistency with the characteristics of large capitalist societies. Such an assertion might be

related to the distinction developed by F. Tönnies (see Cahnman, 1995, for a comprehensive presentation), between *Community and Society (Gemeinschaft and Gesellschaft)*. In large societies, relations are usually more anonymous than in small ones. Therefore, the implementation of gift-engagements between parties seems to be more problematic in large societies since the relevant obligation-scheme is more complex to be framed and to be supervised.[xi]

Rooted in the history of "archaic" societies, a gift-based social relationship is usually considered in opposition to market-based individualistic (utilitarian) relationship of capitalist societies. The latter is regarded in terms of individualistic self-interest based on formal contracting while the former is seen as a matter of social informal trust mechanisms that would lie in more holistic dynamics than the individualistic rationality of homo-oeconomicus (Eisenberg, 1997; Van de Velde, 2003). The market relationship, the so-called commodity exchange schema, rests on the "invisible glue" of the market mechanisms (seeking personal and exclusive alienable wealth accumulation) while the gift stands for moral and collective concerns (with social and inalienable characteristics) which survive after the exchange (Lapavitsas, 2002)[xii].

In economics, gift-giving is also studied as a theory of the voluntary public and private redistribution of wealth (Mercier Ythier, 2006). The central object of the theory is altruistic gift-giving, construed as benevolent voluntary redistribution. However, from the perspective of economics, the scope of a gift-economy is much larger since it could be used as an alternative guide for the financial system's organization as the latter is assumed to be a societal concern determining its domain of viability and not a mere market for some payment services.

In the tradition of Sahlins (1972), the gift allows us to regard the economy as a category of culture and politics related to the material life process of society. In the tradition of Mauss (1954), the threefold social obligation that characterizes a gift-exchange[xiii] enforces the community through some social obligations and can be seen as a source of the formation of social capital (Dolfsma et al., 2008) that might improve social cohesion and strengthen commitments in market exchange relations. Bell (1991) argues that market relations can be embedded in a more general gift-giving schema since they could be thought of as a special (more individualistic) case of social relations globally backed by giving rules.

These different perspectives could improve our understanding of the dynamics of a capitalist economy and its possible viability interval through *societal reforms for market design*.

The latter requires some stabilization rules and tools at a societal level in order to deal with recurrent systemic crises, and then might benefit from the implementation of the reciprocity rule of gift-exchange in market relations. *Therefore, a restatement of the characteristics of a gift relation and its possible implementation as a systemic stabilizer within a capitalist financial framework becomes a relevant issue in search for an alternative financial regulation and supervision system.* This could lead to frame a more holistic and comprehensive regulatory framework that could regard the strategies of market actors as the result of complex behavioural phenomena that develop through uncertainty and out of any social optimum that could be previously given by a perfect market equilibrium mechanism. Indeed, the gift relation can be seen as a source of social capital formation, a social infrastructure "which represents shared meanings and interpretations" (Dolfsma, van der Eijk and Jolink, 2009, p. 317) that could be used by individuals and groups in a way "that can facilitate an individual or collective action not otherwise possible" (ibid.). Gift-rules might then be regarded as socially recognized means that have the power to transfer, between individuals, between individuals and society and between groups within a given society personal utility as well as social values embedded (and then accepted) in a social structure. Although gifts could be thought of as a unilateral transfer (*I give you something for nothing*, beyond the utilitarian perspective), one might argue that in any exchange relation, exchange should entail reciprocal transfers (*I give you something and something else comes back from you to me*). Rose (1992) shows that the potlatch relationship could be regarded as a form of insurance, a kind of revolving exchange relationship since: "the kin-group with the most successful annual catch gives away wealth in a kind of rough circle of reciprocity, so that all kin-groups were assured that they would not go hungry in a year of bad luck – though in return, they had given away a great deal during their own lucky years." (Rose, 1992, p. 299)

Sahlins (1972, p.150), quoting Mauss, states that the social link is given by "the hau" according to the rule of "giving and receiving in a reciprocal way" in order to fill the common (universal, objective, societal?) obligation of mutual respect of things and values, be they socially or individually evaluated: "Meanwhile, the Maori hau is raised to the status of a general explanation: the prototypical principal of reciprocity in Melanesia, Polynesia, and the American northwest coast, the binding quality of the Roman tradition, the key to gifts of cattle in Hindu India – "What you are, I am; become on this day of your essence, in giving you I give myself" (Mauss, p. 248, quoted in Sahlins, ibid.)

Indeed, Mauss (1954, p. 14) gives an interpretation of the hau, the spirit of things that might belong to people as private property. In the giving process between individuals within society, the hau is contained in each article given and must be returned back to each person through time. In other case, serious harm might befall individuals who do not respect this "equivalence through given things". Things given between individuals must respect (at least) a recognized equivalence; this equivalence might be an expected social value of the things received or to be received; such an expectation offering the link between the present and the future for the parties and gives the engagement its time-consistency.[xiv]

In the Preface to Mauss' *Gift*, Douglas (2002, p. xi) maintains that in a gift-giving network the whole society can be described by the catalogue of transfers that maps all the obligations between its members such that the cycling gift system can be regarded as the society:

"The potlatch is an example of a total system of giving. Read this too fast and you miss the meaning. Spelt out it means that each gift is part of a system of reciprocity in which the honour of giver and recipient are engaged. It is a total system in that every item of status or of spiritual or material possession is implicated for everyone in the whole community. The system is quite simple; just the rule that every gift has to be returned in some specified way sets up a perpetual cycle of exchanges within and between generations. In some cases the specified return is of equal value, producing a stable system of statuses; in others it must exceed the value of the earlier gift, producing an escalating contest for honour."[xv]

From this perspective, one might argue with Douglas that the gift cycle echoes Adam Smith's invisible hand since gift-rules could complement market relations especially when market mechanisms reveal to be weak to ensure the viability of social relations: "being more directly cued to public esteem, the distribution of honour, and the sanctions of religion, the gift economy is more visible than the market. Just by being visible, the resultant distribution of goods and services is more readily subject to public scrutiny and judgements of fairness than are the results of market exchange. In operating a gift system a people are more aware of what they are doing, as shown by the sacralization of their institutions of giving. Mauss's fertile idea was to present the gift cycle as a theoretical counterpart to the invisible hand." (ibid., p. xviii).[xvi]

If one follows Mauss' emphasis on the contractual obligation to reciprocate gift - although gift-giving is not entirely touched by the quantitative equivalence relation of the market between two exchanged things -, one could interpret credit relations among enterprises

as a specific gift-transaction in a broader sense. As Lapavitsas (2002) argues, in a capitalist economy, enterprises are connected in many production and trade links that create different relations between sellers and buyers, and along with trade credit (a trust relationship between the creditors and debtors) that leads to continuous economic activities. Lapatvitsas (ibid., p. 13) then maintains that on the one hand: "…trade credit tends to emerge among enterprises connected in chains of business that derive from the use value of products and entail frequent buying and selling among participants. Without non-market relations among enterprises, trade credit and its instruments, markets and institutions would be largely impossible". But, it is worth noting that on the other hand, once the mechanisms of credit are in place, all the non-market relations (such as trust, commitment and moral obligation among parties) are affected: "For this reason, the trust that underpins capitalist credit relations is profoundly noxious and always likely to turn into outright fraud" (Lapavitsas, ibid.).

Therefore, it should be noted that the logic of gift cannot be reduced to disinterestedness or altruism, or to individualistic and egoist calculation. It seems to be a more complex social phenomenon such that formal contracting is possible with a background of informal trust and values (the "gift component of social life". Van de Velde, 2003, p. 100). There is a kind of mix of values, although not formally describable, going from informal and internal rules to more formal and external statements. In the Durkheimian words, one could assert that formal agreements are only the most visible part of the social iceberg of a set of informal norms, traditions, conventions, etc.

The rationale for the intervention of a nonmarket societal organization within the framework of financial markets' regulation rests on the assertion that decentralized and separate individual decisions and strategies cannot ensure a minimal systemic coherence to make society viable through time without any societal constrained framework. In other words, a global equilibrium (or more accurately a globally satisfying viable system) requires a common society-wide organization of rules and their supervision in a preventive way.

A brief inquiry into gift-relying regulation

Several aspects of gift-economics could be used in order to design financial regulatory rules.

Following Malinowski's and Mauss's extensions of the gift category from the gift to the contract, Miyazaki (2013, p. 149) suggests some extension between arbitrage and gift from a perspective of the anthropology of finance and regards the gift "as an almost eternal point of

return and an inexhaustible source of theoretical inspiration and associated humanism, the extensibility of arbitrage lets arbitrage evaporate along with the kind of faith required to recognize its possibility" and argues that "there is a sense of possibility in re-appreciating the kind of excitement entailed in the logics of finance and their extensibility as a locus of slight expansion of thinking, imagination, and humanity despite all the nightmares such excitement often ends up producing" (ibid., p. 150). Miyazaki then states that such a "broadened" view of finance can also enable dialogue between traders and regulators.

In this section, we seek to look at the issue from a slightly different angle, linked to a holistic stance and based on reciprocity in terms of common rules that should be imposed on the market participants in order to enhance the consistency of their separate actions with overall systemic stability. Could such a view be linked to the holistic analysis developed by Tett (2015) in terms of "blindness to our own blindness", requiring external collective action that could be based on societal constraints gathered around the perspective of the gift economy. Going beyond the usual opposition between regulation and liberalization, between regulators and regulatees, between micro-rational individuals and macro-stability-seeking policy-makers, and then breaking out of silos, we suggest some regulatory rules that could use reciprocity as a relevant collective action tool. These rules rest on the assumption that in a large and complex (monetary) capitalist society reciprocity cannot be spontaneously and voluntarily internalized by private profit-seeking players and must be part of a system-wide regulatory framework, organized and supervised through collective action institutions. In other words, reciprocity cannot be ensured in a "natural" way through the so-called market discipline and market incentives that would push individuals to adopt strategies according to society's wishes expressed in the rules of reciprocity. The reason is obvious: capitalism is mainly resting on selfish micro-decision units that seek to achieve private performance in an individualistic way (e.g. capital accumulation).[xvii] These decision-making units have no way of knowing for sure that if they adopt altruistic strategies they could get back more gain (the so-called Smithian invisible hand reflex). In other words, in a non-cooperative environment, there is no generalizable Pareto-optimal equilibrium and individuals must seek partial and imperfect results for themselves without being able to have control over the whole. This situation often leads to opportunistic behaviour that undermines trust between individuals and then harms collective stability and individual optimum. This implies that while reciprocity can provide some stability, it must be organized by a visible hand through collective action. For instance, Lapavitsas (2002, p. 13) notes that "Extensive institutional mechanisms are necessary to police the edifice of promise and counter-promise that comprises the capitalist credit system".

Reciprocity, as a social rule, could keep separate individuals within societal constraints under the implicit threat of being rejected or not being recognized by the community (whether it is a professional community of monetary interests or a collective community of interests related to status, social recognition, etc.). The gift-rules based complexity of economic structure might lead to some distinctions between micro-prudential regulation and macro-prudential regulation. Micro-prudential regulation is usually based on the assertion that each individual unit will be aware of the consequences of her/his strategies and will engage in safest strategies to reduce the risk of failure since her/his aim consists in realizing high gains. Individuals are therefore concerned with factors that affect their own stability through self-monitoring and legal incentives to ensure regular disclosure and accountability, and rating agencies and banks' own IRB (Internal Ratings Based) models. However, these tools inevitably provoke conflict of interest issues (Crockett et al. 2003; King et al. 2012). Thompson defines conflict of interest as "a set of conditions in which professional judgment concerning a primary interest (such as patient's welfare or the validity of research) is unduly influenced by a secondary interest (such as financial gain)"[xviii] while Davis (1982, p. 21) brings forth the concept of "judgment" to elaborate a general definition of a conflict of interest: "A person has a conflict of interest if a) he is in a relationship with another requiring him to exercise judgment in that other's service and b) he has an interest tending to interfere with the proper exercise of judgment in that relationship." In market-related self-regulation systems, conflict of interest is a real concern that arises when the regulator and the regulatee are not well separated from each other. The confusion between these two sides of the process is a common feature of liberal regulation through the rating agencies and IRB mechanisms.

