

Impact of financial stress in advanced and emerging economies

Differences in the impact of financial stress

Flavio Cesar Valerio Roncagliolo

Department of Economics, Universidad de Lima, Lima, Peru, and

Ricardo Norberto Villamonte Blas

Department of Economics, Universidad Nacional Mayor de San Marcos, Lima, Peru

Received 16 May 2021
Revised 15 July 2021
Accepted 6 September 2021

Abstract

Purpose – The purpose of the paper is to examine the differences in the impact of financial stress in advanced and emerging economies.

Design/methodology/approach – The authors employ a panel vector autoregression model (PVAR) for a comparative analysis of the relationship between financial stress, economic growth and monetary stability in 14 advanced and emerging economies. A homogeneous measure of financial stress is constructed and measured as an index that provides signals of stress episodes in an economy.

Findings – The impact of financial stress shocks is greater on the economic growth of advanced economies; likewise, financial stress shocks are significant only in advanced economies. The interbank interest rate is negatively affected by financial stress in emerging economies. In general, the results show a clear view of the importance of financial stability and the economic relevance of financial stress measures in the context of macro-prudential regulation.

Originality/value – The results can be extended to monetary policy to implement measures that mitigate the impact of future financial crises.

Keywords Economic growth, Inflation, Interest rate, Real estate market, Financial stress, PVAR

Paper type Research paper

Introduction

The stability of the financial system became pertinent during the integration of the financial system and its subsequent deregulation in the 1990s (Stiglitz, 2003). The worldwide financial crisis of 2008–2009 generated great economic instability and, with it, fluctuations in the growth of the major economies, which led to a reduction in the production of imports and exports. Very few economies did not report reductions in their Gross Domestic Product (GDP) at that time. The most noticeable consequence of this financial crisis was the collapse of Lehman Brothers, the fourth-largest investment bank in the USA. This initiated the collapse of the entire American financial system (Verick and Islam, 2010). Following this event, a lot of research has been conducted to analyse the relationship between the banking system, financial stress and economic growth. Brunnermeier (2009), Adrian *et al.* (2010) and Davig and Hakkio (2010) conducted studies of the USA; Dhal *et al.* (2011) conducted studies of India; Van Roye (2011) focused on Germany and Mallick and Sousa (2013) and Apostolakis *et al.* (2019) analysed the impact of financial stress on European economies; however, to the best of our knowledge, this is the first study to conduct a comparative analysis of the impact of financial stress between advanced and emerging economies.

© Flavio Cesar Valerio Roncagliolo and Ricardo Norberto Villamonte Blas. Published in *Journal of Economics, Finance and Administrative Science*. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence maybe seen at <http://creativecommons.org/licenses/by/4.0/legalcode>.



According to Smets (2014), maintaining financial stability helps ensure a well-functioning financial system, which generates efficient price stability. Likewise, macro-prudential policies can help reduce financial stress index (FSI) as they correctly manage the financial cycle, which increases the resilience of the financial sector to possible economic instability. Financial stress is a disruption in the functioning of financial markets as an incoherent intermediary between borrowers, lenders, buyers and sellers (Sandahl *et al.*, 2011). Studying financial stress ensures that if systemic financial stress levels can be detected at an early stage, fiscal and monetary policy measures can be taken to mitigate the potential impact on the economy (Haefckel and Skarholt, 2011). Claessens and Habermeier (2013) indicate that monetary policy aims to maintain price stability. They also point out that macro-prudential policies focus on the search for financial stability. Similarly, Blot *et al.* (2020) argue that an unconventional monetary policy hurts sovereign yields, thus reducing the level of financial stress in the economy.

We also examined the relationship between the stock market, public debt and financial stress. Cipollini and Mikaliunaite (2020) argue that there is a transmission effect of financial stress in highly integrated markets as in the case of the Eurozone or the Latin American Integrated Market (MILA). They also posit that the level of debt has a determining effect on the transmission capacity. Jaramillo *et al.* (2017) argue that the level of debt affects financial markets regardless of the state of the economy, effectively reducing the returns of the stock market and increasing the yields on sovereign bonds.

We posit that this research will improve the understanding of the impact of financial stress on economic activity, as well as the channels through which financial stress increases. In addition, the index could serve as a precautionary measure against possible crises in the financial market and consequently informing measures to mitigate the impact of financial stresses on economies. This study analyses two models: the first seeks to find the relationship between GDP, inflation and financial stress in a sample of emerging and advanced economies, and the second seeks to find the relationship between the variables of the first model, the interest rate and house prices. Our hypothesis is as follows: *Financial stress affects the economic growth, financial stability and monetary stability of advanced economies more than emerging economies.* To prove this hypothesis, we employed panel vector autoregressive (PVAR) model techniques to investigate the correlations in financial data obtained from seven advanced economies (The USA, Canada, Germany, France, Spain, Italy and Switzerland) and seven emerging economies (Peru, Chile, Colombia, Mexico, Brazil, China and Russia) from the year 2005 to the second quarter of the year 2019. The econometric estimations show that financial stress hurts all the variables analysed more significantly in advanced economies. Our hypothesis was thus proven.

