IS THERE A DIFFERENCE BETWEEN ADVANCED AND EMERGING COUNTRIES IN TERMS OF FINANCIAL STABILITY?[*]

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ABSTRACT

The 2008-2009 financial crisis highlighted the importance of financial stability, leading to measures to anticipate future crises and mitigate their effects. Central banks and financial institutions began developing their own stability indicators and revising surveillance mechanisms. Among these indicators, the International Monetary Fund's Financial Soundness Assessment System Indicators are widely used. This study examines whether there is a significant difference between advanced and emerging countries in 2010 and 2020 in terms of financial stability, by using different financial stability indices calculated from these indicators. The results show that there is no significant difference in financial stability between these countries.

Keywords: Financial Stability, Financial Soundness, IMF's Financial Soundness Indicators

JEL Classification: E44, G32

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GELİŞMİŞ VE GELİŞMEKTE ÜLKELER ARASINDA FİNANSAL İSTİKRAR AÇISINDAN FARK VAR MIDIR?

ÖZ

2008-2009 finansal kriziyle beraber finansal istikrarın öneminin anlaşılması, gelecekte ortaya çıkabilecek krizleri önceden öngörebilmek ve bu krizlerin olası olumsuz etkilerini hafifletmek amaçlı birtakım önlemleri beraberinde getirmiştir. Merkez bankaları ile finansal kuruluşlar gözetim ve denetim mekanizmalarını gözden geçirmeye ve finansal istikrarın takibi amaçlı kendi göstergelerini oluşturmaya başlamışlardır. Bu kapsamda Uluslararası Para Fonu'nun Finansal Sağlamlık Değerlendirme Sistemi Göstergeleri en çok kullanılan göstergelerden biri olarak kabul edilmektedir. Çalışmada 2010 ve 2020 yıllarında gelişmiş ve gelişmekte olan ülkeler için finansal istikrar açısından anlamlı bir farkın oluşup oluşmadığı, bu göstergelerden hesaplanan farklı finansal istikrar endeksleriyle araştırılmış ve anlamlı bir finansal istikrar farkının ortaya çıkmadığı gözlemlenmiştir.

Anahtar Kelimeler: Finansal İstikrar, Finansal Sağlamlık, Uluslararası Para Fonu, Finansal Sağlamlık Göstergeleri

JEL Sınıflandırması: E44, G32

GENİŞLETİLMİŞ ÖZET

AMAÇ VE MOTİVASYON

Finansal istikrarın giderek önem kazanmasıyla, gelecekteki finansal krizleri öngörmek ve olumsuz etkilerini hafifletmek amacıyla finansal istikrar göstergeleri oluşturulmuş, Basel III kriterleri uygulanmaya başlanmıştır. Ancak literatürde finansal istikrarın tanımı için görüş birliği sağlanamaması ölçümü zorlaştırmakta ve uluslararası karşılaştırmaları engellemektedir. Uluslararası Para Fonu (IMF) Finansal Sağlamlık Göstergelerini yayımlayarak ülkeler arasında karşılaştırma yapılmasına olanak sağlamıştır. Literatürde yer alan çalışmalarda genellikle bir ülkenin ya da bir ülke grubunun finansal istikrarı incelenmektedir. Bu çalışmada, IMF'nin çekirdek göstergelerinden hareketle, gelişmiş ve gelişmekte olan ülkeler için endeksler hesaplanmış ve 2008 krizi sonrasında bu iki ülke grubu arasında finansal istikrar açısından anlamlı bir fark olup olmadığı araştırılmıştır.

ARAŞTIRMA STRATEJİSİ VE YÖNTEMİ

Araştırmada IMF'nin ülkelerin bankacılık sektörleri için, Sermaye Yeterliliği, Aktif Kalitesi, Kârlılık, Likidite ve Piyasa Riskine Duyarlılık başlıkları altında beş ana grupta topladığı çekirdek finansal sağlamlık göstergeleri kullanılmıştır. Bu göstergeler, dünya finansal istikrar değerlendirme sisteminde kullanılmak üzere aynı yöntem ile hesaplanması ve yayınlanması sebebiyle uluslararası

seviyede karşılaştırmaya imkân sağlaması açısından önem taşımaktadır. Literatürde yer alan ampirik çalışmalar, kullandıkları ölçüm metotlarına göre iki grupta toplanmaktadır. Bir grup çalışma, bankacılık sektörünün finansal sistemin en önemli parçası olduğu görüşünden yola çıkarak, bankacılık sektörü istikrarı endeksi ile finansal istikrarı ölçmeye çalışırken, diğer bir grup, ekonomik göstergeleri de kullanarak daha genel bir finansal istikrar endeksi elde etmektedir. Araştırmada öncelikle her bir gösterge tanımlanmış ve seçilmiş gelişmiş ve gelişmekte olan ülkeler için, 2008 Finansal Krizi sonrası dönem içerisinde (2008-2022) karşılaştırılmıştır. Sonrasında her gruptan birer gösterge endekste olacak şekilde yirmi dört farklı finansal istikrar endeksi tanımlanmıştır. Endeksler karma endeks şeklinde iki aşamada oluşturulmuştur. İlk aşamada endekslerde yer alacak her bir gösterge değeri, her ülke için, en yüksek – en düşük değer yöntemini baz alan yeniden ölçeklendirme metodu ile normalize edilmiştir. İkinci aşamada ise standart süreç izlenerek normalleştirilmiş gösterge değerlerinin ortalaması alınarak endeksler analize konu olan ülkeler için tek tek oluşturularak 2010 ve 2020 yılları için endeks serileri elde edilmiştir. Gelişmiş ve gelişmekte olan ülkeler arasında finansal istikrar açısından anlamlı bir fark ortaya çıkıp çıkmadığını görmek üzere, önce endekslere ait serilerin normal dağılım sergileyip sergilemediği Skewness ve Kurtosis katsayıları baz alınarak araştırılmış, sonrasında eğer normal dağılım söz konusu ise T- Test, değilse non-parametrik testlerden Mann-Whitney U Testi uygulanmıştır. Her iki test için de aynı yokluk varsayımı kullanılmıştır (H_0: Gelişmiş ve gelişmekte olan ülkelerin finansal istikrar endeksleri arasındaki fark anlamsızdır).

BULGULAR VE TARTIŞMA

2010 ve 2020 yılları için yapılan göstergelerin karşılaştırmalı grafik analizinde, genel olarak, incelenen göstergelerin gelişmiş ve gelişmekte olan ülkeler için birbirine yakın seviyelerde ve benzer seyir izlediği gözlemlenmiştir. Ancak, dikkat çeken en önemli farklılıklar, gelişmiş ülkelerde gelişmekte olan ülkelere göre daha düşük seyreden aktif kârlılık ve daha yüksek seyreden likit varlıkların kısa vadeli yükümlülüklere oranında ortaya çıkmıştır. Bu farklar, ülkelerin finansal yapılarındaki yapısal farklılıkları yansıtmakta olup, her iki ülke grubunun finansal istikrarı üzerinde belirgin etkiler yaratmaktadır. 2010 ve 2020 yılları için oluşturulan finansal istikrar endekslerinin betimsel istatistiklerine bakıldığında, gelişmiş ve gelişmekte olan ülkelerdeki endeks serilerinin ortalama ve standart sapma değerlerinin birbirine yakın olduğu görülmüştür. Normal dağılım analizi için yapılan Skewness ve Kurtosis (SK) test sonuçları 2010 yılında genel olarak endekslerin normal dağılım sergilemediğini gösterirken 2020 yılında normal dağılım gösteren endeks sayısının 2010 yılına göre daha yüksek olduğu fark edilmektedir. Bu durum 2008-2009 finansal krizinin finansal istikrar üzerinde yarattığı bozulmaya işaret ederken 2020 yılında finansal istikrarın 2010 yılına göre daha güçlü bir düzeye ulaştığını göstermektedir. Bu gelişme, kriz sonrası toparlanmanın ve uygulanan politikaların olumlu etkilerini yansıtmaktadır. Gelişmiş ve gelişmekte olan ülkeler arasındaki finansal istikrar farkının anlamlı olup olmadığını belirlemek için yapılan testlerde, yokluk varsayımının (*null hypothesis*)

reddedildiği tek durum 2010 yılına ait 12. ve 13. endeksler için görülmüştür. Bunun dışında, 2020 yılı için hesaplanan tüm endekslerde yokluk varsayımı reddedilmemektedir. Bu test sonuçları, gelişmiş ve gelişmekte olan ülkeler arasında finansal istikrar açısından anlamlı bir fark olmadığını ortaya koymuştur. Bu da küresel finansal istikrarın zamanla iyileştiğini, ancak gelişmiş ve gelişmekte olan ülkeler arasında yapısal farklılıkların finansal istikrar üzerinde belirgin etkiler yaratmadığını ortaya koymaktadır.