Whatever the supervision mechanisms implemented by public authorities over micro decision units, in a micro-prudential schema the incentives fail to prevent short-sighted individual behaviour which often develops macular degeneration reflecting the very limited horizon of decentralized private expectations and subsequent actions. For instance, the problem of macular degeneration is permitted by the absence of a collective constraint that might be provided by a gift-rule-based anchor. If one can assume that a major gift-rule is reciprocity and respect of mutual engagements, therefore, the preference order in market decisions of individual actors would not be anymore "First, my interest, second possible nice results for society".[xix] In other words, such an alternative organization would not rest on the Smithian ad hoc hypothesis of the egoist butcher who would finally serve society only by seeking his own profit. There is no direct link between micro-interests and social coherence or invisible hand that would incentivize the butcher to supply the best meat to satisfy his client and get back maximum

profits. Furthermore, in a money-based capitalist economy, "money primes individualism: a reluctance to be involved with others, to depend on others, or to accept demand from others" (Kahneman, 2011, p. 55). Since reciprocity requires a reciprocal/mutual respect along with individual objectives, it cannot be generated through market relations. The logic of reciprocity is in an opposite way to market transactions: "Serving community would give me my personal interest thanks to stability and this interest is closely related to the respect for others and myself". Implemented in the financial area, this could prevent society-wide financialisation by directing markets through another regime of accumulation that would not generate speculation-oriented financial products and processes, and transform financing relations into Ponzi schemes (Minsky 1982; 1986b; 1992). Therefore, the inclusion of the reciprocity rule into market exchange relations might contribute to ensure stability.

Limiting the high-risk operations of financial institutions in order to maintain stability on the basis of general rules is a necessary direction is an alternative regulatory model. This essentially means that the institutions do not receive part of the profit that is transferred to other participants of economic relations in the process of redistribution in order to reduce incentives to undertake speculative activities. Another rule might be more explicitly linked to reciprocity. For instance, reciprocity means "you cannot save face if you do not fulfil societal duties (that may be more important than individual interests since "face" means a combination of reputation, honour, dignity, respect, social standing, etc.). Therefore, one of the measures to be included within the financial stability framework could be the interdiction for a failed institution (or person) to undertake similar activities during the next "x" years after the failure if the latter is proved to be due to "collectively irresponsible" (but, maybe, individually rational) strategies. However, this would require some changes in financial regulation and the legal framework according to a set of preannounced social objectives and duties.

The ambivalent nature of money, private and public as mentioned above, is linked both to specific constraints to allow market relations to be developed in a sustainable way. With regard to the private relations, respecting some implicit/explicit accepted standards of behaviour and the rules of good conduct between the parties of a given contract must be observed as an ethical obligation (since in a private property-based society, the respect of the property of a person is a core ethical rule). With regard to the public infrastructure, legal constraints and limitations to individual interests exist in order to prevent individual decisions from generating social crises. For example, the obligation to repay a debt is a legal constraint but also an ethical commitment if the debtor expects to remain included in social market

relations. However, it is clear that the will and the actual way of doing things may not be compatible with each other.

One of the conclusions that one may draw from this analysis is that the power of reciprocity in an individualistic market society is not as strong as the social constraints and reciprocity that could be in force in a traditional society if it is not resting on collectively imposed formal regulatory rules. *Concerns about the implementation of gift-economy rules in a capitalist society are very similar to the difficulties of effectively considering a self-regulatory framework linked to market-mechanisms through the rule of transparency, disclosure and the so-called market discipline* (the usual arguments of liberal regulation). In a decentralized economy, individuals cannot take into account the systemic instability concerns that are beyond their capacity and will. These concerns must be addressed towards collective rules and principles. The problem endemic to financial markets is that individual borrowers and investors may not always be ideally positioned to evaluate complex risks. To cope with such destabilizing evolution and its destructive consequences, the redesign of the regulatory framework is a *sine qua non* condition that requires more voluntarist policies aiming at framing financial markets supervision in a society-viability consistent way. Therefore, collective constraints-based macro-prudential regulation rules that might partly rest on gift-economy rules could be substituted to micro-regulation schemas as they concern themselves with factors that affect the financial system's stability as a whole (Brunnermeier et al. 2009). Macro-prudential regulation holds that micro-regulatory frameworks cannot address the systemic instability issues and take into account counter-cyclical and systemic needs to stabilize the whole economy. That calls for modifications of the institutional structure of financial markets. Stronger macro-prudential regulation framework should be designed instead of market-friendly supervisory approaches, and used to prevent short-sighted speculative activities to offer funds for productive activities, transforming the current crisis into a positive "renaissance opportunity". It seems that the so-called "primitive rules" of a gift-economy may offer us relevant reflections for a renewed way of thinking of our "modern" financial issues. The challenge is, we have to look for means to address it for institutional change.

4.4. Conclusion

This chapter sought to assess whether reciprocity as a gift-economics rule could provide a relevant institutional anchor that could offer a financial regulatory framework able to strengthen the working of financial markets and ensure systemic stabilization of monetary economies. While the liberal private-interest based agenda tends to ignore the need for consistent embedded institutions, an institutional-evolutionary analysis brings out structural fragilities of the working of financialised capitalism and points to a necessary reframing of markets and institutions. Minsky (1986b: 281) maintains: "If the disrupting effects of banking are to be constrained, the authorities must drop their blinders and accept the need to guide and control the evolution of financial usages and practices. In a world of businessmen and financial intermediaries who aggressively seek profit, innovators will always outpace regulators; the authorities cannot prevent changes in the structure of portfolios from occurring. What they can do is keep the asset-equity ratio of banks within bounds by setting equity-absorption ratios for various types of assets. If the authorities constrain banks and are aware of the activities of fringe banks and other financial institutions, they are in a better position to attenuate the disruptive expansionary tendencies of our economy."

Seemingly paradoxical (but logically natural if Minsky's "endogenous financial instability hypothesis", Iwai's "paradox of rationality" and Kahneman's "planning fallacy" are taken into account), the liberalization of financial markets increases the need for public oversight since it results in a system-wide financialisation with continuous and permanent effects on the economy: "In a market-based financial system, banking and capital market developments are inseparable, and fluctuations in financial conditions have a far-reaching impact on the workings of the real economy" (Adrian and Shin, 2010, p. 5).

Therefore, a financial system's stability appears to be a general concern that should be considered at a macro level. For this aim, the rule of reciprocity seems to be a relevant source of reflection to provide an alternative model of financial market organization. However, in a capitalist society, reciprocity needs to be resting on socially given collective rules. It should be relying on a specific financial regulation that should be framed according to a reciprocity-linked-societal-constraints schema that considers the complexity of human decisions (beyond some mere technical models) and strategies (beyond some simplistic optimum calculus). The necessary elaboration of a consistent financial regulatory framework should seek strengthening the trust among market actors but also between markets and society, and between markets and

regulators. For this aim, regulation has to oblige market players to respect reciprocity in their market relations through macro-prudential constraints and incentives. In such a schema, reciprocity would play a holistic role beyond legal regulatory restrictions imposed by public authorities while its relevance would be closely related to the strength of those restrictions.

The Gift in the Economy and Society

Perspectives from Institutional Economics and Other Social Sciences

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9 In search of relevant financial regulation

Some lessons from the gift-economics

Faruk Ülgen and Marina Sakovich

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Introduction

The purpose of this essay is to determine whether gift-economics can provide a relevant analytic direction for an institutional framework in order to design an alternative financial regulation that could strengthen systemic stability in market-based capitalist economies. We regard "gift-economics" as a proxy for different terms such as gift-economy, gift-exchange, gift-transactions, gift-giving, etc. However, there could be crucial differences among them; some concepts relying on neoclassical transactional approaches while some others might mean alternative non-utilitarian perspectives. For instance, Akerlof (1982) argues, from a neoclassical perspective of efficiency-seeking incentive mechanisms, that gift-rules might affect employer-employee relations, and assumes that when they are better (more poorly) paid, workers would feel an obligation (an incentive) to produce a higher (lower) value of output per unit of time even if this "implicit cost equivalence" criterion is not an element of the work contract. In a similar vein, Mercier Ythier (2006) gives a comprehensive analysis of gift-giving as an element of equilibrium redistribution of wealth. With regard to the transaction cost issue but developing on the informational and cultural characteristics of gift relations, Dolfsma et al. (2009, p. 325) consider gift-exchange as a complement to legal contractual arrangements and argue that "Gift exchange can lead to lower transaction costs since it allows individuals to trade with one another without relying solely on formal mechanisms such as legal contracts and litigation". From a more holistic perspective, Sahlins (1972) regards the economy as a category of culture and politics related to the material life process of society and focuses on reciprocity as a social common denominator that could enable society to stabilise inter-individual relations. This way of embedding economic relations within a more general societal framework that would be resting on reciprocity as a social cement/social glue is very close to the Polanyi's approach to the capitalist economy (Polanyi et al., 1957).

This chapter seeks to assess the relevance of the gift-rules, to name (mainly), *reciprocity and mutual engagement*, as possible references that could contribute to frame stabilisation rules in the working of financial markets whether these

rules could be interpreted in an individualistic way or in a holistic way. Using a well-known Maori proverb, *Ko Maru kai atu Ko Maru kai mai Ka ngohe ka ngohe*[1], one can regard the rule of reciprocity in the organisation of society as a central element of "time-consistency", i.e. capacity to allow social relations to develop in a sustainable way and then stabilise the functioning of society. This reciprocity can be considered as the immediate expression of a gift-economy.

However, this chapter argues that in a capitalist society, reciprocity cannot be organised *spontaneously* through decentralised market relations between individuals since the latter is mainly resting on selfish private individual decisions that seek private performance (capital accumulation). In a non-cooperative environment, market incentives rely on opportunistic possibilities that might impede collective stability. In the absence of some cooperation mechanisms able to direct players to trust one another, the economic relation (the transaction, the game) would result in defection and suboptimal outcomes as players might implement strategies that would potentially give them the best payoff without regard for what would be the optimum for the overall system (Harsanyi, 1976, p. 158). This could mean that as a relevant "alternative" solution to suboptimal non-cooperative frameworks, reciprocity can be considered as a rule of institutionalised coordination provided that it is framed and managed by the institutions of collective action in order to become effective. In this case, reciprocity-including regulation can be regarded as a holistic mechanism enlarging the scope of collective action in markets, going beyond the usual opposition between constraint-imposing public regulator and social-restriction-avoiding opportunistic private interests. This assertion will be studied in this essay with regard to financial market regulation.

Many institutionalist economists focus on the crucial role of institutions to design financial structures that are consistent with regard to the characteristics of a capitalist economy. Hyman Minsky (1986a) is one of them and points to the endogenous instability of a monetary/finance-based capitalist economy. In this tradition, socio-cultural norms, habits, group-membership, societal rules, etc., may all influence individuals' strategies. These elements also contribute to the complexity of the individual decision-making process, while individuals are assumed to be rational profit-maximisers or not. Parallel to this, works on economic psychology, in relation with cognitive psychology, also develop on some similar assumptions and place the emphasis on group-centred rules, goals and behaviour in society (Baddeley, 2019; Katona, 1975).