Literature review

Financial stress index

Financial stress is popularly defined as the periods in which economic agents are exposed to extreme uncertainties leading to negative expectations of financial markets (Schinasi, 2004; Allen and Wood, 2006). Illing and Liu (2006) created a financial stress index (FSI) which was applied to Canada by incorporating continuous variables where extreme values corresponded to periods of crisis. Likewise, Cardarelli *et al.* (2011), Balakrishnan *et al.* (2011) and Park and Mercado (2014) used variants of this method and applied it to emerging economies.

Van Roye (2011) constructed a financial stress measure for Germany using several bank measures, including the US Treasury Bond and the Eurodollar. Haefckel and Skarholt (2011) constructed a daily financial stress measure for Sweden by dividing the Swedish financial market into 5 parts and incorporating their individual measures into a single index, whilst Park and Mercado (2014) constructed a homogeneous measure of financial stress for 25 emerging economies.

Dhal *et al.* (2011) constructed a banking stability index to study the relationship between financial stability and economic growth in India. They found that economic growth, inflation and financial market stability share a medium-to-long-term relationship. They also found that financial stability can help economic growth and improve the effectiveness of monetary policies. Mallick and Sousa (2013) examined the impact of financial stress and monetary policy on the economy. They found that monetary policy shocks cause an increase in interest rate, inflation, financial stress, GDP and loan growth in the early periods following the shock. Financial stress shocks can also lead to a decrease in commodity prices, GDP, interest rates and an increase in economic growth.

Malega (2015) constructed a FSI with a specific focus on the Czech Republic, finding a significant and positive response to unemployment due to the impact of financial stress. They also found that financial stress hurts inflation and interest rates. Tng (2017) constructed a FSI for Malaysia, the Philippines and Thailand, concluding that higher-financial stress leads to tighter domestic credit conditions and lower-economic activity in all five economies, and the impact on the real economy shows a rapid initial decline followed by a gradual dissipation.

Creel *et al.* (2015), Stolbov and Shchepeleva (2016) and Landgren and Crook (2018) analysed the impact of financial stress on various economies, finding that financial stress hurts economic activities such as industrial production or inflation; furthermore, they highlighted the importance of macro-prudential monitoring of financial stability and the importance of central banks and policymakers in implementing tools for this purpose. Polat and Ozkan (2019) examined the impact of the financial stress in the Turkish economy; they found that the deterioration of the financial system reduces industrial production and increases inflation. They argued that stress levels should be monitored as an unconventional tool by policymakers to avoid financial instability. Ozcelebi (2020) examined the relationship between financial stresses in advanced economies with the dynamics of the exchange market in emerging economies. They concluded that high levels of financial stress can depreciate the currencies of emerging economies; this effect on the exchange rate will have a positive effect on the volatility of the stock market in the short term (Mrroua and Trabelsi, 2020). Likewise, Eldomiaty *et al.* (2020) examine the relationship between the stock market sector, inflation and the interest rate using a cointegration model, concluding that there is a negative relationship of inflation with stock market performance, and the interest rate has a positive relationship, which is also indicating that stock market stability requires interest rate stability and robust control on inflation.

This study is related to Cardarelli *et al.* (2011) and Park and Mercado (2014), who employed a measure of financial stress to examine the cross-border transmission of financial stress. Balakrishnan *et al.* (2011) investigated how financial stress is transmitted from advanced to emerging economies. They found that the degree of financial stress is linked to the depth of financial relationships between advanced and emerging economies. Similarly, Hung (2019) conducted a study of the returns and volatility spillover of financial markets, finding that financial markets became even more integrated during the crisis, generating a volatility spillover effect that has relevant implications for policymakers. This study is also related to Apostolakis and Papadopoulos (2015) who analysed the impact of financial stress on economic growth, inflation and real estate for advanced economies in the Organisation for economic Co-operation and Development (OECD) through Panel vector autoregression (VAR). However, we extend the literature to include an analysis of the impact of financial stress in advanced and emerging economies.

Construction of the financial stress index

The construction of the FSI follows the work of Balakrishnan *et al.* (2011) and Park and Mercado (2014), who constructed a homogeneous FSI for advanced and emerging economies.

Banking sector. Due to the large variety of economies chosen for the sample, the heterogeneity of the sample and available data, the measure of banking stress “banking sector beta” as in [Balakrishnan et al. \(2011\)](#) was used. This banking sector beta follows [Sharpe’s \(1964\)](#) Capital Asset Pricing Model (CAPM) model and is given by as follows:

$$\beta = \frac{\text{cov}(r, m)}{\text{var}(m)}$$

where r and m are the bank stock and market returns, respectively. The volatility of the banking sector is measured depending on the value of β ; the higher the value of β , the higher the level of stress in which the banking sector is.