SONUÇ VE ÖNERİLER

2008 finansal krizinin reel ekonomiyi etkilemesi ve tüm dünyada küresel bir krize dönüşmesiyle finansal istikrarın önemi daha çok anlaşılmıştır. Bu sebeple merkez bankaları, ulusal ve uluslararası finansal kuruluşlar finansal istikrarı da gözetmeye başlamışlar; Basel II kriterleri yenilenerek 2008 krizine karşı global olarak koordine edilerek uygulanmaya başlanmıştır. Ancak finansal istikrar kavramı için kabul görmüş bir tanım olmaması, finansal istikrarın ölçümünü zor hale getirmiştir. Ekonomik birimler kendi finansal istikrar göstergeleri üzerinde çalışırken, IMF ve Avrupa Merkez Bankası gibi kurumlar da finansal istikrar göstergeleri tanımlamış ve farklı ülkeler için karşılaştırılabilir veri setleri oluşturmuşlardır.

Bu çalışmada IMF'in bankacılık kesimi için hesaplanan ve Basel III kriterleri arasında da yer alan çekirdek finansal sağlamlık göstergeleri bazı seçili gelişmiş ve gelişmekte olan ülkeler için incelenmiş ve sonrasında, bu göstergelerden hareketle 2010 ve 2020 yılları için farklı finansal sağlamlık göstergeleri oluşturulmuştur. Hem göstergelerin detaylı analizi hem de uygulanan testler ülkelerin finansal istikrar açısından endekslerde istatistiksel olarak anlamlı bir fark olmadığını ortaya koymuştur. Bu da 2008 finansal krizinin sonrasında tasarlanan Basel III düzenlemelerinin gelişmiş ve gelişmekte olan ülkeler tarafından benimsenerek etkin şekilde uygulandığına, finansal istikrarın önemle gözetildiğine işaret etmektedir.

1. INTRODUCTION

The recent 2008 global financial maelstrom underscores the significance of financial stability in maintaining the integrity of economic systems. During that turmoil, disruptions such as the runs of financial giants and the liquidity crunch (Brunnermeier, 2009) were among the symptoms of the financial oversight mechanism's weaknesses, which brought about the search for convenient and reinforced tools to prevent systemic risks. After this maelstrom, several national and international regulatory and supervisory authorities in most jurisdictions focused intensively on developing metrics and indicators to measure and monitor financial stability, which is among the factors determining the effectiveness of monetary and fiscal policies by affecting macro and micro indicators.

The developments mentioned above are still under construction, which has led the academic literature to avoid a unified definition of financial stability (Oosterloo & de Haan, 2004). Providing a single definition may not be possible due to technical reasons, such as the interdependence and interaction of financial system components themselves. Furthermore, a uniform definition is almost impossible since each financial market actor considers this concept from its own perspective. Overall, the Crockett's (1996) approach is still more or less valid: he prefers focusing on financial instability, as there is a lack of a common definition of financial stability. The absence of a clear definition has hindered cross-country comparisons and empirical analyses.

To our knowledge, the literature overwhelmingly considers the subject from a single-country or regional perspective and is limited to analyses around specific crises. However, dynamic changes over time and economic development categories should also be considered. In other words, although financial stability is studied extensively (see, among others, Čihák et al., 2013; Jakubik & Slacik, 2013; Karanovic & Karanovic, 2015; Shah et al., 2024), there has been very limited research providing a systematic financial stability comparison, considering different development levels over multiple periods and utilizing a standardized and multidimensional index framework. For instance, Shah et al. (2024) create a multidimensional stability index for only developing economies while Wang et al. (2022) focus on crisis periods in a specific jurisdiction, and Čihák et al. (2013) do not construct a composite index. Furthermore, employing several composite indices, each formed by considering different risk aspects, is not sufficiently utilized as a methodology.

Our study aims to fill the aforementioned gap, and the novelty of our research is twofold. First, we construct 24 distinct composite financial stability indices, each consisting of five different risk aspects (capital adequacy, asset quality, profitability, liquidity, and market risk sensitivity), based on the core Financial Soundness Assessment System Indicators (FSIs) of the International Monetary Fund (IMF), for a group of advanced and emerging economies for the years 2010 (which reflects post-crisis adaptation) and 2020, a decade later, 2020. Our indices are constructed by consistent normalization and aggregation, which allow for a convenient parametric or non-parametric testing of group differences. Second, we aim to capture the very short-term and longer-term impacts of global responses to the 2008 crisis by selecting the years 2010 and 2020. In the wake of this crisis, as discussed above, several regulatory and supervisory authorities started to review their surveillance and supervision mechanisms to restructure their financial systems and increase their resilience to the crisis, and Basel III criteria were designed and implemented as a necessary change to prevent future crises.

Our findings indicate that, contrary to the general bias and assumption, financial stability levels do not significantly differ between advanced and emerging economies in either 2010 or 2020, with minor exceptions. This outcome may be interpreted as follows: Global financial reforms and prudential

standards have contributed to financial stability harmonization across different development levels. It is also in line with Shah et al. (2024)'s evidence for the post-crisis period. To sum up, our research contributes to the literature by proposing a scalable methodology based on standardized international data.

2. THEORETICAL DISCUSSION

2.1. Conceptualizing Financial Stability

Although having emerged in the 1970s, the concept of financial stability has received substantial attention after the financial maelstrom of 2008. This crisis especially underscores the importance of financial stability at the global level and makes it a priority among all other agendas. Even though financial stability is defined from different perspectives including, i) the resilience of financial systems to shocks (Schinasi, 2006), ii) the efficient functioning of financial markets under stress (Allen & Wood, 2006), and iii) the system's ability to continue providing its essential functions under adverse conditions (IMF, 2006), this concept remains theoretically elusive as a unified definition is absent.

There may be several reasons for the absence mentioned above. The complexity and interconnectedness of financial systems may be one reason. Institutional lenses may be another reason: Central banks consider the concept from one aspect, while regulators approach the concept from a different perspective. All these may lead to addressing it as financial instability instead of financial stability since the former is more observable and operationally understandable. For instance, one can infer from Crockett (1996) and Mishkin (1999) that financial instability can be defined as the unstable functioning of financial intermediaries and the inability of financial systems to allocate resources efficiently. Furthermore, asset price volatility, excessive institutional risk exposure, and declining output performance may be considered as signals for financial instability (Driffill et al., 2006). Borio and Drehmann (2009) also address financial stability as financial instability. In other words, all these negative definitions are considered more understandable, which makes financial instability easier to comprehend.

Building on this, there are certain interpretations and definitions used to conceptualize financial stability. For instance, Zhao (2016) underscores that this concept has macroeconomic, dynamic, and utility-enhancing characteristics. From a slightly different perspective, Borio and Drehmann (2009) point out three conditions for achieving financial stability: i) evaluating financial factors for different economic agents, ii) not considering financial stability independently from the real economy, and iii) addressing financial stability with financial instability. There is also a stream considering the concept from a financial crisis perspective. For instance, Schinasi (2006) defines financial stability as resilience

to financial crises. Allen and Wood (2006) argue that financial stability is achieved when the market becomes functional again, without a major crisis, despite bank failures, loan defaults, balance sheet distortions, and financial imbalances in the financial system. All in all, the literature approaches this concept from different aspects and does not provide a common and generic definition.

2.2. Measuring Financial Stability: From Indicators to Indices

Defining and measuring financial stability is difficult and challenging. Main drivers of financial instability may be grouped under macro-structural factors and financial system-specific risks. The former includes factors such as economic growth volatility, inflation, exchange rate volatility, regulatory shortcomings, and disruptions in capital flows. Such factors may create a convenient environment for financial instability by affecting the whole economy and, eventually, financial institutions (International Monetary Fund [IMF], 2025). The latter includes elements such as credit risk, market risk, liquidity risk, operational risk, and reputational risk, all of which heavily require extensive surveillance and monitoring to hinder systemic vulnerabilities (Basel Committee on Banking Supervision [BCBS], 2011).