In this line, reciprocity might be a relevant angle of reflection when it comes to the design of an institutional regulatory framework consistent with the characteristics of monetary capitalist economies. However, a specific study of a possible contribution of gift-economy dynamics to an institutional reflection on an alternative financial regulation aiming at dealing with recurrent financial instabilities of capitalism has not yet been done.[2] This essay aims at exploring the possibility to fill this gap between a rich analytical

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tradition on the gift-economics and the research done on financial instability and regulation. We suggest an institutional analysis of the possible corrective effects of gift-rules as determining social and cognitive factors, on the recurrent financial instabilities in capitalist economies. The departure hypothesis is that a gift-economics approach may provide a social rules-related guide to shape individuals' behaviour within society. The core purpose is then to investigate how to match reciprocity and the macro-prudential approach, both resting on the idea that the organisation of society should rely on some social/collective constraints in order to lead to social stability and coherence. In the gift-based environment, those constraints are usually implicit and conventional while in a market-based capitalist society, written rules are needed and a constraint-related macro-regulatory framework is required.

For this aim, the second section presents the major features of a monetary capitalist economy and the concerns that arise from its financialisation in a loosely regulated institutional environment since the late 1970s. The third section presents some of the characteristics of gift-economics and questions the possibility of considering alternatives to liberal and micro-prudential financial regulation that could be based on the reciprocity rule of gift-economics and then lead to a consistent institutional environment able to provide a sustainable financial regulation. Although some directions are suggested in terms of relevant alternative financial regulation, we do not give a list of collective actions that should be implemented to reframe financial markets, but rather indicate the necessary institutional analysis of financial regulation. The last section concludes.

An institutionalist analysis of financialisation and liberal financial regulation

Capitalism as a monetary economy

Capitalism is a historically identifiable social structure where economic relations are resting on some specific features. One of these features that determine the reproduction possibilities of the economy is the monetary and financial system and the underlying institutional structure. The institutionalist approach (Dillard, 1987; Mitchell, 1916; Veblen, 1904; among others) develops a relevant analysis of capitalism as a "money economy" where money plays a central role in economic evolution. Minsky (1982, p. 92) states that the mode that actually rules at any time depends upon institutions, the structure of financial linkages, usages and policies. In a capitalist economy, the monetary and financial structure is at the heart of the economy since all economic relations require the use of money and generate financial operations (Ülgen, 2018). This framework displays some features resting on a specific schema called a payments system that allows private individuals to set up multiple relations in society and develop their plans in a decentralised way. Money is the name of the payments system, a set of rules that permits the

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creation-circulation-repayment process of debts within the economy. These debts flow through the entire economy as money.

Consequently, a core feature of such an economy lies in the financing process of decentralised private plans without any central (external) decision control mechanism. In this "endogenous money" environment, all economic activities need to be financed to become effective. This usually results in private debt contracts between the spending units (mainly the enterprises) and the banking system. Debts generated through these operations must be repaid according to their maturity. The debt-financing process and resulting financial operations enable private economic units to undertake their own plans according to their expectations (the Keynesian animal spirits of entrepreneurs) once they are financed by the banking and/or financial system (Ülgen, 2019).

In such a social institutional framework, money has two core characteristics: ambivalence and transversality.

First, money is ambivalent, private and public. On the one hand, it is generated through decentralised private decisions and actions as a means of financing profit-seeking activities. On the other hand, it is public since its threefold use – as a general unit of account, a means of payment, and the only society-wide means of settlement of debts – rests on its publicness that gives it its supra-individual power[3]. Although created in a private (endogenous) way, money stands as a public system of accounts through payment-repayment relations and draws its objective validity from public (non-market) power (such as an extra-market central bank, public rules and constraints imposed on private debt operations, obligation to repay debts, limited access to money and credit, etc.).

Second, money is transversal to all economic relations whether they directly or indirectly involve individuals in these operations. Everyone uses money, contributes to financial operations, and is affected by the systemic consequences of these operations (and related policies) without being necessarily directly engaged in monetary and financial transactions in markets.

The efficiency of the working of a capitalist economy is then related to the relevance of its monetary and financial institutional framework in force. Given this crucial role of the payments system,

> … money and finance can be seen as capitalism-specific public utilities. Without their regular provision, a capitalist society cannot develop. At the same time, their sustainable provision cannot rest on decentralized market mechanisms that evolve through uncertainty in a non-ergodic world. The provision of money and finance often requires policies and intervention by a public power.
>
> (Ülgen, 2018, pp. 543–544)

However, two major concerns arise in the "normal" working of a capitalist economy and depend on the aforementioned specific characteristics of

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money: the tendency to financial instability and the tendency too loose regulation. These two concerns recurrently provoke systemic instabilities and crises and call for corrective measures to calm down market's ardour and potential to generate imbalances.

Financial instability and financialisation

Minsky (1982, p. 66) states that in a private debt-financing economy instability is an endogenous feature since serious business cycles are due to the financial attributes that are essential to capitalism: "the fundamental instability of a capitalist economy is upward. The tendency to transform doing well into a speculative investment boom is the basic instability in a capitalist economy".

This idea follows Keynes' Chapter 12 of *The General Theory* where the development of the exchange market is assumed to be mainly relying on speculation that often results in instability: "When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done" (Keynes, 1936, p. 159).

This "Financial Instability Hypothesis" (FIH), developed by Minsky, is very close to Polanyi's disembedded economy analysis where capitalist evolution may destroy the sustainability of the social environment through its incentive-mechanism, the accumulation process (Polanyi, 1944). Therefore, the principle of entropy may enter into the picture as "Economic activity cannot create energy and thus produces negentropy. In essence, it destroys environmental resources and biodiversity" (O'Hara, 2007, p. 31). Here are some of the consequences of the inability of market mechanisms to operate in a stable path of evolution. This would require public interventions to counterbalance the tendency of individual behaviours to generate systemic crises. This propensity to generate endogenously instability is exacerbated through the financialisation process that major market economies experienced during the last four decades, displaying some features of Minsky's FIH. Indeed, the financialisation of capitalist economies from the 1980s onwards rested on the transformation of the capital development into a by-product of casino-like activities that developed on financial efficiency criteria seeking rapid speculative rents.

Financialisation can be identified as the evolution of economies when financial relations and aims become increasingly important and dictate how decisions should be assessed as efficient choices over the whole economy. This results in the implementation of short-sighted financial efficiency criteria[4] as the best way of improving the economy's performances. Then the money manager capitalism of Minsky (Minsky, 1991; Wray, 2009) can emerge through complex new financial vehicles. Epstein (2005, p. 5) argues that some of the effects of financialisation "in concert with neo-liberalism and globalization – have been highly detrimental to significant numbers of people around the globe". Such a process resulted in a worldwide catastrophe

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in 2007–2008 (henceforth "the crisis"), "the worst in modern history" (Bernanke, 2010), that began in the United States and then spread to the entire planet. This turmoil continues to threaten, 12 years later in 2020, the viability of globalised and interdependent economies.

This crisis obviously challenges the efficient financial market ideology (Lepper, 2011) and liberal financial regulation, still in force in major advanced and emerging market economies. Financialisation is a systemic result of the implementation of market individualist ideology that resulted in the worldwide catastrophe (Hodgson, 2009). At the roots was the belief that liberalised market mechanisms could not only allocate resources efficiently, but also redistribute risks among those better prepared to bear them. Not only the international organisations but also scholars and policy-makers did share the same belief: the "good" institutions should be market-friendly, and private-interests-incentive mechanisms could contain self-adjusting dynamics. Numerous works draw attention to the possible consequences of such an evolution over the real economy and point to various analytical weaknesses that played a role in the failure to identify risks and give clear warnings. To point to the weaknesses of this approach, Galbraith (2008, p. 5) maintains that nothing in this consensus could lead to a correct and relevant anticipation of the ongoing financial crisis since what one could find in this approach is: "a resolute, dogmatic, absolutist belief that monetary policy should not – should never – concern itself with such problems". Indeed, the irrelevance of such a synthesis stems from the fact that it cannot allow questions about financial instability since it does not allow questions about booms and busts, about insolvency and illiquidity to be asked (Buiter, 2009).

The Independent Evaluation Office of the International Monetary Fund (2011, p. 17) states that:

> The prevailing view among IMF staff – a cohesive group of macroeconomists – was that market discipline and self-regulation would be sufficient to stave off serious problems in financial institutions. They also believed that crises were unlikely to happen in advanced economies, where "sophisticated" financial markets could thrive safely with minimal regulation of a large and growing portion of the financial system.

Minsky (1991, p. 17) underlines the fragile working of liberalised markets that evolve through subjective transformation of uncertainty into mere risk calculations:

> The way markets price capital and financial assets often reflects an heroic assumption that the unknowable can be known: that propositions about fundamentally uncertain situations can be derived by assuming that what happens can be viewed as if it is a sample from a well-defined probability distribution.

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As Keynes (1936) remarks, that it is mass psychology which allows individuals to take heroic decisions and then enter into fragile financial positions. But this heroism develops on financial markets in an uncertain world which are fundamentally precarious: "Day-to-day fluctuations in the profits of existing investments, which are obviously of an ephemeral and non-significant character, tend to have an altogether excessive, and even an absurd, on the market" (ibid., pp. 153–154). Harvey (2010, p. 4) states then that such behaviour "while this enables economic activity to take place despite uncertainty, it also inspires agents to anticipate increasingly favourable economic outcomes in times of plenty", contributing to increase fragilities and preparing the roots of the future instability.

The environment in which the current crisis occurred is partly the outcome of some regulatory changes supported by the New Classical/New Keynesian synthesis (Arestis, 2009; Buiter, 2009). This synthesis theoretically relies on the assumption that free markets are globally self-stabilising without restrictive exogenous public intervention and active monetary and financial policies (Ülgen, 2017). Greenspan (1997) assumes, for instance, that detailed rules and standards have become both burdensome and ineffective, if not counterproductive. He then asserts that a consistent regulatory rule must be to make that effective risk management systems are in place in the private sector (accountability, compliance and disclosure of information) in order to foster financial innovation without imposing rules that inhibit it. Such a perspective gained strength and became a common ground of agreement among policy-makers in major capitalist economies.

Liberal regulation as a crisis generator

The regulatory structure that frames the behaviour of economic units plays a crucial role in economic evolution. The way of functioning of markets is determined by the way financial systems are organised by the authorities of regulation. The regulatory framework provides markets and agents with collective rules and means of acceptable actions in order to maintain separate individual strategies within a viability zone. The very issue is to find the right way (e.g. a relevant way with regard to the objectives and consistent with regard to the constraints and capabilities) to make decentralised private actors' plans compatible with systemic stability of society within which these plans could be built up and implemented.

In major market economies, regulatory reforms were designed and implemented in favour of a loose regulation of financial markets from the 1980s with a large retreat of public supervisors from macro-prudential mechanisms for the benefit of the models of self-regulation of markets[5]. This resulted in a sharp reduction of the public regulatory power over the financial markets (Hake, 2005; Wray, 2011). Such an evolution of financial systems during the last decades was a conscious and voluntary institutional orientation resting on the hypothesis of financial market efficiency. The dominant approach

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of regulation assumes that self-control mechanisms can globally ensure the stability of financial systems and maintains that the individual safety of banks and financial institutions at the micro level is the major concern with regard to systemic stability. Therefore, it is argued that if relevant micro-prudential measures can be framed, markets would not require restrictive public supervision. This (dominant) liberal regulatory approach builds systemic stability on individual risk instruments through the mechanisms of self-control. This phenomenon, also called the deregulation process, is actually a specific liberal financial regulation that reframed the working conditions and incentive-mechanisms of markets.[6]

Such a process failed to result in a more stable and time-consistent financial system able to answer to the needs of the real economy. The crisis pointed to the weaknesses of micro-prudential and market mechanisms-related regulatory framework. Several concerns can be pointed out in such an approach. We will only develop a few of them specifically related to the limits of micro-rationality with regard to systemic stability.