For the construction of the beta, we used monthly data on the average of the returns of the banks listed on each stock exchange of the economies in the sample and the return of the main stock market index of each country. The treatment of the data follows the work of [Park and Mercado \(2014\)](#): (1) the data were converted into year-to-year returns by taking the difference in logarithms of the current period’s price with concerning last year, (2) the β was calculated using the covariance and variance of the returns in 12 months and (3) the series were transformed to take a positive value if they exceeded the value 1 and 0 otherwise.

Foreign exchange market. This study uses the conditional volatility of the monthly change in the nominal effective exchange rate quantified by a Generalized AutoRegressive Conditional Heteroskedasticity GARCH (1, 1) process. This measure is a weighted basket of the nominal exchange rate concerning the foreign currencies of a given country.

Stock market. Two stock market measures are included in the composition of the FSI. The first is stock market returns multiplied by minus one, where a decrease in returns will cause the index to increase ([Apostolakis et al., 2019](#)). The second component is stock market volatility, which is measured as a GARCH (1,1) process considering the distribution that best fits the characteristics of stock market returns. The GARCH (1,1) process proposed by [Bollerslev \(1986\)](#) and [Engle \(2001\)](#) is composed of two equations as follows:

$$r_i = \mu_i + \sqrt{h_i}\varepsilon_i, \quad \forall i \in \{1, \dots, N\} \quad (1)$$

$$h_i = \omega + \alpha(r_{i-1} - \mu_{i-1})^2 + \beta h_{i-1} \quad (2)$$

where [Equation \(1\)](#) is the equation of the returns of the main stock indexes of each country, μ_i is the mean of r for each i and ε_i is the error term for each i that follows a normal distribution $N \sim (0,1)$. [Equation \(2\)](#) specifies the conditional variance process for each h_i that depends on the quadratic term of $(r_{i-1} - \mu_{i-1})$ and the variance h_{i-1} . This equation only makes sense if $\omega > 0$, $\alpha > 0$, $\beta > 0$ and $\alpha + \beta < 1$ are satisfied ([Bollerslev, 1986](#); [Engle, 2001](#)). This method for measuring stock market volatility and incorporating it into a stress index was used by [Balakrishnan et al. \(2011\)](#), [Cardarelli et al. \(2011\)](#) and [Park and Mercado \(2014\)](#). Monthly data were used, and the returns were calculated using the month-to-month difference in stock market indices.

Debt market: In this research, due to the limited availability of data on emerging economies, we chose to use the measure adopted by [Cardarelli et al. \(2011\)](#) research, which uses the yield spreads of the ten-year sovereign bond with respect to the US Treasury bond; in the USA, only the yield of the treasury bond will be used. This measure not only captures the systemic risk of the sovereign debt market but also any form of fiscal fragility ([Rodríguez-Moreno and Peña, 2013](#)).

Financial stress index weighting scheme

The choice of the weighting method of the financial stress components in a single index is of great importance in this construction. The method mostly used for the construction of this index is equality of variances in which the FSI is constructed by assigning each of the

components similar importance and assuming that the series are normally distributed and that each series is degraded and standardised. Furthermore, equality of variances is suitable for the construction of indexes that measure the severity of financial stress in a heterogeneous sample of economies (Das *et al.*, 2005). Each component was calculated as follows:

$$y_t = \frac{(x_t - \bar{x})}{\sigma}$$

where y_t is the degraded and standardised series of each component, \bar{x} is the mean of the time series and σ is the standard deviation of the series. The degraded and standardised components are then transformed into values from 0 to 1, where 1 is the largest historical value. The choice was based on the research by Cardarelli *et al.* (2011), Yiu *et al.* (2010), Park and Mercado (2014) and Apostolakis *et al.* (2019).

Finally, the FSI will be composed as follows:

$$FSI_{i,t} = \beta_{i,t} + \text{Stock Market Return}_{i,t} + \text{Stock Market Volatility}_{i,t} + \text{Debt Spread}_{i,t} \\ + \text{Exchange Market Volatility}_{i,t}$$

where a FSI greater than zero will mean episodes of financial stress in the economies in the sample and a value less than zero will mean that the financial markets are stable.

Methodology

Data collection

Quarterly economic growth (GDP), consumer price index (CPI), house prices (HP), short-term interest rate and FSI's data were obtained from Bloomberg and the Bank for International Settlements (BIS). To obtain more balanced panel data and achieve consistency in findings, monthly data were converted to quarterly data. The data ranges from Q1 2005 to Q2 2019; 2019 full-year data were not considered due to unavailable data sources for both economies at the time this research took place. The sample is divided into two groups: emerging economies and advanced economies.

Table 1 shows the descriptive statistics of the sample. As can be seen, there is a higher variability of financial stress in advanced economies; furthermore, financial stress has a negative correlation with house prices and economic growth and a positive correlation with interest rate and inflation. To test the stationarity of the series, unit root tests for panel data were carried out; the tests used were Harris and Tzavalis (1999), Hadri (2000), Breitung (2005), Phillips and Perron (1988), Levin *et al.* (2002) and Im *et al.* (2003). These many tests were necessary to check for unit roots in the panel data series. The results reject the null hypothesis of the presence of unit roots in the panel data series at a 5% level of significance, except for the interest rate; therefore, this variable will be estimated in differences.