This multi-risk perspective has provided a starting point for the development of monitoring tools such as the Financial Soundness Indicators (FSIs) developed by the IMF and Macroprudential Indicators (MPIs) by the European Central Bank. These tools offer standardized metrics and enable evaluating financial stability over time and among jurisdictions. In practice, metrics include simple ratios, which are useful ingredients of composite indices. Composite indices are created by aggregating several indicators (ratios) into a single numeric score. Individual indicators, separately, may not be sufficient to reflect the total vulnerability of the system (Borio and Drehmann, 2009). Hence, the multidimensional nature of financial stability is reflected by composite indices, the development of which is significant for research (Jakubik and Slacik, 2013). Development of indices is a synthetic approach that helps us understand the change in the stability of different markets, which makes such indices convenient for macro-econometric research (Zhao, 2016). As summarized by Jakubik and Slacik (2013), index construction is performed via several methods, such as equal-variance weighting, principal component analysis, and impulse-response-based aggregation.

In the literature, there are two types of indexes: country-specific financial stability indexes and financial stability indexes that allow for international analysis. For example, Illing and Liu (2003), Brave and Butters (2011), and Sales et al. (2012) construct country-specific financial indices. Illing and Liu (2003) propose a financial stress index for Canada by combining different methods, including factor analysis and GARCH models. They conclude that the index tailored for Canada has decent results. Sales et al. (2012) construct an index for Brazil using three different methods: i) a Broad Financial Stability Indicator based on unobserved indicators, ii) a specific financial stability indicator for the Brazilian economy combining indicators of observed credit, debt, and exchange rate markets, and iii) a business

cycle decomposition into financial and real factors. Brave and Butters (2011) construct a weekly financial condition index as a weighted average of several financial stability indicators by using principal components analysis for the United States (US). Wang et.al. (2022) aim to analyze the impact of monetary policy on financial stability. To perform their analyses, they construct an index specific to China that includes eight variables, which reflect Chinese financial institutions, financial markets, macroeconomic situation, and external sector shocks. Overall, as can be inferred from the aforementioned research, employing indices designed for a specific country may not be appropriate for cross-country comparisons.

On the other hand, if the indicators are comparable and standard in different jurisdictions, it is possible to analyze and compare financial stability for different countries. For example, Jakubik and Slacik (2013) construct a composite index for Central, Eastern, and South-Eastern European countries from 1996 to 2012 by using macroprudential variables in 5 categories, including sovereign risk, banking sector, contagion risk, real sector, and macroeconomy, and they determine which variable is a good indicator of financial instability. Karanovic and Karanovic (2015) construct an aggregate financial stability index for the Balkan countries over the period 1995-2011 by using 16 indicators grouped into four categories: financial development, financial vulnerability, financial soundness, and world economic climate. They compare the level of financial stability between the countries and measure the contribution of each indicator to the volatility of the financial stability index. Shah et al. (2024) construct a composite internal and external financial stability index for 87 developed countries for the period 2005 and 2020. For the internal financial stability index, variables such as domestic credit, inflation, monetary supply, bank z-score, interest rate spread are used, while reserves, current account balance, and external debt constitute the external financial stability index. According to the index value, they group countries into three groups based on their financial inclusion. Their outcomes reveal that China is the sole country in the high financial inclusion category, while most economies are classified under the lower financial inclusion categories.

3. SAMPLE SELECTION

In this study, we aim to shed light on the cross-country comparison of financial stability by constructing several composite financial stability indices. To maintain the homogeneity of data calculation and methodology, we utilize IMF's core Financial Soundness Indicators to perform an international comparison. Afterwards, we document evidence for how financial stability differs between emerging and developed economies just after the recent financial maelstrom, in 2010, and in 2020, 10 years later.

Our emerging economies sample includes Indonesia, Mexico, Poland, Argentina, Colombia, Russia, South Africa, the Philippines, Hungary, and Türkiye, while our advanced economies include Australia, Canada, Germany, Denmark, Greece, Korea, Malta, Slovakia, Slovenia, Switzerland, the United Kingdom and the United States. These countries are selected as they have complete data over the years 2008-2022. Note that the number of observations is 22 because we calculated each index for each economy and for 2010 and 2020.

4. METHODOLOGY

It is possible to construct a financial stability index using different approaches, such as equal-variance weighting method, generalized impulse-response function, and principal component analysis. To ensure the comparability and compatibility of the time series, each individual component of an index is normalized. There are also different normalization methods. Generally, while constructing an index, each individual indicator is weighted. In the literature, the simplest way is to give identical weights to all indicators (Albulescu, 2010). Illing and Liu (2003) propose to determine the weight to be given, in terms of credit aggregate weights or factor analysis. According to the approach proposed by Van den End (2006), the indicators making up an index can be weighted according to their contribution to GDP growth. In this study, the max-min normalization method is utilized, as in Albulescu (2013).

The index is constructed in two stages. In the first stage, the value of each indicator is normalized by the rescaling method shown in Formula (1). Then, in the second stage, the index is constructed by following the standard process of averaging the normalized indicator values, as shown in Formula (2).

$$I_{ijc} = \frac{I_{ijc} - Min\,(I_i)}{Max\,(I_i) - Min\,(I_i)} \quad \textbf{(1)}$$

$$Financial\ Soundness\ Index_{ij} = \frac{\sum_{i=1}^{5} I_{ij}}{5} \quad \textbf{(2)}$$

In the above formulas, i, j, c, max, and min denote, respectively, the value of the indicator, time, country, maximum, and minimum. Overall, the financial soundness indices for the banking sectors of advanced and emerging countries are then constructed by using the Financial Soundness Index (FSI) core set indicators for the years 2010 and 2020, to determine whether financial stability differs between advanced and emerging economies over a decade.

As can be seen in Appendix 1, the Financial Soundness Assessment System Indicators are calculated in separate groups, namely, core and additional indicators. Seventeen of these indicators belong to the banking sector, while the rest are not directly related to that sector. For all selected economies, core

indicators are calculated for the banking sector in five different categories, namely, capital adequacy, asset quality, earnings and profitability, liquidity, and sensitivity to market risk.

In our study, we define indices as a combination of indicators grouped into five main groups, as illustrated in Table 1. Each index is calculated with only one indicator from each group by employing Formula (2). A total of 24 indices are calculated for each economy.

Table 1. Determination of the Indices

Indicators	Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	Index 7	Index 8	Index 9	Index 10	Index 11	Index 12	Index 13	Index 14	Index 15	Index 16	Index 17	Index 18	Index 19	Index 20	Index 21	Index 22	Index 23	Index 24
Capital Adequacy																								
Regulatory capital to risk-weighted assets	✓		✓	✓	✓				✓		✓		✓		✓									
Tier 1 capital to risk-weighted assets		✓				✓	✓	✓		✓		✓		✓		✓								
Nonperforming loans net of provisions to capital																	✓	✓	✓	✓	✓	✓	✓	✓
Asset quality																								
Tier 1 capital to assets																								
Nonperforming loans to total gross loans	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Profitability																								
Return on assets	✓		✓			✓	✓										✓	✓						
Return on equity		✓		✓	✓			✓											✓	✓				
Interest margin to gross income									✓	✓	✓	✓									✓	✓		
Noninterest expenses to gross income													✓	✓	✓	✓							✓	✓
Liquidity																								
Liquid assets to total assets	✓	✓			✓		✓		✓	✓			✓	✓			✓		✓		✓		✓	
Liquid assets to short-term liabilities			✓	✓		✓		✓			✓	✓			✓	✓		✓		✓		✓		✓
Sensibility to market risk																								
Net open position in foreign exchange to capital	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

After obtaining the index values, the significance of the difference between emerging and advanced economies is calculated. To perform this analysis, first, normality should be checked to select the correct test: the parametric T-test should be used if the normality condition holds, and non-parametric Mann-Whitney U-Test should be used otherwise.[1] This condition is examined by employing the SK test, which is based on skewness and kurtosis coefficients. We provide the outcomes of this test in Appendices 2 and 3, for brevity. Test outcomes reveal that while most index figures are not normally distributed in the immediate aftermath of the 2008-2009 financial crisis, most satisfy the normality condition in 2020, ten years after the crisis.

5. RESULTS

Prior to index construction, we provide a graphical representation to get a clearer and intuitive understanding of how banking indicators differ across countries and over time. Hence, we plot metrics

[1] Both tests have the null hypothesis of no significant difference between groups.

for each of the IMF's core banking sector indicator (capital adequacy, asset quality, earnings and profitability, liquidity, and market risk sensitivity) across selected advanced (Australia, Germany, Canada, US) and emerging economies (Indonesia, Mexico, Türkiye, Poland). In other words, we start by trying to capture patterns, shifts, and outliers, if any, which may remain hidden in our main analyses.