One of the analytic explanations of the malfunctioning of the market-based regulation models is that these models rely on the assumptions that the decisions and actions of decentralised units (e.g. micro-rational strategies) would result in social harmony (the so-called Pareto-optimum), thanks to the self-adjustment capacity of market mechanisms (usually summarised by the encounters between private individuals' supply and demand through market prices)[7]. However, there is a crucial difference between micro-rationality and macro-stability. The former is limited as it is based on private information about the microeconomic environment while macroeconomic stability seeks at assessing the situation of the whole system and then to evaluate its possible deviation from the sustainability/viability range through time. In this sense, microeconomic rationality-based behaviour transforms, in the private decision process, the Knightian authentic uncertainty into risk though this does not reduce the potential systemic instability at a macroeconomic level. In the absence of macro regulation there is no other mechanism that could prevent decentralised private decisions from resulting in a general crisis. The macro-regulatory structure lies in a specific institutional structure built on some collective principles aimed at the sustainable reproduction of the economic system. Liberal regulation ignores, by its own logic, the missing bridge between micro-coverage of risks and systemic stability concerns, skipping parts of necessary prevention-based prudential policies.

Another point of interest is the cognitive bias (Janis, 1982) which is the tendency among homogeneous, cohesive groups to consider issues only within a certain paradigm and not challenge its basic premises. This can be related to what Akerlof and Dickens (1982) call the *cognitive dissonance* such that people who are able to exercise some choice about belief given available information can also manipulate their own beliefs by selecting sources of information likely to confirm "desired" beliefs. Economic actors usually believe that their speculative strategies are safe, but in this line, they do not experience the

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unpleasant feelings of constant fear or unsettling doubts about how wise it was to take such dangerous direction. When they convince themselves their decisions are safe, they potentially make judgement errors due to the discrepancy between their beliefs and the true state of the world. But at the individual (microeconomic) level the true state of the world (e.g. the systemic macro situation) cannot be observed but *a posteriori*. One may also add to this picture of human decision complexity the *planning fallacy* such that the market players (the insiders) are inclined to assume that they are always right and overestimate their ability to overcome obstacles and neglect to look at contingencies that are opposite or contrary to their beliefs (Kahneman, 2011).

Such a complex decision process may obviously generate macular degeneration that is permitted by the absence of collective constraints and lack of social reference. The result is a new regime of (financial) accumulation that generates speculation-oriented financial products and processes and transforms financing relations into Ponzi schemes (Minsky, 1982, 1986b, 1992). In the period before the crisis, the economy turned out to a bubble environment based on real-estate-related debt leveraging in search of capital gains: "The annual rise in land prices has far outstripped growth in national income since the late 1960s, becoming the driving force in today's financialised mode of 'wealth creation'" (Hudson, 2010, p. 4). The regime of accumulation therefore moved towards more short-term criteria. Financial operations, and new products and processes were directed towards speculative opportunities that became the main helm of not only the private decisions but also public policies. This evolution was obviously related to a specific institutional environment that allowed actors and markets, and especially banks, to adopt fragile strategies. With the financial liberalisation-liberal regulation in financial markets, banks were more incited to enter into competition for the collection of deposits by offering higher interest rates to the expenses, often, of their balance-sheet stability and thus entered into excessively optimistic and short-sighted positions by financing holding companies' LBO operations without questioning their financial and economic soundness at the long-run. Obviously, accompanied by the limited liability of banks in the (de)regulatory system, such a situation creates an environment dominated by the moral hazard; the highly risky investments – the cost of bankruptcy of which is partially transferable on public funds – becoming more attractive.

Ahearne et al. (2005) then remark that:

> Financial deregulation has often been pointed to as a possible culprit for the large run-up in house prices experienced by many countries in the late 1980s. Indeed, (…) in the 1980s a large portion of the countries in our sample experienced some sort of mortgage market deregulation. By the end of the 1980s, most constraints in most industrial countries had been lifted. Much of the deregulation eased constraints on household

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> borrowing. In the United Kingdom, the United States, France, Canada, and Denmark, the deregulation increased the pool of potential lenders by lifting constraints on eligible lenders. In Australia, Denmark, Finland, Japan, Sweden, and the United States, removing the regulations pertaining to the interest rates paid by borrowers and the interest rates paid to lenders increased the willingness and ability of borrowers and lenders to arrange mortgages. These changes may also have boosted competition in the lending market as financial institutions sought to establish or protect market share.

In a similar way, the *Special Report on Regulatory Reform* of the US Congress (2009, p. 10) documents that unregulated and weakly regulated financial markets have historically shown a tendency towards excessive risk taking and instability. The reasons for this are many:

> To begin with, financial actors do not always bear the full consequences of their decisions and therefore are liable to take (or impose) more risk than would otherwise seem reasonable. For example, financial institutions generally invest other people's money and often enjoy asymmetric compensation incentives, which reward them for gains without penalizing them for losses. Even more troubling, the failure of a large financial firm can have systemic consequences, potentially triggering a cascade of losses, which means that risk taking by the firm can impose costs far beyond its own shareholders, creditors, and counterparties. The freezing up of the credit markets in 2008–09, because even healthy banks are afraid to lend, is an especially serious example of this phenomenon.

Therefore, in the aftermath of the crisis, Bernanke (2010) asks what policy implications should we draw. Bernanke argues:

> … the best response to the housing bubble would have been regulatory, not monetary. Stronger regulation and supervision aimed at problems with underwriting practices and lenders' risk management would have been a more effective and surgical approach to constraining the housing bubble than a general increase in interest rates.

In this vein, it is maintained that the roots of the crisis mainly rest on the institutional regulatory structure of financialised capitalism. Economic instability is a result of cumulative euphoric expectations in the absence of consistent institutional-policy framework. Dugger (2005) states that a market is the result of collective action backed by the state. The role that policy-makers play in market economies should be reconsidered with the aim of strengthening the resilience of macroeconomic structures to possible negative consequences of private micro decisions.

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Gift-economics: elements for an alternative regulatory framework?

Financial regulation after the crisis: some directions

In the aftermath of the crisis, scholars as well as central bankers called for a necessary "revision" of financial regulation and maintained that a more macro-prudential approach would be suitable to strengthen financial stability. However, after more than one decade of reforms, relevant regulatory structures are not in place to ensure the systemic resilience of banks and financial markets:

> eight years after the passage of Dodd–Frank, and nearly a decade after the banking agencies began to work on stronger capital and liquidity regulation, the new regulatory framework in place is still not completed, with numerous proposed regulations not having been finalized.
>
> (Tarullo, 2019, p. 70)

Major remarks that are brought forth are mainly related to increasing debt positions and the persistency of risky practices that feed vulnerabilities while an appropriate regulation of liquidity and short-term finance is still not in place (Tarullo, ibid., p. 62). Tarullo (ibid., pp. 70–71) also argues that the relative resilience that large banks recovered during the last years thanks to new regulatory measures does not rest on long-term sustainable change and may become degraded over time. It is worth noting that while US Congress legislated some changes to the Dodd–Frank Act in early 2018 that eliminated regulatory requirements for small- and mid-sized banks, the banking agencies have moved towards relaxing regulation for the largest banks as well. Tarullo (ibid., p. 71) reports that these agencies have proposed reductions in the leverage ratio surcharge for the eight banks designated as being of global systemic importance and effective reduction in capital requirements for the three "super-regional" banks. Tarullo (ibid., p. 70) then maintains that: "The future degradation of the resiliency of large banking organizations is by no means foreordained…".

Moreover, Clark and Large (2011, p. 25) insist that sources of systemic financial vulnerability that stem from unsustainable evolution in financial aggregates over time still reinforce an unstable pattern of financial exposures, and structural weaknesses. Even though some significant progress has been made in the field of bank capital and liquidity regulation during the last decades, new sources of risk are emerging. Financial innovations keep on developing also outside the perimeter of regulated banking organisations; notably from forms of shadow banking, and new financial instruments, practices and forms of business activity may become the impetus for another crisis (Tarullo, ibid., p. 63).

It is worth noting that technologies and financial market participants are transforming, and this can lead to new risks: "Technology is transforming the

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payments and banking industry and, together with opportunities, it brings with it new risks" (Saporta, 2018, p. 8). In addition, market participants trying to reduce the cost of regulation change their behaviour and adapt to regulation. Therefore, "core capital and liquidity regulations need continual refinement, both to combat arbitrage efforts by the banks and to adapt to new financial products and conditions" (Tarullo, ibid., p. 70). Monitoring the creation and development of new instruments and the emergence of new forms of business activity can give important clues to potential sources of risk. From this perspective, the macro-prudential approach should seek to identify systemic vulnerabilities and sources of risk. It is important to maintain the results achieved in reducing the risks of the banking sector while it is clear that the regulation approach should be system-wide. An important feature of macro-prudential regulation is to fix the rules in normative legal acts in order to make their implementation mandatory for financial system participants.

Various tools are currently being used to prevent future financial crisis, smooth the financial cycle and mitigate the effects of the financial crisis. Risk-weighted requirements, minimum capital ratios, stress tests, tail risks, etc., can lead to identify globally and systemically important banks: "Three significant accomplishments seem reasonably apparent: tiering of bank regulations by size of institution, greater financial resiliency for bank-related financial institutions, and movement toward an orderly resolution mechanism for failing banks" (Tarullo, ibid., p. 64). From this perspective, Saporta (ibid., p. 12) notes that "horizon scanning draws on supervisory and market intelligence, macroeconomic analysis, and thematic analysis of trends in key financial markets".

The use of such tools has contributed to the increase in financial system's stability. Saporta (2018, p. 4) reports, for instance, that: "UK banks' buffers of liquid assets have increased by over 40 percent since 2010". Tarullo (ibid., p. 64) argues that

> the post-crisis regulatory regime has led to a dramatic increase in the resiliency of the prudentially regulated part of the financial system, as measured by (1) the quality and quantity of capital both required and actually maintained by banks; (2) the greater stability of funding sources for banks; and (3) the risk management capacities and practices of banks.

When making adjustments of regulation in response to emerging risks, it is important to remember the main goal of the reforms and verify compliance with this goal: "It is important to remember the aim of these reforms. Their aim was to reduce excessive variability of banks' risk-weighted assets, and in doing so making banks' risk-based capital ratios more transparent and comparable" (Saporta, ibid., p. 4). The selection and implementation of an appropriate tool is an important foundation for successful macro-prudential policies. However, it is important to understand that the financial environment is actively changing and new sources of risks arise. Therefore, it is important to

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adapt the tools to current conditions: "It is by making dynamic adjustments that we can ensure the regulatory framework continues to deliver on the reforms' objectives and ensures that the resilience that policy makers injected into the system post-crisis endures" (Saporta, ibid., p. 9). [8]

To implement successful macro-prudential policy, institutions are needed:

> Macroprudential regulation advocates were able to present practical policy proposals that promised to limit future potential market losses, to reduce future calls on public finances and to minimise the loss to macroeconomic output that came with episodes of financial distress. This increased the appeal of these ideas to both public and private sector representatives.
>
> (Baker, 2013, p. 18)

It is clear that a successful framework requires the input and engagement of a number of institutions, with a shared objective of delivering financial stability.[9]

An interesting question is to consider the possibility of imagining an institutional regulatory framework based on the rules of gift-economics in that the latter is based on social constraints that would act as social institutions and link individual choices to societal constraints and choices required for the social recognition of each community member.