Econometric estimation

We employed the PVAR model to investigate the relationship between the impact of financial stress on economic growth, and monetary and financial stability. The VAR methodology allows for the treatment of the study variables as endogenous, thus enabling us to examine the effect of the shocks of one variable on the other. Following the model of Love and Zicchino (2006), we used the PVAR model together with the generalised method of moments (GMM) to examine and compare the impact of stress between advanced and emerging economies. The PVAR model was formulated as follows:

$$Y_{i,t} = \Gamma_0 + \Gamma(L)Y_{i,t-1} + f_i + d_t + e_t$$

Table 1.
Descriptive statistics

	Advanced economies panel				Emerging economies panel					
	GDP	CPI	HP	Interest	FSI	GDP	CPI	HP	Interest	FSI
Mean	1.40	1.45	0.28	0.98	0.00	4.18	4.48	0.89	5.89	0.00
Median	1.78	1.48	0.40	0.36	-0.43	4.06	3.89	0.79	4.58	-0.27
Minimum	-7.17	-1.62	-6.75	-1.87	-4.46	-9.4	-3.03	-26.12	0.43	-4.65
Maximum	5.93	5.30	5.61	5.26	9.89	15.00	16.2	13.22	19.67	8.91
Std. dev.	2.08	1.19	1.73	1.51	2.39	3.68	2.86	3.15	3.56	2.31
Skewness	-1.41	0.12	-0.52	1.06	0.8	-0.12	1.42	-0.99	1.29	0.76
Kurtosis	2.55	0.06	1.56	0.14	0.65	0.98	3.07	15.03	1.28	0.71
Sample size	406	406	406	406	406	406	406	406	406	406

Pairwise correlation coefficients										
	GDP	CPI	HP	Interest	FSI	GDP	CPI	HP	Interest	FSI
GDP	1					1				
CPI	0.1760 ^{***}	1				-0.300 ^{***}	1			
HP	0.3917 ^{***}	-0.185 ^{***}	1			0.2583 ^{***}	-0.135 ^{***}	1		
Interest	0.1628 ^{***}	0.5850 ^{***}	-0.029 [*]	1		-0.299 ^{***}	0.6865 ^{***}	-0.010 [*]	1	
FSI	-0.481 ^{***}	0.0745 ^{**}	-0.359 ^{***}	0.1023 ^{**}	1	-0.165 ^{***}	0.2488 ^{***}	-0.1127 ^{***}	0.2073 ^{***}	1

Note(s): Correlation coefficients were calculated using Pearson's correlation test. ^{***}, ^{**}, and ^{*} denote the level of significance at 1, 5 and 10%, respectively
Source(s): Own elaboration

where $Y_{i,t}$ is a vector of endogenous variables; Γ_0 is the vector of constants; $\Gamma(L)$ is the matrix of polynomial lag operators; f_i is the fixed effects parameter that captures time-invariant effects unobservable at the country level; d_i is the forward mean difference parameter and e_t is the vector of independent and identically distributed errors. The time series were disaggregated and forward skewed using the Helmert procedure as in [Apostolakis et al. \(2019\)](#). This was done since the fixed effects are correlated with the regressors ([Arellano and Bover, 1995](#)); likewise, the models were estimated by employing GMM-style instrumental variables as proposed by [Holtz-Eakin et al. \(1988\)](#).

In the following section, first, the results of the simple model and the extended five-variable model are presented; second, the Granger causality tests for each equation of the PVAR model are presented; third, the impulse response functions (IRFs) are presented. For greater accuracy of the confidence intervals, 1,000 Monte Carlo (MC) iterations are used, and finally, the forecast error variance decomposition (FEVD) is analysed.

Results

In the VAR models, the variables are arranged according to the Cholesky decomposition, which assembles the variables introduced in the model from the most exogenous to the most endogenous, followed by the introduction of macro-economic variables in the system. The models proposed for both advanced and emerging economies are as follows:

Base model: GDP – CPI – FSI

Extended model: GDP – CPI – Real estate prices – Interest rate – FSI

This ordering is since the shocks originate from the real sector of the economy and the financial sector is affected by several such shocks.

Base model

Base model estimation results. [Table 2](#) shows the results of the PVAR (1) model for emerging and advanced economies. As can be seen, the impact of financial stress on the economy is much more significant in advanced economies on the first lag. Meanwhile, the effect of the financial stress shock on price stability, which is measured as inflation, is not significant in any of the economies.