5.1. Capital Adequacy

Capital Adequacy is defined as the ratio of capital (or equity) available to cover the credit risk, market risk, and operational risk of the banking industry. Thus, the ability to absorb and mitigate the impact of sudden losses arising from these risks can be measured. The IMF measures capital adequacy in slightly different ways: i) the ratio of regulatory capital to risk-weighted assets, ii) the ratio of Tier 1 capital to risk-weighted assets, and iii) the ratio of nonperforming loans net of provisions to capital. The former two indicate stronger financial soundness, while an increase in the latter refers to weaker soundness.

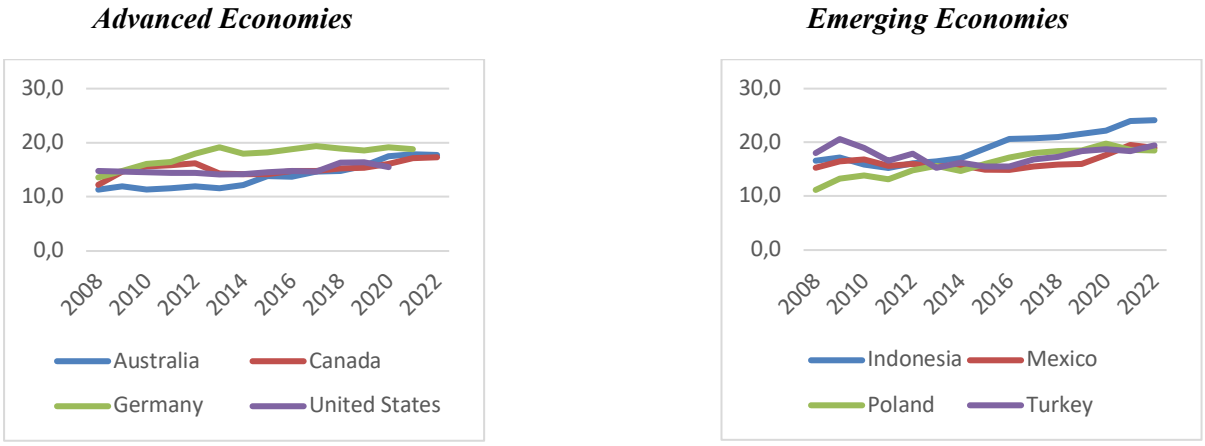

Figure 1. Regulatory Capital to Risk-Weighted Assets

Source: FSIs, IMF.

Figure 1 reveals that the ratio of risk-weighted assets to capital is relatively stable (around 15%) throughout the period for both advanced and emerging economies. There is an increasing trend beginning in 2015 for each group.

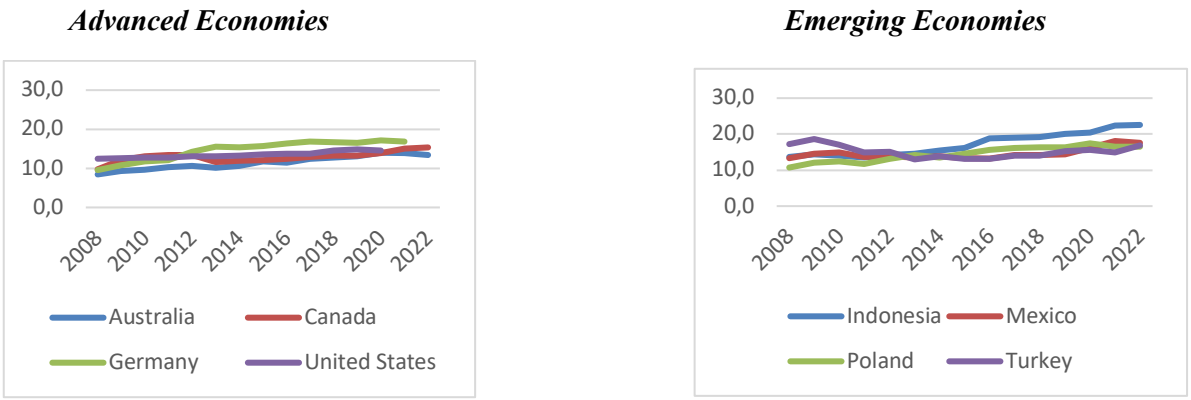

Figure 2. Tier 1 Capital to Risk-Weighted Assets

Source: FSIs, IMF.

As demonstrated in Figure 2, Tier 1 capital ratios show a clearly increasing trend throughout the period for all economies except for Türkiye. Germany and Indonesia are the leading economies in their groups, while Turkey and Mexico seem to be similar countries because they have the same trend, especially after 2012. Figure 3 illustrates that the ratio of nonperforming loans net of provisions to capital reached its highest value during the 2008 global financial crisis, both in advanced and emerging economies. It declined after the crisis in advanced economies and has been below 10% since 2018 in both groups. It is noteworthy that Mexico has negative figures over the period. This negative ratio reflects conservative, forward-looking provisioning practices that result in provisions exceeding nonperforming loans. Supported by strong regulatory oversight and robust bank capitalization, Mexican banks were able to recognize credit risk early without eroding capital adequacy. Consequently, despite severe shocks such as the 2008–2009 Global Financial Crisis and the 2020 Covid-19 shock**,** Mexico's banking sector remained resilient throughout the period.

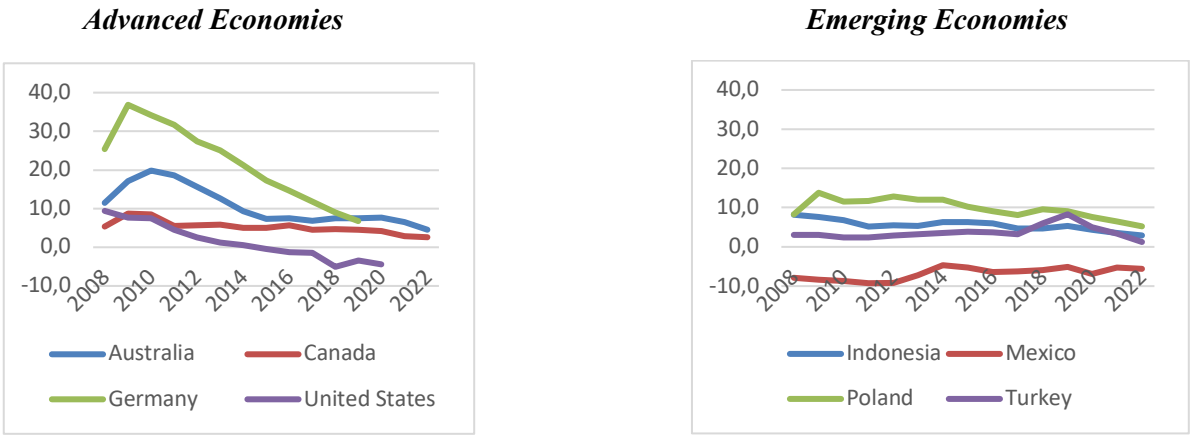

Figure 3. Nonperforming Loans Net of Provisions to Capital

Source: FSIs, IMF.

5.1.2. Asset Quality

Asset Quality reflects a bank's exposure to credit risk, or its effectiveness in loan collection. The IMF measures asset quality in different ways: i) the ratio of nonperforming loans to total gross loans, ii) provisions for nonperforming loans, and iii) loan concentration by economic activity. The higher the former two, the lower the financial soundness. The latter may induce an additional potential credit risk stemming from sectoral concentration. In our study, due to data limitations, only the first ratio is considered in our analysis. Figure 4 indicates that advanced economies perform better than emerging economies. While this ratio in advanced economies shows a downward trend throughout the period, falling below 1% at the end, it fluctuates and remains higher in emerging economies.