Institutions and gift-economics

The research on financial regulation points to the crucial role of the institutional framework but also to the micro-macro relationship and the coherence between micro-rationality and macro-systemic results. Such an opposition is one of the issues studied within the alternative monetary models of capitalism that bring forth endogenous instability of capitalist finance. From this perspective, Iwai (2010, pp. 6–7) argues:

> The key point here is that bubbles and busts look totally irrational at the macroscopic level. Yet the behaviour of individual speculators – buying when they expect prices to rise and selling when they expect them to fall – is perfectly rational on the individual level, and indeed profitable – at least in the short term. Contrary to Milton Friedman's claim, macroscopic irrationality is not necessarily a reflection of individual irrationalities but often an unintended aggregate outcome of individual rationalities.

This "natural feature" of a capitalist economy, the "fallacy of composition" that Iwai terms "the paradox of rationality", is accentuated by the financialisation of economic society since the development of financial markets increase the speed and scale of operations that reinforce the speculative character of rational economic strategies of individuals. In a 2000 book published

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in Japanese (quoted in Miyazaki, 2013, p. 134), Iwai argues that in a market economy, each individual who produces, consumes and exchanges is naturally a speculator and such behaviour should involve the economy in recurrent crises. A relevant question is therefore: could the use of gift-rules through reciprocity that is mainly resting on societal constraints and that should aim at strengthening macro-stability be a possible direction to make both sides of financial regulation, micro and macro, consistent with each other?

To answer this question one should fix the role of institutions in the organisation of markets. Whatever the (many) shades of capitalism, in economics, markets are considered as an environment (price mechanisms, competition rules, private property and individualistic values) that could lead separate individuals to enter into economic and social transactions in a coherent manner while institutions are usually regarded as social-constraint-structures that are given and aiming at supporting/improving/correcting market transactions (Baumol et al., 2007; Hall and Soskice, 2001, to quote but a few).

Institutions provide the frame in which society evolves in a consistent and "rational" direction. In this, institutions contribute to shape the operating way of societies. Neale (1987, p. 1180) states that institutions "allow people to act with a high degree of confidence in their expectations of how other people will respond to their actions, and that allow other people to interpret actions and to respond intelligently". From this perspective, institutions are the framework that contains written and unwritten rules[10] that should allow a given social group to function in a "normal" and predictable way. Group members would then be enabled to adopt behaviours that would more likely be consistent with each other. This could lead members of society to avoid conflict situations that could provoke crises and challenge the values and references that constitute the societal cement. Consequently, the analysis of economic relations among decentralised individuals is the analysis of an "instituted economy in evolution" (e.g. system-consistent institutional development). Gift-rules, as extra-individual rules, imposed to market participants have then to be fixed on an institutional framework in order to give a consistency with the characteristics of large capitalist societies. Such an assertion might be related to the distinction developed by F. Tönnies (see Cahnman, 1995, for a comprehensive presentation), between *Community and Society (Gemeinschaft and Gesellschaft)*. In large societies, relations are usually more anonymous than in small ones. Therefore, the implementation of gift-engagements between parties seems to be more problematic in large societies since the relevant obligation-scheme is more complex to be framed and to be supervised.[11]

Rooted in the history of "archaic" societies, a gift-based social relationship is usually considered in opposition to market-based individualistic (utilitarian) relationship of capitalist societies. The latter is regarded in terms of individualistic self-interest based on formal contracting while the former is seen as a matter of social informal trust mechanisms that would lie in more holistic dynamics than the individualistic rationality of homo-oeconomicus

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(Eisenberg, 1997; Van de Velde, 2003). The market relationship, the so-called commodity exchange schema, rests on the "invisible glue" of the market mechanisms (seeking personal and exclusive alienable wealth accumulation), while the gift stands for moral and collective concerns (with social and inalienable characteristics) which survive after the exchange (Lapavitsas, 2002)[12].

In economics, gift-giving is also studied as a theory of the voluntary public and private redistribution of wealth (Mercier Ythier, 2006). The central object of the theory is altruistic gift-giving, construed as benevolent voluntary redistribution. However, from the perspective of economics, the scope of a gift-economy is much larger since it could be used as an alternative guide for the financial system's organisation as the latter is assumed to be a societal concern determining its domain of viability and not a mere market for some payment services.

In the tradition of Sahlins (1972), the gift allows us to regard the economy as a category of culture and politics related to the material life process of society. In the tradition of Mauss (1954), the threefold social obligation that characterises a gift-exchange[13] enforces the community through some social obligations and can be seen as a source of the formation of social capital (Dolfsma et al., 2008) that might improve social cohesion and strengthen commitments in market exchange relations. Bell (1991) argues that market relations can be embedded in a more general gift-giving schema since they could be thought of as a special (more individualistic) case of social relations globally backed by giving rules.

These different perspectives could improve our understanding of the dynamics of a capitalist economy and its possible viability interval through *societal reforms for market design*. The latter requires some stabilisation rules and tools at a societal level in order to deal with recurrent systemic crises, and then might benefit from the implementation of the reciprocity rule of gift-exchange in market relations. *Therefore, a restatement of the characteristics of a gift relation and its possible implementation as a systemic stabilizer within a capitalist financial framework becomes a relevant issue in search for an alternative financial regulation and supervision system*. This could lead to create a more holistic and comprehensive regulatory framework that could regard the strategies of market actors as the result of complex behavioural phenomena that develop through uncertainty and out of any social optimum that could be previously given by a perfect market equilibrium mechanism. Indeed, the gift relation can be seen as a source of social capital formation, a social infrastructure "which represents shared meanings and interpretations" (Dolfsma et al., 2009, p. 317) that could be used by individuals and groups in a way "that can facilitate an individual or collective action not otherwise possible" (ibid.). Gift-rules might then be regarded as socially recognised means that have the power to transfer, between individuals, between individuals and society and between groups within a given society personal utility as well as social values embedded (and then accepted) in a social structure. Although gifts could be thought of as a unilateral transfer (*I give you something for nothing*, beyond the utilitarian

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perspective), one might argue that in any exchange relation, exchange should entail reciprocal transfers (*I give you something and something else comes back from you to me*). Rose (1992) shows that the potlatch relationship could be regarded as a form of insurance, a kind of revolving exchange relationship since:

> the kin-group with the most successful annual catch gives away wealth in a kind of rough circle of reciprocity, so that all kin-groups were assured that they would not go hungry in a year of bad luck – though in return, they had given away a great deal during their own lucky years.
>
> (Rose, 1992, p. 299)

Sahlins (1972, p. 150), quoting Mauss, states that the social link is given by "the hau" according to the rule of "giving and receiving in a reciprocal way" in order to fill the common (universal, objective, societal?) obligation of mutual respect of things and values, be they socially or individually evaluated:

> Meanwhile, the Maori hau is raised to the status of a general explanation: the prototypical principal of reciprocity in Melanesia, Polynesia and the American northwest coast, the binding quality of the Roman tradition, the key to gifts of cattle in Hindu India – "What you are, I am; become on this day of your essence, in giving you I give myself"
>
> (Mauss, p. 248, quoted in Sahlins, ibid.)

Indeed, Mauss (1954, p. 14) gives an interpretation of the hau, the spirit of things that might belong to people as private property. In the giving process between individuals within society, the hau is contained in each article given and must be returned back to each person through time. In other case, serious harm might befall individuals who do not respect this "equivalence through given things". Things given between individuals must respect (at least) a recognised equivalence; this equivalence might be an expected social value of the things received or to be received; such an expectation offers the link between the present and the future for the parties and gives the engagement its time-consistency.[14]

In the Preface to Mauss's *Gift*, Douglas (2002, p. xi) maintains that in a gift-giving network the whole society can be described by the catalogue of transfers that maps all the obligations between its members such that the cycling gift system can be regarded as the society:

> The potlatch is an example of a total system of giving. Read this too fast and you miss the meaning. Spelt out it means that each gift is part of a system of reciprocity in which the honour of giver and recipient are engaged. It is a total system in that every item of status or of spiritual or material possession is implicated for everyone in the whole community. The system is quite simple; just the rule that every gift has to be returned in some specified way sets up a perpetual cycle of exchanges within and

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> between generations. In some cases the specified return is of equal value, producing a stable system of statuses; in others it must exceed the value of the earlier gift, producing an escalating contest for honour.[15]

From this perspective, one might argue with Douglas that the gift cycle echoes Adam Smith's invisible hand since gift-rules could complement market relations especially when market mechanisms reveal to be weak to ensure the viability of social relations:

> being more directly cued to public esteem, the distribution of honour, and the sanctions of religion, the gift economy is more visible than the market. Just by being visible, the resultant distribution of goods and services is more readily subject to public scrutiny and judgements of fairness than are the results of market exchange. In operating a gift system a people are more aware of what they are doing, as shown by the sacralization of their institutions of giving. Mauss's fertile idea was to present the gift cycle as a theoretical counterpart to the invisible hand.
>
> (ibid., p. xviii).[16]

If one follows Mauss's emphasis on the contractual obligation to reciprocate gift – although gift-giving is not entirely touched by the quantitative equivalence relation of the market between two exchanged things – one could interpret credit relations among enterprises as a specific gift-transaction in a broader sense. As Lapavitsas (2002) argues, in a capitalist economy, enterprises are connected in many production and trade links that create different relations between sellers and buyers, and along with trade credit (a trust relationship between the creditors and debtors) that leads to continuous economic activities. Lapatvitsas (ibid., p. 13) then maintains that, on the one hand:

> …trade credit tends to emerge among enterprises connected in chains of business that derive from the use value of products and entail frequent buying and selling among participants. Without non-market relations among enterprises, trade credit and its instruments, markets and institutions would be largely impossible.

But, it is worth noting that, on the other hand, once the mechanisms of credit are in place, all the non-market relations (such as trust, commitment and moral obligation among parties) are affected: "For this reason, the trust that underpins capitalist credit relations is profoundly noxious and always likely to turn into outright fraud" (Lapavitsas, ibid.).

Therefore, it should be noted that the logic of gift cannot be reduced to disinterestedness or altruism, or to individualistic and egoist calculation. It seems to be a more complex social phenomenon such that formal contracting is possible with a background of informal trust and values (the "gift

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component of social life". Van de Velde, 2003, p. 100). There is a kind of mix of values, although not formally describable, going from informal and internal rules to more formal and external statements. In the Durkheimian words, one could assert that formal agreements are only the most visible part of the social iceberg of a set of informal norms, traditions, conventions, etc.

The rationale for the intervention of a non-market societal organisation within the framework of financial markets' regulation rests on the assertion that decentralised and separate individual decisions and strategies cannot ensure a minimal systemic coherence to make society viable through time without any societal constrained framework. In other words, a global equilibrium (or more accurately a globally satisfying viable system) requires a common society-wide organisation of rules and their supervision in a preventive way.

A brief enquiry into gift-relying regulation

Several aspects of gift-economics could be used in order to design financial regulatory rules.

Following Malinowski's and Mauss's extensions of the gift category from the gift to the contract, Miyazaki (2013, p. 149) suggests some extension between arbitrage and gift from a perspective of the anthropology of finance and regards the gift "as an almost eternal point of return and an inexhaustible source of theoretical inspiration and associated humanism, the extensibility of arbitrage lets arbitrage evaporate along with the kind of faith required to recognize its possibility" and argues that

> there is a sense of possibility in re-appreciating the kind of excitement entailed in the logics of finance and their extensibility as a locus of slight expansion of thinking, imagination, and humanity despite all the nightmares such excitement often ends up producing.
>
> (Ibid., p. 150)

Miyazaki then states that such a "broadened" view of finance can also enable dialogue between traders and regulators.