Granger causality of the base model. [Table 3](#) shows the Granger causality results of both models. The null hypothesis of this test is: *FSI does not Granger-cause GDP or inflation.* As

Emerging economies			Advanced economies		
GDP	L. GDP	0.9179***	GDP	L. GDP	0.8804***
	L. CPI	-0.1302***		L. CPI	-0.2126***
	L. FSI	-0.0690**		L. FSI	-0.0740***
CPI	L. GDP	0.0853***	CPI	L. GDP	0.0535***
	L. CPI	0.9360***		L. CPI	0.9057***
	L. FSI	-0.03020		L. FSI	-0.0001
FSI	L. GDP	0.0459**	FSI	L. GDP	0.0420
	L. CPI	0.1792***		L. CPI	0.3538***
	L. FSI	0.7461***		L. FSI	0.7851***

Note(s): The PVAR model was estimated with one lag according to the modified Bayesian information criterion (MBIC). No. of observations: 812 per variable; no. of panels: 14 panels. ***, ** and * denote significance level at 1% and 10%, respectively

Source(s): Own elaboration

Table 2.
Base model coefficients

JEFAS

Emerging economies		Advanced economies	
Equation/excluded	Chi square	Equation/excluded	Chi square
GDP		GDP	
CPI	7.897 ^{***}	CPI	27.156 ^{***}
FSI	2.597 ^{**}	FSI	9.606 ^{***}
Todas	7.985 ^{***}	Todas	44.868 ^{***}
CPI		CPI	
GDP	31.430 ^{***}	GDP	11.101 ^{***}
FSI	1.447	FSI	0.004
Todas	33.368 ^{***}	Todas	12.380 ^{**}
FSI		FSI	
GDP	2.837 ^{**}	GDP	1.504
CPI	12.602 ^{***}	CPI	24.960 ^{***}
Todas	13.189 ^{***}	Todas	33.402 ^{***}

Table 3.
Granger causality of
the base model

Note(s): These results are based on a three-variable PVAR model (1). Values are Wald's chi-square statistics. ^{***}, ^{**} and ^{*} denote the significance level at 1, 5 and 10%, respectively

Source(s): Own elaboration

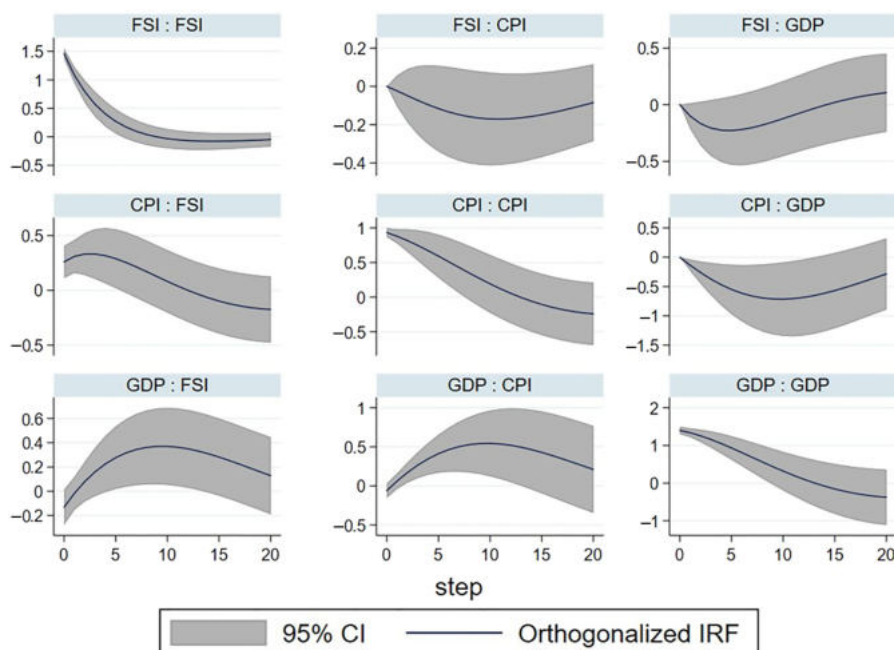
can be seen, Wald statistics in the case of emerging economies indicate bidirectional causality between financial stress and economic growth, i.e. FSI has a causal effect on GDP and vice versa. In the case of advanced economies, there is unidirectional causality between FSI and GDP, and financial stress has a causal relationship with economic growth.

Impulse response functions. Figures 1 and 2 show the IRFs for emerging and advanced economies, respectively. They also show that in the case of emerging and advanced economies, GDP responds negatively and significantly to a financial stress shock, being more significant in the latter. These results are consistent with previous research (Mallick and Sousa, 2013; Creel *et al.*, 2015; Apostolakis and Papadopoulos, 2015). In the case of FSI, it responds positively to shocks to CPI and economic growth in emerging economies; in the case of advanced economies, FSI responds positively to shocks to GDP and CPI. Inflation responds significantly and positively after one lag to a GDP shock in advanced and emerging economies. GDP responds negatively to CPI shocks in advanced and emerging economies. These results are also consistent with Mallik and Chowdhury (2001).