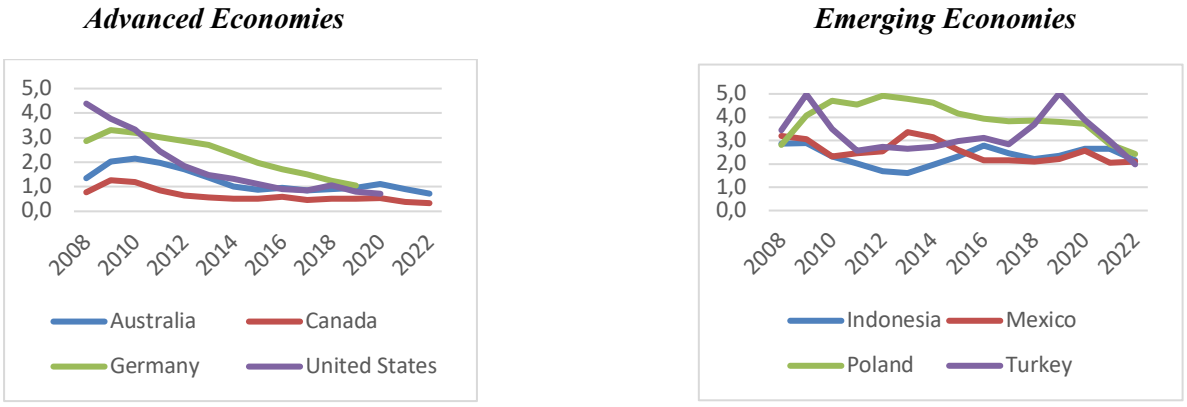

Figure 4. Nonperforming Loans to Total Gross Loans

Source: FSIs, IMF.

5.1.3. Profitability

Profitability is considered a component of financial soundness as it shows the outcome of the performance of the business. The IMF measures profitability in four dimensions: i) return on assets, ii) return on equity, iii) the ratio of interest margin to gross income, and iv) the ratio of non-interest expenses to gross income. Return on assets reflects the efficient use of assets, while return on equity measures the earnings capacity of equity. The third ratio reflects the capability of generating profit from core business activities, while the last one indicates operational efficiency—lower values are typically preferable. Higher values in the first three ratios are considered to improve financial soundness.

Figures 5 and 6 reveal the evolution of return on assets and return on equity throughout the period. Figure 5 indicates that emerging economies perform better than advanced economies. That is, emerging economies are descriptively more successful in efficient use of assets than developed economies. Remarkably, Germany (Poland) is the worst-performing advanced (emerging) economy. Similar outcomes are provided in Figure 6, and the previous interpretation for Germany and Poland is valid as well.

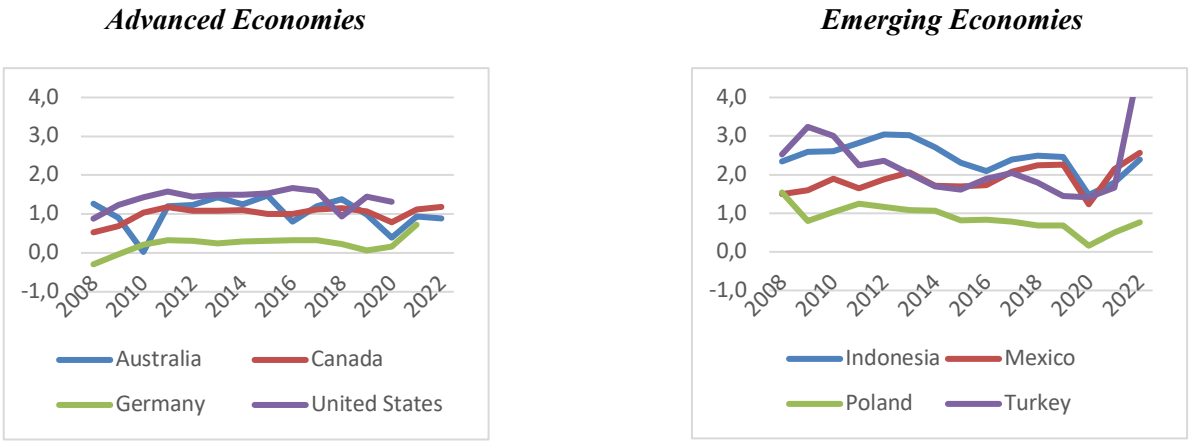

Figure 5. Return on Assets (ROA)

Source: FSIs, IMF.

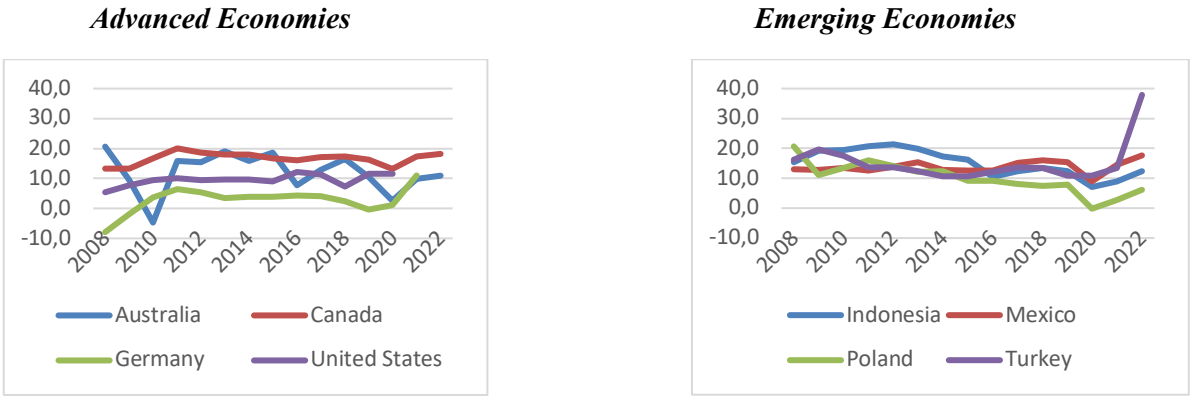

Figure 6. Return on Equity (ROE)

Source: FSIs, IMF.

Figure 7 shows that the interest margin to gross income ratio follows fluctuations within a stable band for all economies. For this ratio, emerging economies have a slightly positive trend. Last, Figure 8 reveals that while countries display different levels of interest margin to gross income over time, advanced economies move in a parallel fashion, and then diverge from each other, especially after 2020. The same is almost valid for emerging economies as well.

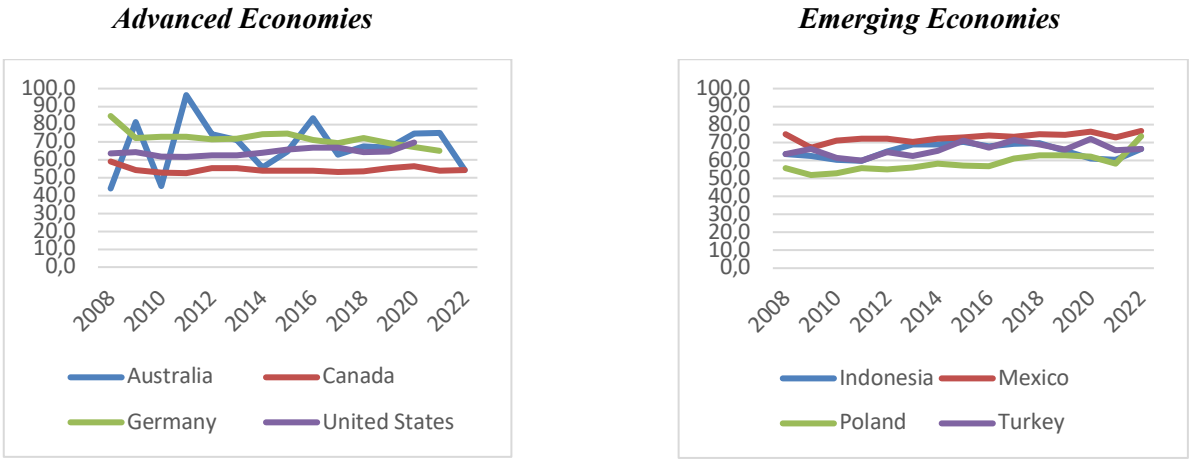

Figure 7. Interest Margin to Gross Income

Source: FSIs, IMF.