In this section, we seek to look at the issue from a slightly different angle, linked to a holistic stance and based on reciprocity in terms of common rules that should be imposed on the market participants in order to enhance the consistency of their separate actions with overall systemic stability. Could such a view be linked to the holistic analysis developed by Tett (2015) in terms of "blindness to our own blindness", requiring external collective action that could be based on societal constraints gathered around the perspective of the gift-economy. Going beyond the usual opposition between regulation and liberalisation, between regulators and regulatees, between micro-rational individuals and macro-stability-seeking policy-makers, and then breaking out of silos, we suggest some regulatory rules that could use reciprocity as a relevant collective action tool. These rules rest on the assumption that in a large

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and complex (monetary) capitalist society reciprocity cannot be spontaneously and voluntarily internalised by private profit-seeking players and must be part of a system-wide regulatory framework, organised and supervised through collective action institutions. In other words, reciprocity cannot be ensured in a "natural" way through the so-called market discipline and market incentives that would push individuals to adopt strategies according to society's wishes expressed in the rules of reciprocity. The reason is obvious: capitalism is mainly resting on selfish micro-decision units that seek to achieve private performance in an individualistic way (e.g. capital accumulation).[17] These decision-making units have no way of knowing for sure that if they adopt altruistic strategies they could get back more gain (the so-called Smithian invisible hand reflex). In other words, in a non-cooperative environment, there is no generalisable Pareto-optimal equilibrium and individuals must seek partial and imperfect results for themselves without being able to have control over the whole. This situation often leads to opportunistic behaviour that undermines trust between individuals and then harms collective stability and individual optimum. This implies that while reciprocity can provide some stability, it must be organised by a visible hand through collective action. For instance, Lapavitsas (2002, p. 13) notes that "Extensive institutional mechanisms are necessary to police the edifice of promise and counter-promise that comprises the capitalist credit system".

Reciprocity, as a social rule, could keep separate individuals within societal constraints under the implicit threat of being rejected or not being recognised by the community (whether it is a professional community of monetary interests or a collective community of interests related to status, social recognition, etc.). The gift-rules-based complexity of economic structure might lead to some distinctions between micro-prudential regulation and macro-prudential regulation. Micro-prudential regulation is usually based on the assertion that each individual unit will be aware of the consequences of her/his strategies and will engage in safest strategies to reduce the risk of failure since her/his aim consists in realising high gains. Individuals are therefore concerned with factors that affect their own stability through self-monitoring and legal incentives to ensure regular disclosure and accountability, and rating agencies and banks' own IRB (Internal Ratings Based) models. However, these tools inevitably provoke conflict of interest issues (Crockett et al. 2003; King et al. 2012). Thompson defines conflict of interest as "a set of conditions in which professional judgment concerning a primary interest (such as patient's welfare or the validity of research) is unduly influenced by a secondary interest (such as financial gain)"[18] while Davis (1982, p. 21) brings forth the concept of "judgment" to elaborate a general definition of a conflict of interest:

> A person has a conflict of interest if (a) he is in a relationship with another requiring him to exercise judgment in that other's service and (b) he has an interest tending to interfere with the proper exercise of judgment in that relationship.

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In market-related self-regulation systems, conflict of interest is a real concern that arises when the regulator and the regulatee are not well separated from each other. The confusion between these two sides of the process is a common feature of liberal regulation through the rating agencies and IRB mechanisms.

Whatever the supervision mechanisms implemented by public authorities over micro decision units, in a micro-prudential schema the incentives fail to prevent short-sighted individual behaviour which often develops macular degeneration reflecting the very limited horizon of decentralised private expectations and subsequent actions. For instance, the problem of macular degeneration is permitted by the absence of a collective constraint that might be provided by a gift-rule-based anchor. If one can assume that a major gift-rule is reciprocity and respect of mutual engagements, then, the preference order in market decisions of individual actors would not be anymore "First, my interest, second possible nice results for society".[19] In other words, such an alternative organisation would not rest on the Smithian ad hoc hypothesis of the egoist butcher who would finally serve society only by seeking his own profit. There is no direct link between micro-interests and social coherence or invisible hand that would incentivise the butcher to supply the best meat to satisfy his client and get back maximum profits. Furthermore, in a money-based capitalist economy, "money primes individualism: a reluctance to be involved with others, to depend on others, or to accept demand from others" (Kahneman, 2011, p. 55). Since reciprocity requires a reciprocal/mutual respect along with individual objectives, it cannot be generated through market relations. The logic of reciprocity is in an opposite way to market transactions: "Serving community would give me my personal interest thanks to stability and this interest is closely related to the respect for others and myself". Implemented in the financial area, this could prevent society-wide financialisation by directing markets through another regime of accumulation that would not generate speculation-oriented financial products and processes, and transform financing relations into Ponzi schemes (Minsky, 1982, 1986b, 1992). Therefore, the inclusion of the reciprocity rule into market exchange relations might contribute to ensure stability.

Limiting the high-risk operations of financial institutions in order to maintain stability on the basis of general rules is a necessary direction is an alternative regulatory model. This essentially means that the institutions do not receive part of the profit that is transferred to other participants of economic relations in the process of redistribution in order to reduce incentives to undertake speculative activities. Another rule might be more explicitly linked to reciprocity. For instance, reciprocity means you cannot save face if you do not fulfil societal duties (that may be more important than individual interests since "face" means a combination of reputation, honour, dignity, respect, social standing, etc.). Therefore, one of the measures to be included within the financial stability framework could be the interdiction for a failed institution (or person) to undertake similar activities during the next "x" years after the

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failure if the latter is proved to be due to "collectively irresponsible" (but, maybe, individually rational) strategies. However, this would require some changes in financial regulation and the legal framework according to a set of preannounced social objectives and duties.

The ambivalent nature of money, private and public as mentioned above, is linked both to specific constraints to allow market relations to be developed in a sustainable way. With regard to the private relations, respecting some implicit/explicit accepted standards of behaviour and the rules of good conduct between the parties of a given contract must be observed as an ethical obligation (since in a private property-based society, the respect of the property of a person is a core ethical rule). With regard to the public infrastructure, legal constraints and limitations to individual interests exist in order to prevent individual decisions from generating social crises. For example, the obligation to repay a debt is not only a legal constraint but also an ethical commitment if the debtor expects to remain included in social market relations. However, it is clear that the will and the actual way of doing things may not be compatible with each other.

One of the conclusions that one may draw from this analysis is that the power of reciprocity in an individualistic market society is not as strong as the social constraints and reciprocity that could be in force in a traditional society if it is not resting on collectively imposed formal regulatory rules. *Concerns about the implementation of gift-economy rules in a capitalist society are very similar to the difficulties of effectively considering a self-regulatory framework linked to market-mechanisms through the rule of transparency, disclosure and the so-called market discipline* (the usual arguments of liberal regulation). In a decentralised economy, individuals cannot take into account the systemic instability concerns that are beyond their capacity and will. These concerns must be addressed towards collective rules and principles. The problem endemic to financial markets is that individual borrowers and investors may not always be ideally positioned to evaluate complex risks. To cope with such destabilising evolution and its destructive consequences, the redesign of the regulatory framework is a *sine qua non* condition that requires more voluntarist policies aiming at framing financial markets supervision in a society-viability consistent way. Therefore, collective constraints-based macro-prudential regulation rules that might partly rest on gift-economy rules could be substituted to micro-regulation schemas as they concern themselves with factors that affect the financial system's stability as a whole (Brunnermeier et al., 2009). Macro-prudential regulation holds that micro-regulatory frameworks cannot address the systemic instability issues and take into account counter-cyclical and systemic needs to stabilise the whole economy. That calls for modifications of the institutional structure of financial markets. Stronger macro-prudential regulation framework should be designed instead of market-friendly supervisory approaches, and used to prevent short-sighted speculative activities to offer funds for productive activities, transforming the current crisis into a positive "renaissance opportunity". It seems that the so-called "primitive

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rules" of a gift-economy may offer us relevant reflections for a renewed way of thinking of our "modern" financial issues. The challenge is, we have to look for means to address it for institutional change.

Conclusion

This article sought to assess whether reciprocity as a gift-economics rule could provide a relevant institutional anchor that could offer a financial regulatory framework able to strengthen the working of financial markets and ensure systemic stabilisation of monetary economies. While the liberal private-interest based agenda tends to ignore the need for consistent embedded institutions, an institutional-evolutionary analysis brings out structural fragilities of the working of financialised capitalism and points to a necessary reframing of markets and institutions. Minsky (1986b, p. 281) maintains:

> If the disrupting effects of banking are to be constrained, the authorities must drop their blinders and accept the need to guide and control the evolution of financial usages and practices. In a world of businessmen and financial intermediaries who aggressively seek profit, innovators will always outpace regulators; the authorities cannot prevent changes in the structure of portfolios from occurring. What they can do is keep the asset-equity ratio of banks within bounds by setting equity-absorption ratios for various types of assets. If the authorities constrain banks and are aware of the activities of fringe banks and other financial institutions, they are in a better position to attenuate the disruptive expansionary tendencies of our economy.

Seemingly paradoxical (but logically natural if Minsky's "endogenous financial instability hypothesis", Iwai's "paradox of rationality" and Kahneman's "planning fallacy" are taken into account), the liberalisation of financial markets increases the need for public oversight since it results in a system-wide financialisation with continuous and permanent effects on the economy: "In a market-based financial system, banking and capital market developments are inseparable, and fluctuations in financial conditions have a far-reaching impact on the workings of the real economy" (Adrian and Shin, 2010, p. 5).

Therefore, a financial system's stability appears to be a general concern that should be considered at a macro level. For this aim, the rule of reciprocity seems to be a relevant source of reflection to provide an alternative model of financial market organisation. However, in a capitalist society, reciprocity needs to be resting on socially given collective rules. It should be relying on a specific financial regulation that should be framed according to a reciprocity-linked-societal-constraints schema that considers the complexity of human decisions (beyond some mere technical models) and strategies (beyond some simplistic optimum calculus). The necessary elaboration of a consistent financial regulatory framework should seek strengthening the trust among market

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actors but also between markets and society, and between markets and regulators. For this aim, regulation has to oblige market players to respect reciprocity in their market relations through macro-prudential constraints and incentives. In such a schema, reciprocity would play a holistic role beyond legal regulatory restrictions imposed by public authorities while its relevance would be closely related to the strength of those restrictions.

Notes

1 "Give as much you take, all shall be very well" or "My food basket and your food basket will please the people", a Maori *Whakataukī* (proverbe), quoted in Mauss (1954, p. 91). Mauss (Ibid.) precise, at the footnote 14 of Conclusion at page 189, that

> Rev. Taylor, *Te Ika a Maui. Old New Zealand,* p. 130, proverb 42, translates very briefly as "give as well as take and all will be right", but the literal translation is probably as follows: As much as Maru gives, so much Maru takes, and this is good, good. (Maru is the god of war and justice).

2 It is worth noting that in the Anthropology of finance literature, numerous seminal works are available on alternative analyses of financial instabilities in a capitalist economy (see, for instance, Miyazaki, 2013, for a comprehensive presentation on various analytic proposals on related topics). However, an institutionalist framework seeking to use reciprocity/gift-economics in a financial regulation framework is not yet available.

3 See Ülgen, 2013, for a general presentation of the payments system and related issues. The approach developed in this chapter is very close to the arguments developed by the "Modern Monetary Theory" approach. See Tymoigne and Wray, 2013.

4 stock market prices are usually observed as a proxy for this kind of criteria.