Forecast error variance decomposition (FEVD) of the base model. Table 4 shows the results of the FEVD of the PVAR base model (1), which shows that FSI in the case of advanced economies is responsible for 7% and 1.5% of the variations in GDP and CPI, respectively. For emerging economies, FSI is responsible for 1% and an average of 2% of the changes in GDP and CPI. Meanwhile, in the case of macroeconomic variables, GDP is responsible for 20% and 15% of the variations in FSI and CPI and 21% and 20% in emerging and advanced economies, respectively. Also, the results show that FSI is more responsible for GDP variations in emerging economies than advanced economies. However, in advanced economies, FSI is more responsible for CPI variations.

Extended model

Extended model estimation results. Table 5 shows the estimation results of the extended model PVAR (1); as can be seen, FSI continues to hurt GDP in both emerging and advanced economies but has only a positive and significant impact on CPI in advanced economies. Also, it can be seen that FSI hurts real estate prices in both emerging and advanced economies but only hurts interest rates in emerging economies. This finding can be attributed to European economies reducing their interest rates to negative levels from 2014 (regardless of the level of stress in their economies) as a measure for price stability.



Note(s): Impulse: Response, confidence intervals were performed with 1000 Monte Carlo iterations

Source(s): Own elaboration

Figure 1.
IRFs of the three-variable model for emerging economies

Granger causality of the extended model. The results in Table 6 show that most variables can predict each other, i.e. they are bidirectional. In the case of emerging economies, FSI has a bidirectional relationship with house prices and a unidirectional relationship with the interest rate and the CPI; however, in advanced economies, FSI has a bidirectional relationship with the CPI and house prices and a unidirectional relationship with the interest rate.

Impulse response functions of the extended model. Figures 3 and 4 show the IRFs for the emerging and advanced economies, respectively. The IRFs show that FSI shocks have similar effects on real estate prices in both emerging and advanced economies but are more significant in advanced economies. The other variables of the model do not present significant IRFs in the presence of FSI shocks. Meanwhile, the FSI is positively affected by shocks to all model variables in both emerging and advanced economies.

Variance decomposition (FEVD) of the extended model. Table 7 shows the results of the FEVD of the extended PVAR model (1). As can be seen, FSI and inflation are responsible for the greater proportions of the variations of GDP in emerging economies and advanced economies, respectively. Concerning the new aggregate variables, FSI is more responsible for the changes in real estate prices in advanced economies than in emerging economies, and the opposite is true for the interest rate. Meanwhile, GDP, inflation and real estate prices are more responsible for the changes in FSI in advanced economies than in emerging ones.

Discussion

Most of the results obtained in this study are consistent with previous studies. For example, Apostolakis and Papadopoulus (2015) states that financial stability should be monitored

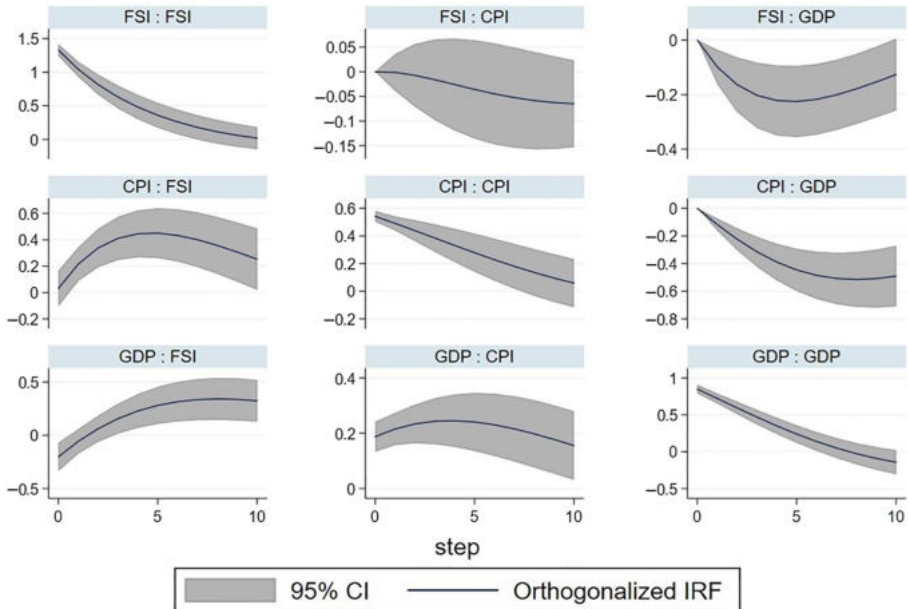


Figure 2. IRFs of the three-variable model for emerging economies

Note(s): Impulse: Response, confidence intervals were performed with 1000 Monte Carlo iterations
Source(s): Own elaboration

Response variable/forecast horizon	Emerging economies Impulse variable			Advanced economies Impulse variable		
	GDP	CPI	FSI	GDP	CPI	FSI
GDP						
10	0.8611	0.1373	0.0016	0.5221	0.3952	0.0827
20	0.7634	0.2300	0.0063	0.4501	0.4846	0.0652
CPI						
10	0.2310	0.7537	0.0152	0.2896	0.7018	0.0085
20	0.3693	0.6158	0.0150	0.3071	0.6683	0.0246
GDP						
10	0.0848	0.2123	0.7029	0.1017	0.2053	0.6929
20	0.2015	0.1958	0.6027	0.1585	0.2082	0.6333