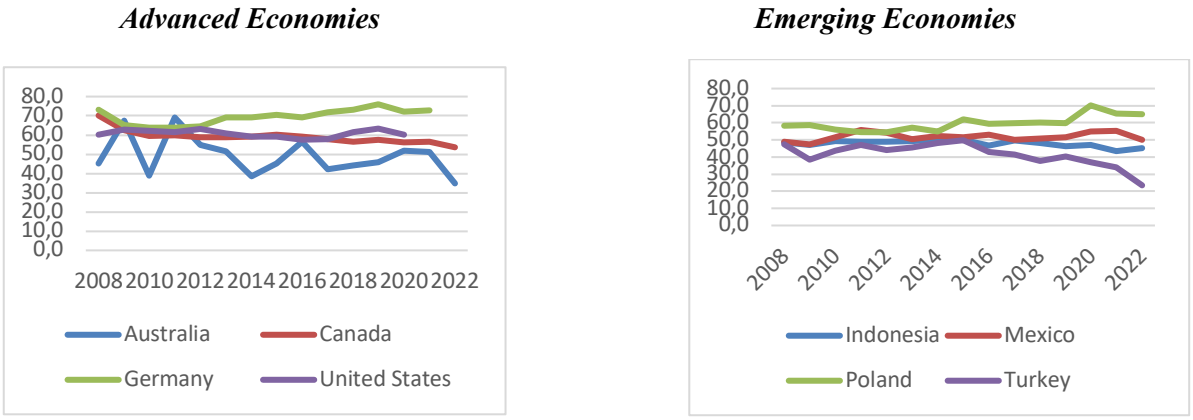

Figure 8. Non-Interest Expenses to Gross Income

Source: FSIs, IMF.

5.1.4. Liquidity

One of the determinants of financial stability is liquidity, which is controlled by regulatory authorities as a significant monetary policy instrument. The IMF measures liquidity as the liquid asset ratio (liquid assets to total assets) and the ratio of liquid assets to short-term liabilities. High levels of these ratios indicate whether the banking system is prepared to meet the liquidity demand in the event of a possible liquidity crunch.

Figures 9 and 10 reveal the evolution of these two liquidity ratios throughout the period. Figure 9 shows that among emerging economies, the liquid assets ratio is remarkably high in Türkiye, followed by Mexico. Canada and Australia have lower liquid assets ratios than the US and Germany, with one exception: in Germany, there is a sharp decline from 2017 to 2018, which is recovered afterwards. Figure 10 indicates that the best-performing economies remain almost unchanged in terms of the ratio of liquid assets to short-term liabilities, with small differences. For emerging (advanced) economies, Mexico and Türkiye (Germany) are the leaders in their respective groups. The US experienced a drastic increase from 2016 to 2018, which was followed by a sharp decline.

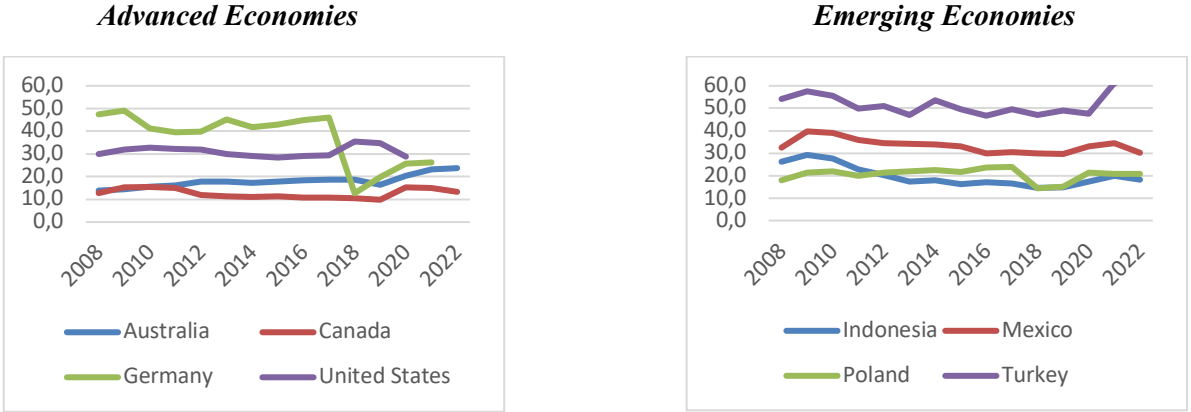

Figure 9. Liquid Assets to Total Assets

Source: FSIs, IMF.

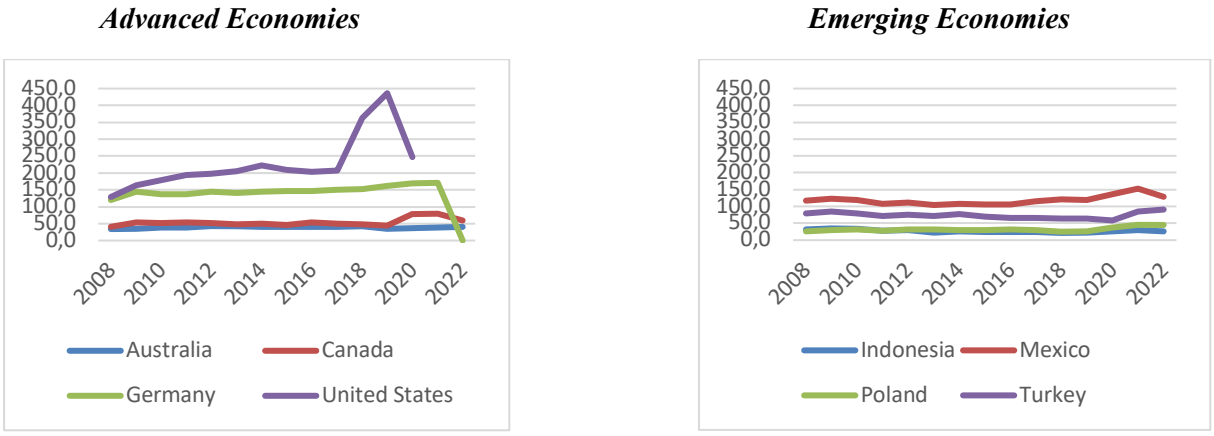

Figure 10. Liquid Assets to Short-Term Liabilities

Source: FSIs, IMF.

5.1.5. Sensitivity to Market Risk

The last determinant of financial stability is sensitivity to market risk, which reflects the banks' vulnerability to sudden market movements and fluctuations. The IMF measures this as the ratio of net open position in foreign exchange to capital. From this perspective, the IMF aims to observe the balance between assets and liabilities denominated in foreign currency, in relation to capital. As shown in Figure 11, this data is not available in FSIs for most advanced countries, but it is available for Austria and Germany. For Germany, there was a significant decline in 2021, and the ratio is very close to zero in 2022. This may be related to the increased dominance of the Euro, which has reduced the use of other currencies. In contrast, Mexico and Indonesia have higher ratios than advanced economies, which reflects their vulnerability to foreign exchange fluctuations. Türkiye presents an intriguing case: this ratio hovers around 0 until 2019, followed by a sharp increase in 2020. This jump from -1% to 5.5% may be interpreted as an early warning signal of foreign exchange risk.

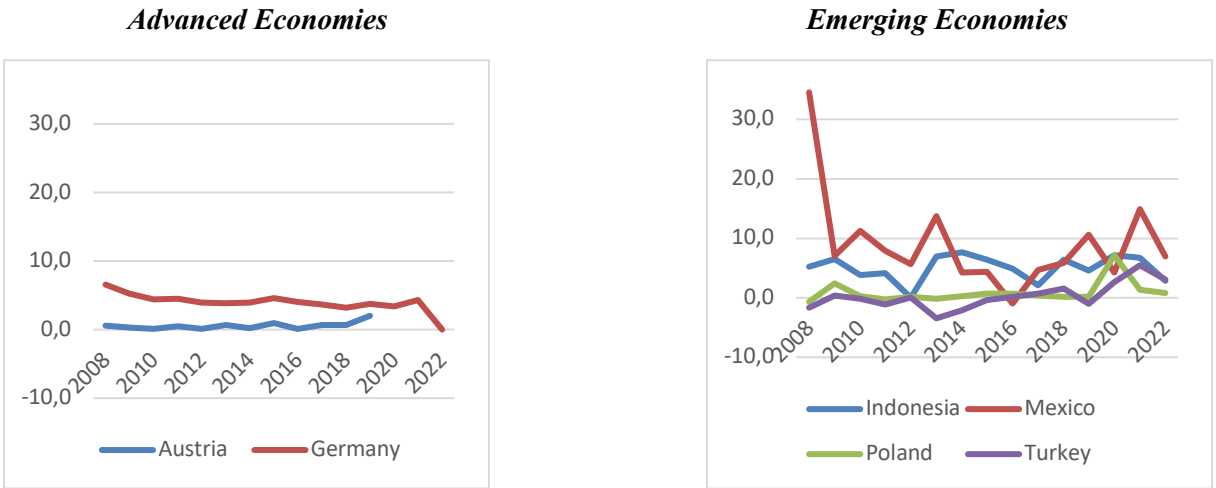

Figure 11. Net Open Position in Foreign Exchange to Capital

Source: FSIs, IMF.