5 The debate on the "relevant" financial regulation is very close to the debate on the meaning of democracy since both are related to the same issue about the organisation of society and the role that individual actions and the so-called individual freedom could play within the societal framework with regard to the means and aims of society and its viability concerns. The so-called "third principle" on which democracy could rest, which would differ not only from market transactions but also from state bureaucracy, is a direction suggested by some works (Adloff, 2006). Universalistic politics of justice or recognition that could orient citizens towards the common good and not only act out of utilitarian calculations is one of the expected directions of social organisations.

6 Ülgen (2019, p. 491) defines deregulation as follows:

> Deregulation is an institutional transformation of the public regulation and supervision mechanisms into market-relying, self-regulation mechanisms. There is a retreat of restrictive public rules in order to reduce the constraining character of the supervision in force. This change mainly rests on the assumption that market forces are naturally self-adjusting. However, in most models, market mechanisms are supported by some public rules and laws and require public intervention in order to be re-enforceable and implemental. From this perspective, it might be more suitable to define the financial liberalization as a liberal regulation framework than a deregulation process.

7 See, among others, Ekelund and Hébert (1997) for a presentation of this view from the perspective of the history of economic theory.

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8 Saporta (ibid., p. 10) remarks that it is important to evaluate the cost and effect of regulation; however, quantifying financial stability is still a complex issue. Regulatory costs will often be easier to quantify than the financial stability and safety and soundness benefits. And depending on the case, we may need to look beyond the banking system to capture all of the costs and benefits. For instance, unintended consequences of bank regulation might be felt not in the banking sector but in financial markets, financial infrastructures and other parts of the financial system.

9 A further critical consideration is the compatibility of the macro-prudential objective with other economic and financial policy objectives. Given that macro-prudential policy interacts with a range of other policy areas, some tension is probably unavoidable both on the substance of policy and in interinstitutional (and conceivably interpersonal) relationships (Clark and Large, 2011, p. 10). This is most obviously a question in relation to monetary policy where, for example, pursuit of a macro-prudential credit-growth target or ceiling would be likely to have a bearing on the monetary transmission mechanism and on economic growth. But it also applies to other policy areas such as competition, consumer protection and, indeed, fiscal policy (Clark and Large, ibid., p. 13).

10 We will not discuss the respective effectiveness of written and unwritten rules. However, DeHart-Davis, Chen and Little (2013) argue that rule formalisation triggers greater thought and scrutiny about rule design than unwritten rules, and the written nature of formalised rules would convey their legitimacy in ways that unwritten rules cannot: "These possibilities present a paradox: while written organizational rules can be associated with organizational pathologies, they may be a more effective means of achieving managerial objectives than their unwritten counterparts because they are more logically designed and faithfully followed" (ibid., p. 332).

11 We owe this remark to one of the referees. Beyond the scope of this chapter, this issue is however, related to the problems of (ill)working of large, opened and liberalised financial markets that involve huge number of people within their operations without respect to living conditions of these populations that often suffer from the consequences of the crises generated by financial speculation.

12 However, Lapavitsas (ibid.) argues that the use of "commodity versus gift" as metaphor for "market versus non-market" relations in a capitalist society is misleading and the analysis of the interaction between market and non-market relations must be framed on the understanding of capital as a set of social relations in a Marxist political economy way.

13 Namely: giving, receiving and reciprocity.

14 Mauss (1954, p. 14) quotes an example on this issue:

> I will speak to you about the *hau*…The *hau* is not the wind that blows – not at all. Let us suppose that you possess a certain article (*taonga*) and that you give me this article. You give it me without setting a price on it. We strike no bargain about it. Now, I give this article to a third person who, after a certain lapse of time, decides to give me something as payment in return (*utu*). He makes a present to me of something (*taonga*). Now, this *taonga* that he gives me is the spirit (*hau*) of the *taonga* that I had received from you and that I had given to *him*. The *taonga* that I received for these *taonga* (which came from you) must be returned to you. It would not be fair (*tika*) on my part to keep these *taonga* for myself, whether they were desirable (*rawe*) or undesirable (*kino*). I must give them to you because they are a *hau* of the *taonga* that you gave me. If I kept this other *taonga* for myself, serious harm might befall me, even death. This is the nature of the *hau,* the *hau* of personal property, the *hau* of the *taonga,* the *hau* of the forest. *Kati ena* (But enough on this subject).

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15 Douglas (2002, pp. xiii–xiv) notes:

> The main strands in Durkheim's opposition to the English Utilitarians were already formulated by French political philosophers. As Larry Siedentrop summarizes a tradition that stemmed from the eighteenth century, from Rousseau and Tocqueville, it made three criticisms of English liberalism: first, that it was based on an impoverished concept of the person seen as an independent individual instead of as a social being; second, that it neglected how social relations change with changes in the mode of production; and third, that it had a too negative concept of liberty and so failed to appreciate the moral role of political participation. Furthermore, early English empiricist philosophy did not explain the role of social norms in shaping individual intentions and in making social action possible; their sensationalist model of the mind allowed no scope for explaining rule-governed action.
>
> (Ibid., pp. xiii–xiv)

16 Indeed, Mauss (1954, p. 17) states:

> It is easy to find many facts concerning the obligation to receive. For a clan, a household, a group of people, a guest, have no option but to ask for hospitality, to receive presents, to enter into trading, to contract alliances, through wives or blood kinship. The Dayaks have even developed a whole system of law and morality based upon the duty one has not to fail to share in the meal at which one is present or that one has seen in preparation. The obligation to give is no less important; a study of it might enable us to understand how people have become exchangers of goods and services. We can only point out a few facts. To refuse to give, to fail to invite, just as to refuse to accept, is tantamount to declaring war; it is to reject the bond of alliance and commonality. Also, one gives because one is compelled to do so, because the recipient possesses some kind of right of property over anything that belongs to the donor.

17 The modern economic theory is based on the assumption that the social organisation around decentralised market rules is the best structure, often called a market economy or a market society, since it would reach – in most efficient way – a social Pareto-optimum under specific competitive conditions. See the two fundamental welfare theorems for this assertion (Hammond, 1998).

18 Thompson, D. 1993. Understanding Financial Conflicts of Interest. *The New England Journal of Medicine*. **329**, pp. 573–576 (quoted in MacKenzie and Cronstein, 2006, p. 198).

19 In an individualistic society, this is rather limited to "I hope so, if possible, even if it's not my explicit intention".

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T&F Proofs – Not for Distribution

General Conclusion

This dissertation is devoted to the topic “Financial regulation in the midst of recurrent instability: toward macroprudential approaches to supervision”. The main question of the study is how can the effectiveness of macroprudential regulation be increased, taking into account the costs of such regulation and the potential for economic growth? To obtain a comprehensive answer to this question, we study the institutional structure of the MaP, the channels of spread of the financial crisis based on Minsky's theory of the endogenous nature of crises, early warning signal systems, approaches to their identification, and whether there can be alternative structures for maintaining financial stability.

First of all, we study the institutional framework of the MaP to understand how the effectiveness of the MaP can be increased. We analyze and systematize the institutional aspects of the MaP and come to the conclusion that it includes two main components - these are organizations/institutions that implement the MaP and the mechanisms by which the MaP is implemented. MaP can be implemented by various types of institutions: the Central Bank, the Government, their committees, or mixed structures. The results of the studied academic papers show that for the successful implementation of MaP it is necessary that the mandate for policy be attributed to one specific body, since responsibility for the timely application of policy and analysis of the effectiveness of the measures applied is important. That is, the mandate of MaP should be centralized, while it is not essential whether it is, for example, the Central Bank or the Government. It is more important that this body with the mandate of MaP has good coordination with the holders of mandates for other policies such as microprudential or monetary or that all these policies are within the area of responsibility of one organization. We see that the institutions implementing the MaP are located at three levels: international (recommendations of the Basel Committee), regional (may be present or absent, example: ECB) and national (Central Bank, Government, committees).

In this study, we systematize the institutional mechanisms for organizing MAP proposed in various academic papers (Chagas Goudard and Bittes Terra, 2015; Egawa et al., 2015; Grigaite et al., 2020; Nier et al., 2011): access to information, risk identification, selection and implementation of policy tools, calibration of policy measures, coordination with other policies, communication with economic agents and society. For each of the identified institutional aspects of the MAP, we make a proposal on how it can be improved. Access to information is

ensured by the presence of appropriate powers or good coordination with agencies that consolidate information. Access to information, the presence of an early warning system (EWS), and the availability of big data analysis tools are important for the timely identification of risks. The selection and implementation of policy tools should be based on the identification of a set of MaP tools and situations of their use, the presence of a mandate for the application of MaP measures, a system for determining the intensity of measures, the use of previous experience, and a system for evaluating results. Calibration of policy measures should be carried out through the selection of EWS for a crisis, access to information, monitoring of signal changes, and a system for responding to signal changes. To coordinate MaP with other policies, it is important to have established channels of information exchange with other agencies or consolidate mandates for the implementation of different policies in one institution, and publish a MaP strategy. For effective communication with economic agencies and society, we recommend defining communication channels, frequency of communication, openness of MaP goals, and publishing a MaP strategy and the results of its implementation.

We find interesting results that the same components are important for improving some institutional aspects of MaP, namely a system of EWS, which can improve both risk identification and (what is equally important) the calibration of MaP, that is, make MaP measures more effective. The next step of our research was to find and analyze the causes and channels of the financial crisis, therefore we tried to answer the question of what an effective EWS system should be. We understand that the option we have proposed for improving the institutional structure of the MAP may not be the only one and this area and may include a wide range of various improvements.

In the second chapter of the dissertation, we are looking for an answer to the question of what are the causes of a financial crisis and how it can be identified, and therefore what should be an effective system of EWS signals about a high probability of a crisis. To study the nature of the emergence of a financial crisis, we turn to the theory of Hyman Minsky (Minsky 1986, Minsky 1992, Ferri and Minsky 1992). The basis of Minsky's statements is that the causes of a financial crisis have an endogenous nature, which is associated with the vulnerabilities of excess credit and are associated with the paradox of financial instability (the financial system seems most stable at the moment when it is most vulnerable). Analyzing papers devoted to the causes of the global financial crisis of 2008-2009 (Borio 2011, Brunnermeier and Sannikov 2014, Tymoigne 2014, Tonveronachi 2020) we find in them similar statements about the nature of the origin of financial vulnerability.

We analyze academic papers and papers presented by institutions engaged in the development of MaP in order to identify those EWSs that have proven themselves to be effective. The result of the analysis states that no single signal can be recognized as a universal predictor of the crisis. EWSs recognized as effective in different papers can be classified as follows *credit-related*: credit growth, credit gap, credit-to-GDP gap, debt to service ratio (Schularick and Taylor, 2009; Drehmann and Juselius, 2013; Borio and Lowe, 2002; Frankel and Sarsvelos, 2011); *asset price-related*: property price gap, equity price gap, VIX (volatility index), commodities price (Borio and Drehmann, 2009; Borio et al.,2019; Gerdesmeir, 2010, Rey, 2018, Eberhardt and Presbitero, 2018); *mixed*, including monetary and real factors: financial conditions indexes (Hatzius et al., 2010; Alessi and Detken, 2009; Ng, 2011).

In our opinion, the nature of the presented indicators (credit-related and asset-price-related) is consistent with the concept of the endogenous nature of the financial crisis. Excessive credit obligations create vulnerability in creditworthiness and liquidity, and the price of assets can decrease under the influence of the absence of a credit component or lack of confidence in the issuer of assets.