Source(s): Own elaboration

Table 4. FEVD of the base model

macro-prudentially through tools developed by central banks and policymakers. Our results consistently indicate a significant increase in inflation from a financial stress shock. Similarly, they also indicate that financial stress shocks hurt economic growth, government deficit and house prices. [Park and Mercado \(2014\)](#) state that the FSI has a great impact on economies and that a shock in the stress index can spread to other economies. Further, they posit that the financial stress of emerging economies is affected by global growth and other similar factors. Consistently, our results also show that the stress index of advanced and emerging economies affects various domestic economies; global and domestic factors also

Emerging economies			Advanced economies			Differences in the impact of financial stress
GDP	L. GDP	0.9442 ^{***}	GDP	L. GDP	0.5947 ^{***}	
	L. CPI	-0.0409		L. CPI	-0.3077 ^{***}	
	L. House prices	-0.0126		L. House prices	0.0829 ^{***}	
	L. Interest rate	-1.2551 ^{***}		L. Interest rate	3.7689 ^{***}	
	L. FSI	-0.0109 [*]		L. FSI	0.0342 [*]	
CPI	L. GDP	0.0399 ^{***}	CPI	L. GDP	-0.0278 [*]	
	L. CPI	0.8756 ^{***}		L. CPI	0.8794 ^{***}	
	L. House prices	0.0171		L. House prices	0.0194	
	L. Interest rate	0.7362 ^{***}		L. Interest rate	1.0726 ^{***}	
	L. FSI	-0.0257		L. FSI	0.0298 ^{***}	
House prices	L. GDP	0.2617 ^{***}	House prices	L. GDP	-0.0234	
	L. CPI	0.1951 ^{***}		L. CPI	-0.0803 ^{***}	
	L. House prices	0.2612 ^{***}		L. House prices	0.5677 ^{***}	
	L. Interest rate	-1.2610 ^{***}		L. Interest rate	0.1907	
	L. FSI	-0.1035 ^{**}		L. FSI	-0.1300 ^{***}	
Interest rate	L. GDP	0.0137 ^{**}	Interest rate	L. GDP	-0.0289 ^{***}	
	L. CPI	-0.0353 ^{***}		L. CPI	-0.0302 ^{***}	
	L. House prices	0.0103 [*]		L. House prices	0.0281 ^{***}	
	L. Interest rate	0.6000 ^{***}		L. Interest rate	0.9953 ^{***}	
	L. FSI	-0.0195 ^{**}		L. FSI	0.0071	
FSI	L. GDP	0.0432 ^{**}	FSI	L. GDP	0.0310	
	L. CPI	0.1141 ^{***}		L. CPI	0.3519 ^{***}	
	L. House prices	0.0540 ^{***}		L. House prices	0.1130 ^{***}	
	L. Interest rate	0.1749 ^{***}		L. Interest rate	0.6231 ^{***}	
	L. FSI	0.7628 ^{***}		L. FSI	0.8295 ^{***}	

Note(s): The PVAR model was estimated with one lag according to the MBIC. No. of observations: 812 per variable; no. of panels: 14 panels. ^{***}, ^{**} and ^{*} denote significance level at 1, 5 and 10%, respectively

Source(s): Own elaboration

Table 5.
Extended model results for emerging and advanced economies

affect the stress index, and trade openness has a positive effect on financial stress. Mallick and Sousa (2013) posit that monetary policy shocks cause an increase in the interest rate, inflation, financial stress, GDP and loan growth in the first period following the shock. According to them, financial stress shocks lead to a decrease in commodity prices, GDP, interest rates and an increase in money growth. Finally, they hold that monetary policy shocks lead to an increase in the interest rate and a decrease in money growth. Similarly, our results also show that financial stress shocks lead to a decrease in economic growth and an increase in inflation.

Furthermore, Dhal *et al.* (2011) indicated that a bank stability index shock causes an increase in inflation and economic growth but a decrease in interest rates. In turn, an interest rate shock causes an increase in inflation and a decrease in economic growth. Consistently, in our results, the third model shows that inflation and economic growth shocks cause an increase in the interest rate. Cevik *et al.* (2013) constructed FSIs for five economies and examined their relationship with economic activities. Their results show that in most economies, a financial stress shock prolongs the industrial production index, as well as the other indicators of economic activity taken into consideration in their model. Further, they found that a shock of the industrial production index decreases the financial stress in that economy. Although the variables studied are not the same as in our case, they demonstrate the same impact that occurs in a scenario of a positive shock of the FSI to other exogenous variables. Finally, Kırıcı Çevik *et al.* (2019) examined the relationship between inflation and the FSI using a Markov regime-switching model. The results show that the monetary policy of the economies analysed is consistent with the Taylor rule. They found that the low-inflation-