5.2. Test Results

Table 2 presents the mean and standard deviation values of different indices separately for advanced and emerging economies in 2010 and 2020. Although certain indices show statistical similarities between economies in these years, most are different. Note that most mean index values are close to each other for emerging economies in both years, while this is not the case for advanced economies.

Table 2. Descriptive Statistics

	2010				**2020**			
	Mean		**Standard Deviation**		**Mean**		**Standard Deviation**	
Index	Advanced Eco.	Emerging Eco.	Advanced Eco.	Emerging Eco.	Advanced Eco.	Emerging Eco.	Advanced Eco.	Emerging Eco.
1	0,49	0,47	0,18	0,10	0,53	0,44	0,18	0,11
2	0,49	0,45	0,18	0,11	0,53	0,44	0,16	0,11
3	0,50	0,45	0,15	0,08	0,52	0,44	0,13	0,09
4	0,51	0,44	0,15	0,10	0,52	0,44	0,13	0,10
5	0,50	0,45	0,18	0,12	0,53	0,43	0,17	0,10
6	0,49	0,43	0,15	0,08	0,51	0,44	0,13	0,12
7	0,48	0,43	0,19	0,08	0,52	0,42	0,17	0,10
8	0,50	0,42	0,15	0,09	0,51	0,44	0,12	0,11
9	0,51	0,42	0,19	0,09	0,50	0,55	0,15	0,12
10	0,50	0,40	0,20	0,10	0,49	0,55	0,15	0,14
11	0,53	0,40	0,15	0,07	0,49	0,56	0,09	0,12
12	0,51	0,38	0,17	0,07	0,48	0,56	0,09	0,14
13	0,47	0,47	0,17	0,11	0,51	0,51	0,10	0,15
14	0,46	0,45	0,18	0,11	0,52	0,51	0,09	0,17
15	0,48	0,44	0,15	0,11	0,52	0,51	0,08	0,14
16	0,47	0,42	0,15	0,11	0,51	0,52	0,08	0,16
17	0,55	2,64	0,17	5,08	0,40	2,51	0,24	4,52
18	0,57	4,43	0,16	9,30	0,39	4,65	0,20	10,66
19	0,56	3,09	0,16	6,15	0,40	2,93	0,23	5,42
20	0,57	4,88	0,16	10,27	0,39	5,08	0,19	11,65
21	0,57	4,67	0,18	9,94	0,37	5,01	0,21	9,65
22	0,58	6,45	0,18	14,02	0,36	7,15	0,16	15,70
23	0,53	4,77	0,17	9,97	0,39	4,02	0,16	7,55
24	0,54	6,56	0,17	14,40	0,38	6,18	0,15	13,85

Source: Calculated by the author

Table 3 presents the parametric T-test or the non-parametric Mann-Whitney U-Test results. Except for indices 12 and 13 calculated for 2010, the null hypothesis stating no difference between advanced and emerging economies is not rejected for all indices. In other words, financial stability does not significantly differ between these economies just after the global economic crisis, with two exceptions. A similar outcome is also reported in 2020: Except for index 4, the null hypothesis is not rejected. These results may be interpreted as a convergence in financial stability levels. In other words, the global financial architecture taking place as of the end of the global financial maelstrom may have resulted in

similar risk structures, yielding similar financial stability levels. It may also mean a strong interconnectedness of the global financial environment.

Table 3. Tests Results

PANEL A: Test results of indices 1 to 8								
Index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2010	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected
2020	not rejected	not rejected	not rejected	rejected	not rejected	not rejected	not rejected	not rejected
PANEL B: Test results of indices 9 to 16								
Index	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
2010	not rejected	not rejected	not rejected	rejected	rejected	not rejected	not rejected	not rejected
2020	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected
PANEL C: Test results of indices 17 to 24								
Index	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
2010	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected
2020	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected	not rejected

5. CONCLUSION

As the 2008 financial crisis affected the real economy and turned into a global maelstrom, the concept of financial stability drew everyone's attention more than ever. For this reason, central banks, as well as several national and international authorities, were forced to redesign their financial stability definitions and frameworks. In its aftermath, Basel II criteria were significantly revised and started to be implemented at the global level. These efforts gave birth to Basel III, which is now the existing standard for enhancing financial stability. Despite these efforts, there is still no consensus on the definition of financial stability, and this has made its measurement difficult. Almost every authority has its unique approach to financial stability from its own lens, which has made economic agents work with their own financial stability indicators. Institutions such as the IMF and the European Central Bank have created their own financial stability indicators and comparable data sets for different countries.

In our study, by utilizing the IMF's core FSIs for the banking sector, which are also embedded in the Basel III criteria, we construct 24 distinct financial stability indices for selected advanced and emerging economies for the years 2010 and 2020. This 10-year perspective enables us to comprehend the long-term and short-term reflections of post-crisis global banking reforms. Our outcomes clearly indicate that there is no statistically significant difference in financial stability between emerging and advanced economies in either 2010 or 2020, despite their deemed structural and institutional differences. This may be interpreted as follows: The Basel III framework and its global enforcement have been beneficial in creating convergence in financial stability, resulting in harmonization, independent of development

levels. Furthermore, this outcome indicates that advanced and emerging economies are meaningfully interconnected, and global actions yield spillover effects across economies.

For future research, our analyses may be extended beyond 2020, allowing researchers to examine longer-term effects of Basel III implementation, especially considering the recent global trade wars and geopolitical tensions. Furthermore, future research may analyze the association between financial soundness indicators and key macroeconomic indicators such as GDP growth, inflation, and unemployment to shed light on our understanding of the interaction between financial stability and real economic outcomes.

YAZARIN BEYANI

Bu çalışmada, Araştırma ve Yayın etiğine uyulmuştur, çıkar çatışması bulunmamaktadır ve çalışma için finansal destek alınmamıştır.

AUTHOR'S DECLARATION

This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support.

REFERENCES

Albulescu, C. T. (2010). Forecasting the Romanian financial system stability using a stochastic simulation model. *Romanian Journal of Economic Forecasting*, *13*(1), 81-98.

Albulescu, C. T. (2013). Financial stability and monetary policy: A reduced-form model for the euro area. *Romanian Journal of Economic Forecasting*, *16*(1), 62-81.

Allen, W. A., & Wood, G. (2006). Defining and Achieving Financial Stability. *Journal of Financial Stability*, 2, 152-172. https://doi.org/10.1016/j.jfs.2005.10.001

Basel Committee on Banking Supervision [BCBS], (2011). *Principles for Sound Liquidity Risk Management and Supervision (September 2008)*.

Brunnermeier, M. K. (2009). Deciphering the liquidity and credit crunch 2007–2008. *Journal of Economic perspectives*, *23*(1), 77-100. https://doi.org/10.1257/jep.23.1.77

Brave, S. A., & Butters, R. A. (2011). Monitoring financial stability: A financial conditions index approach. *Economic Perspectives*, *35*(1), 22-43. https://ssrn.com/abstract=1758783

Borio, C.E.V., & Drehmann, M. (2009). Towards On Operational Framework for Financial Stability: "fuzzy" measurement and its consequences, *BIS Working Paper*, 284. Bank for International Settlements. https://www.bis.org/publ/work284.pdf

Čihák, M., Demirgüč-Kunt, A., Feyen, E., & Levine, R. (2013). *Financial development in 205 economies, 1960 to 2010* (No. w18946). National Bureau of Economic Research. https://www.nber.org/system/files/working_papers/w18946/w18946.pdf

Crockett, A., (1996). The Theory and Practice of Financial Stability. *De Economist*, 144, 531-568. https://doi.org/10.1007/BF01371939

Driffill, J., Rotondi, Z., & Zazzara, C. (2006). Monetary policy and financial stability: What role for the futures market?. *Journal of Financial Stability*, 2(1), 95-112. https://doi.org/10.1016/j.jfs.2005.03.001

Illing, M., & Liu, Y. (2003). *An index of financial stress for Canada* (No. 2003-14). Bank of Canada. https://www.bankofcanada.ca/wp-content/uploads/2010/02/wp03-14.pdf

International Money Fund (IMF). (2006). *Financial Soundness Indicators Compilation Guide and Amendment*, Washington. https://www.imf.org/external/pubs/ft/fsi/guide/2006/pdf/fsift.pdf