Based on our results and also on the views presented in academic and professional papers (Basu et al., 2017; Claessens and Kose, 2013), we conclude that the best indicator of a crisis could be an EWS system, which would be a combination of vulnerability indicator/s (excessive credit) and trigger event indicators. We propose dividing possible trigger events into three groups: *events on the borrower's side* (business, individuals), when the borrower cannot repay credit obligations; *events on the creditor's side* (financial organization), when the financial organization loses liquidity and solvency as a result of excessive risks taken; events associated with a *decrease in asset prices*.

We would like to test the effectiveness of the proposed EWS system on specific statistical data to confirm or refute the assumptions made, but limitations in access to data for analysis and information technology for calculations have prevented us from doing this at this stage. We hope that this will become the subject of further research.

In the third chapter of the study, we draw attention to the fact that the effectiveness of MaP is still a subject of debate for policymakers and academics. Tightening MaP to reduce financial stability risks simultaneously leads to a decrease in the availability of loans, an increase in risks in the non-banking sector and a decrease in the potential for economic growth (Adrian et al., 2022; Belkhir et al., 2022; Borio et al., 2022; Laeven et al.). These statements

lead us to the idea of the need to calibrate MaP instruments depending on the current situation in economics and the EWSs also contributes to the solution of this issue. Therefore, we continue to explore this area and seek an answer to the question of how to effectively analyze EWS? We also study the case of France, the situation and risk indicators from 2008 to the latest data to answer the question of whether the current MaP measures are effective?

We conducted a comprehensive analysis of several academic papers aimed at identifying EWS and found that the methods for determining EWS based on numerical information can be divided into groups: *econometric* (Borio et al., 2019; Eberhardt and Presbitero, 2018; Chen and Svirydzenka, 2021) and *machine learning (ML)* (Bluwstein et al., 2023; Vrontos et al., 2021; Alessi and Detken, 2018). A detailed analysis of the papers allowed us to conclude that ML methods are capable of processing large amounts of data to identify patterns between many variables. The importance of the ability to simultaneously process a large number of variables is confirmed by the authorities' policy on assessing financial stability, in particular in the ECB Financial Stability Review (2023) uses more than 100 indicators which to assess financial stability.

We also highlight the EWS analysis method, which can be considered innovative for MaP (we have not previously encountered a mention of such a method in MaP) - this is the analysis of *text information using deep learning (DL) methods*. We analyze academic papers on this topic (Gu and Kurov, 2020; Fulo and Kocsis, 2023; Li et al., 2019), and we see that difficulties in using these methods are highlighted, however, ways to eliminate these difficulties are also proposed. Based on the fact that some variables in ECB Financial Stability Review (2023) indicate expectations, we conclude that the analysis of text data using the DL method can increase the efficiency of the EWS, and therefore the MaP.

Due to the author's limitations on data sources and information technologies, it was not possible to conduct a comparative analysis of the effectiveness of the presented methods using examples of specific crises; this may become the subject of further scientific developments.

Also, in this chapter we seek an answer to the question whether the MaP applied after 2008 is effective. We consider eight types of risk assessment indicators (example of France, from 2003 to 2024 (or 2023). We note that five of the eight risk assessment indicators examined showed a sustained change after the global financial crisis. On the one hand, this points to the effectiveness of the MaP measures implemented since 2008. Also, given the more sustained

changes in these indicators after the strengthening of MaP measures, we can consider these indicators as EWSs for authorities, which can be used for policy calibration.

In Chapter 4, we address the question of whether there may be alternative structures for maintaining financial stability other than the MaP. As an alternative, we consider the gift economy. In this case, a gift implies a gratuitous renunciation of benefits (high-risk and high-return transactions) to satisfy the interests of other participants (supporting financial stability). The resulting alternative structure differs from the MaP in that in the MaP, the initiative to restrict high-risk transactions comes from the regulator represented by the Central Bank or the Government, which monitor the operations of the financial sector and can apply restrictive measures to maintain financial stability. In the case of the gift economy, the initiative to restrict high-risk transactions comes from the financial community, that is, it is implied that financial institutions renounce some of the benefits to maintain overall financial stability. We understand that the development and refinement of this alternative approach to maintain financial stability requires significant additional research, including in the area of the benefits and costs of such an approach, as well as the development of incentives that can encourage financial institutions to adhere to the gift economy approach.

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[i] "Give as much you take, all shall be very well" or "My food basket and your food basket will please the people", a Maori *Whakataukī* (proverbe), quoted in Mauss (1954, p. 91). Mauss (Ibid.) precise, at the footnote 14 of Conclusion at page 189, that "Rev. Taylor, *Te Ika a Maui. Old New Zealand,* p. 130, proverb 42, translates very briefly as 'give as well as take and all will be right', but the literal translation is probably as follows: As much as Maru gives, so much Maru takes, and this is good, good. (Maru is the god of war and justice)."

[ii] It is worth noting that in the Anthropology of finance literature, numerous seminal works are available on alternative analyses of financial instabilities in a capitalist economy (see, for instance, Miyazaki, 2013, for a comprehensive presentation on various analytic proposals on related topics). However, an institutionalist framework seeking to use reciprocity/gift-economics in a financial regulation framework is not yet available.

[iii] See Ülgen, 2013, for a general presentation of the payments system and related issues. The approach developed in this paper is very close to the arguments developed by the "Modern Monetary Theory" approach. See Tymoigne and Wray, 2013.

[iv]stock market prices are usually observed as a proxy for this kind of criteria.

[v] The debate on the "relevant" financial regulation is very close to the debate on the meaning of democracy since both are related to the same issue about the organization of society and the role that individual actions and the so-called individual freedom could play within the societal framework with regard to the means and aims of society ant its viability concerns. The so-called "third principle" on which democracy could rest, which would differ from market transactions but also from state bureaucracy, is a direction suggested by some works (Adloff, 2006). Universalistic politics of justice or recognition that could orient citizens towards the common good and not only act out of utilitarian calculations is one of the expected directions of social organizations.

[vi] Ülgen (2019, p. 491) defines deregulation as follows: "Deregulation is an institutional transformation of the public regulation and supervision mechanisms into market-relying, self-regulation mechanisms. There is a retreat of restrictive public rules in order to reduce the constraining character of the supervision in force. This change mainly rests on the assumption that market forces are naturally self-adjusting. However, in most models, market mechanisms are supported by some public rules and laws and require public intervention in order to be re-enforceable and implemental. From this perspective, it might be more suitable to define the financial liberalization as a liberal regulation framework than a deregulation process."

[vii] See, among others, Ekelund and Hébert (1997) for a presentation of this view from the perspective of the history of economic theory.

[viii] Saporta (ibid., p. 10) remarks that it is important to evaluate the cost and effect of regulation, however, quantifying financial stability is still a complex issue. Regulatory costs will often be easier to quantify than the financial stability and safety and soundness benefits. And depending on the case, we may need to look beyond the banking system to capture all of the costs and benefits. For instance, unintended consequences of bank regulation might be felt not in the banking sector but in financial markets, financial infrastructures, and other parts of the financial system.

[ix] A further critical consideration is the compatibility of the macro-prudential objective with other economic and financial policy objectives. Given that macro-prudential policy interacts with a range of other policy areas, some tension is probably unavoidable both on the substance of policy and in interinstitutional (and conceivably interpersonal) relationships (Clark and Large, 2011, p. 10). This is most obviously a question in relation to monetary policy where, for example, pursuit of a macro-prudential credit-growth target or ceiling would be likely to have a bearing on the monetary transmission mechanism and on economic growth. But it also applies to other policy areas such as competition, consumer protection and, indeed, fiscal policy. (Clark and Large, ibid., p. 13)

[x] We will not discuss the respective effectiveness of written and unwritten rules. However, DeHart-Davis, Chen and Little (2013) argue that rule formalization triggers greater thought and scrutiny about rule design than unwritten rules, and the written nature of formalized rules would convey their legitimacy in ways that unwritten rules cannot: "These possibilities present a paradox: while written organizational rules can be associated with organizational pathologies, they may be a more effective means of achieving managerial objectives than their unwritten counterparts because they are more logically designed and faithfully followed." (ibid., p. 332).

[xi] We owe this remark to one of the referees. Beyond the scope of this chapter, this issue is however, related to the problems of (ill)working of large, opened and liberalized financial markets that involve huge number of people within their operations without respect to living conditions of these populations that often suffer from the consequences of the crises generated by financial speculation.

[xii] However, Lapavitsas (ibid.) argues that the use of "commodity versus gift" as metaphor for "market versus non-market" relations in a capitalist society is misleading and the analysis of the interaction between market and nonmarket relations must be framed on the understanding of capital as a set of social relations in a Marxist political economy way.

[xiii] Namely: giving, receiving and reciprocity.

[xiv] Mauss (1954, p. 14) quotes an example on this issue: "I will speak to you about the *hau*…The *hau* is not the wind that blows—not at all. Let us suppose that you possess a certain article (*taonga*) and that you give me this article. You give it me without setting a price on it. We strike no bargain about it. Now, I give this article to a third

person who, after a certain lapse of time, decides to give me something as payment in return (*utu*). He makes a present to me of something (*taonga*). Now, this *taonga* that he gives me is the spirit (*hau*) of the *taonga* that I had received from you and that I had given to *him*. The *taonga* that I received for these *taonga* (which came from you) must be returned to you. It would not be fair (*tika*) on my part to keep these *taonga* for myself, whether they were desirable (*rawe*) or undesirable (*kino*). I must give them to you because they are a *hau* of the *taonga* that you gave me. If I kept this other *taonga* for myself, serious harm might befall me, even death. This is the nature of the *hau*, the *hau* of personal property, the *hau* of the *taonga*, the *hau* of the forest. *Kati ena* (But enough on this subject)."

[xv] Douglas (2002, pp. xiii-xiv) notes: "The main strands in Durkheim's opposition to the English Utilitarians were already formulated by French political philosophers. As Larry Siedentrop summarizes a tradition that stemmed from the eighteenth century, from Rousseau and Tocqueville, it made three criticisms of English liberalism: first, that it was based on an impoverished concept of the person seen as an independent individual instead of as a social being; second, that it neglected how social relations change with changes in the mode of production; and third, that it had a too negative concept of liberty and so failed to appreciate the moral role of political participation. Furthermore, early English empiricist philosophy did not explain the role of social norms in shaping individual intentions and in making social action possible; their sensationalist model of the mind allowed no scope for explaining rule-governed action." (ibid, pp. xiii-xiv).

[xvi] Indeed, Mauss (1954, p. 17) states: "It is easy to find many facts concerning the obligation to receive. For a clan, a household, a group of people, a guest, have no option but to ask for hospitality, to receive presents, to enter into trading, to contract alliances, through wives or blood kinship. The Dayaks have even developed a whole system of law and morality based upon the duty one has not to fail to share in the meal at which one is present or that one has seen in preparation. The obligation to give is no less important; a study of it might enable us to understand how people have become exchangers of goods and services. We can only point out a few facts. To refuse to give, to fail to invite, just as to refuse to accept, is tantamount to declaring war; it is to reject the bond of alliance and commonality. Also, one gives because one is compelled to do so, because the recipient possesses some kind of right of property over anything that belongs to the donor."

[xvii] The modern economic theory is based on the assumption that the social organization around decentralized market rules is the best structure, often called a market economy or a market society, since it would reach -in most efficient way- a social Pareto optimum under specific competitive conditions. See the two fundamental welfare theorems for this assertion (Hammond, 1998).

[xviii] D. Thompson (1993), "Understanding financial conflicts of interest", N Engl J Med, 329: 573-576 (quoted in MacKenzie and Cronstein, 2006, p. 198).

[xix] In an individualistic society, this is rather limited to « I hope so, if possible, even if it's not my explicit intention".