International Money Fund (IMF). (2025). Global Financial Stability Report. *Finance & Development. : Enhancing Resilience amid Uncertainty*. Washington, DC, 69 p. https://www.imf.org/en/Publications/GFSR/Issues/2025/04/22/global-financial-stability-report-april-2025

Jakubik, P. & Slacik, T. (2013). Measuring Financial (In)Stability in Emerging Europe: A New Index-Based Approach. *Financial Stability Report*, 25, 102-117. https://www.oenb.at/dam/jcr:2ae4aa51-3edf-411a-900 ... cs5_tcm16-256591.pdf

Karanovic, G. & Karanovic, B. (2015). Developing An Aggregate Index for Measuring Financial Stability in The Balkans. *Procedia Economics and Finance*, 33, 3-17. https://doi.org/10.1016/S2212-5671(15)01690-1

Mishkin, F. (1999). Global Financial Instability: Framework, Events, Isssues. *Journal of Economic Perspectives*, vol. 13(4), 3–20. https://doi.org/10.1257/jep.13.4.3

Oosterloo, S. & de Haan, J. (2004). Central banks and financial stability: a survey. *Journal of Financial Stability*, 1(2), 257-273. https://doi.org/10.1016/j.jfs.2004.09.002

Sales, A.S., Areosa, W., D. & Areosa, M., B., M. (2012). Some Financial Stability Indicators for Brazil, *Working Papers Series,* (287), Central Bank of Brazil. https://www.bcb.gov.br/content/publicacoes/WorkingPaperSeries/wps287.pdf

Schinasi, G.J. (2006). Defining Financial Stability, *IMF Working Paper*, 04/187. https://www.imf.org/external/pubs/ft/wp/2004/wp04187.pdf

Shah, S.M., Ali, A., Alim, W. & Alam, M. (2024). Constructing a Multidimensional Financial Stability Index: A Focus on Internal and External Drivers in Developing Nations. *Journal of Asian Development Studies*, 13 (3), 663-684. https://doi.org/10.62345/jads.2024.13.3.57

Van den End, J. W. (2006). *Indicator and boundaries of financial stability,* (097). Netherlands Central Bank, Research Department.

Wang, H., Xu, N., Yin, H. & Ji, H. (2022). The Dynamic Impact of Monetary Policy on Financial Stability in China after Crises, *Pacific-Basin Finance Journal*, 75, 1-18. https://doi.org/10.1016/j.pacfin.2022.101855

Zhao, B. (2016). The Analysis of The Measurements of Financial Stability. *Proceedings of the 2016 International Conference on Management Science and Innovative Education 2nd International Conference on Management Science and Innovative Education* (MSIE 2016), China, 134-137. https://doi.org/10.2991/msie-16.2016.20

Appendix 1. Financial Soundness Indicators

Core Set	
Deposit Takers	
Capital Adequacy	Regulatory capital to risk-weighted assets Tier 1 capital to risk-weighted assets Nonperforming loans net of provisions to capital Common Equity Tier 1 capital to risk-weighted assets Tier 1 capital to assets
Asset Quality	Nonperforming loans to total gross loans Loan concentration by economic activity Provisions to nonperforming loans
Earnings and Profitability	Return on assets Return on equity Interest margin to gross income Noninterest expense to gross income
Liquidity	Liquid assets to total assets (liquid asset ratio) for all deposit takers Liquid assets to short term liabilities for all DTs Liquidity Coverage Ratio for the DTs that have implemented Basel III liquidity standards Net Stable Funding Ratio for the DTs that have implemented Basel III liquidity standards
Sensitivity to Market Risk	Net open position in foreign exchange to capital
Real Estate Markets	
	Residential real estate prices
Additional Set	
Deposit Takers	Large exposures to capital Geographical distribution of loans to total loans Gross asset position in financial derivatives to capital Gross liability position in financial derivatives to capital Trading income to total income Personnel expenses to noninterest expenses Spread between reference lending and deposit rates Spread between highest and lowest interbank rate Customer deposits to total (noninterbank) loans Foreign-currency denominated loans to total loans Foreign-currency denominated liabilities to total liabilities Credit growth to private sector
Other Financial Corporations	Assets to total financial system assets (for total of OFCs and by subsectors) Assets to gross domestic product (GDP) (for total of OFCs and by subsectors)
Other Financial Corporations Money Market Funds	Sectoral distribution of investments Maturity distribution of investments
Other Financial Corporations Insurance Corporations	Shareholder equity to total invested assets (life and non-life insurance) Combined ratio (non-life insurance only) Return on assets (life insurance only) Return on equity (life and non-life insurance)
Other Financial Corporations Pension Funds	Liquid assets to estimated pension payments in the next year Return on assets
Nonfinancial Corporations	Total debt to equity External debt to equity Foreign currency debt to equity Total debt to GDP Return on equity Earnings to interest and principal expenses Earnings to interest expenses
Households (HH)	Household debt to GDP Household debt service and principal payments to income Household debt to household disposable income
Real Estate Markets	Commercial real estate prices Residential real estate loans to total loans Commercial real estate loans to total loans

Source: IMF (2006), FSI Compilation Guide and Amendment, p.2-3.

Appendix 2. Skewness ve Kurtosis (SK) Test Results

	2010		2020	
Index	prob(skewness=0)	prob(kurtosis=3)	prob(skewness=0)	prob(kurtosis=3)
1	0,0028	0,0114	0,1828	0,9409
2	0,0046	0,0142	0,2079	0,8753
3	0,0231	0,2622	0,3058	0,5354
4	0,0470	0,5514	0,2085	0,8340
5	0,0053	0,0219	0,1027	0,7178
6	0,0193	0,1575	0,3672	0,7873
7	0,0005	0,0028	0,2321	0,7424
8	0,0487	0,3674	0,4363	0,7738
9	0,0034	0,0127	0,4926	0,7177
10	0,0087	0,0300	0,5584	0,4326
11	0,0232	0,2082	0,4996	0,9385
12	0,0589	0,3791	0,8369	0,7299
13	0,2067	0,1781	0,0122	0,0787
14	0,4294	0,2232	0,0156	0,0791
15	0,7834	0,5139	0,0496	0,1173
16	0,6924	0,3777	0,0374	0,0807
17	0,0000	0,0005	0,0001	0,0018
18	0,0000	0,0005	0,0000	0,0001
19	0,0000	0,0004	0,0001	0,0023
20	0,0000	0,0007	0,0000	0,0001
21	0,0000	0,0005	0,0000	0,0013
22	0,0000	0,0009	0,0000	0,0006
23	0,0000	0,0009	0,0001	0,0024
24	0,0000	0,0004	0,0000	0,0002

Source: Calculated by the autho

Appendix 3. Hypothesis Tests Results

	2010			2020		
Index	Normal distribution	TTest Pr(T<t) Pr(|T|>ltl) Pr(T>t)	Mann-Whitney U Test (prob>lzl)	Normal distribution	TTest Pr(T<t) Pr(|T|>ltl) Pr(T>t)	Mann-Whitney U Test (prob>lzl)
1	X		0,7624	✓	0,9008 0,1985 0,0992	
2	X		0,8798	✓	0,9037 0,1926 0,0963	
3	X		0,7624	✓	0,9440 0,1120 0,0560	
4	X		0,2568	✓	0,9627 0,0747 **0,0373**	
5	X		0,7055	✓	0,9341 0,1318 0,0659	
6	X		0,5967	✓	0,8680 0,2640 0,1320	
7	X		0,8798	✓	0,9308 0,1384 0,0692	
8	X		0,4058	✓	0,9418 0,1164 0,0582	
9	X		0,4497	✓	0,2085 0,4171 0,7915	

Appendix 3. Hypothesis Tests Results (Cont.)

10	X		0,2265	✓	0,1677 0,3353 0,8323	
11	X		0,0588	✓	0,0996 0,1991 0,9004	
12	✓	0,9776 0,0449 **0,0224**		✓	0,0679 0,1358 0,9321	
13	✓	0,5543 0,8915 **0,4457**		X		0,8590
14	✓	0,5842 0,8317 0,4158		X		0,4772
15	✓	0,7291 0,5417 0,2709		X		0,5676
16	✓	0,7751 0,4499 0,2249		X		0,8065
17	X		0,9397	X		0,4239
18	X		0,6501	X		0,3272
19	X		0,8798	X		0,4239
20	X		0,7055	X		0,2885
21	X		0,3643	X		0,0756
22	X		0,2899	X		0,0604
23	X		0,9397	X		0,1826
24	X		0,8206	X		0,0864

Source: Calculated by the author