Emerging economies		Advanced economies	
Equation/excluded	Chi square	Equation/excluded	Chi square
GDP		GDP	
CPI	1.330	CPI	37.909***
House prices	0.330	House prices	6.522***
Interest rate	95.835***	Interest rate	174.682***
FSI	0.124	FSI	2.941*
Todas	99.839***	Todas	204.775***
CPI		CPI	
GDP	8.553***	GDP	3.533*
House prices	1.635	House prices	1.298
Interest rate	214.924***	Interest rate	142.185***
FSI	2.374	FSI	7.126***
Todas	347.583***	Todas	204.190***
House prices		House prices	
GDP	28.093***	GDP	0.439
CPI	13.565***	CPI	2.398
Interest rate	89.166***	Interest rate	1.342
FSI	4.900***	FSI	20.627***
Todas	97.854***	Todas	57.831***
Interest rate		Interest rate	
GDP	4.678**	GDP	20.687***
CPI	9.640***	CPI	5.604**
House prices	3.548*	House prices	12.723***
FSI	4.046***	FSI	2.197
Todas	30.298***	Todas	58.864***
FSI		FSI	
GDP	3.505*	GDP	1.151
CPI	10.633***	CPI	46.887***
House prices	7.893***	House prices	11.631***
Interest rate	5.421***	Interest rate	11.756***
Todas	24.535***	Todas	106.115***

Table 6.
Granger causality of
the extended model

Note(s): These results are based on a 5-variable PVAR model (1). Values are Wald's chi-square statistics. ***, **, and * denote the significance level at 1, 5 and 10%, respectively
Source(s): Own elaboration

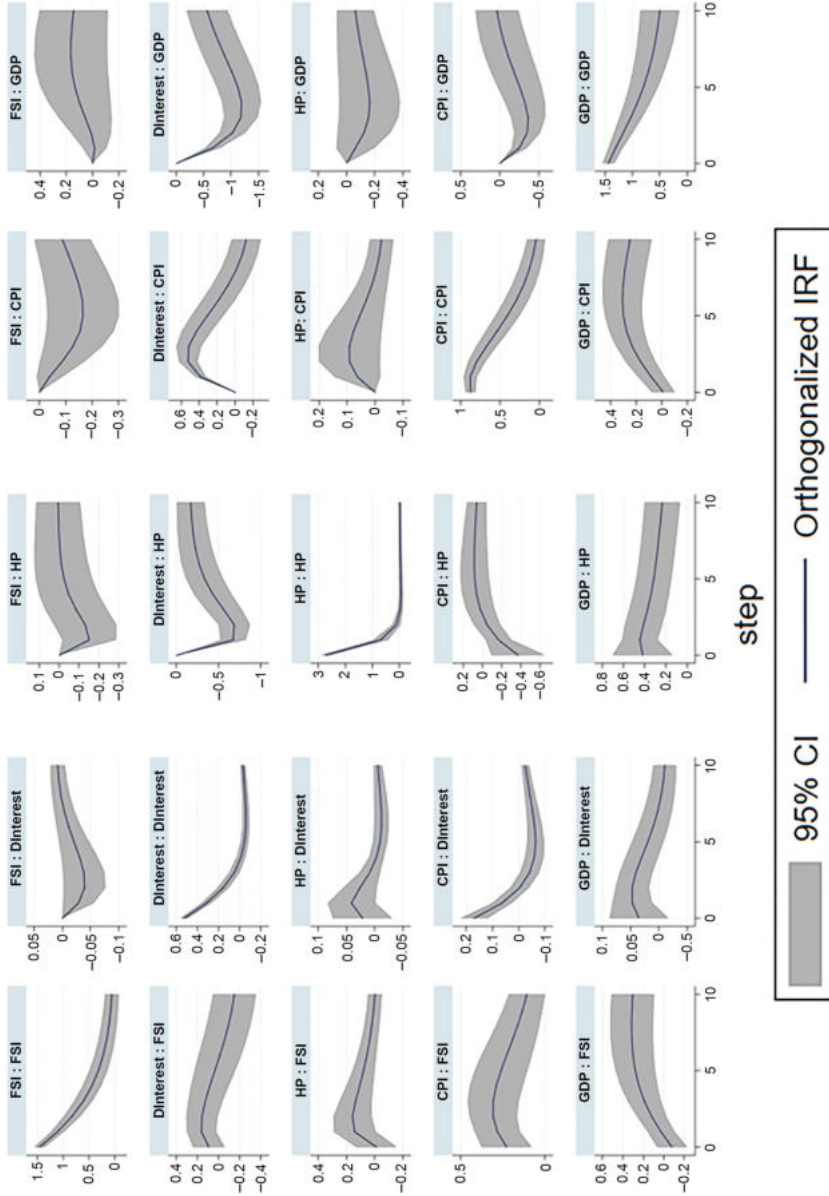
targeting regime is more persistent and has a longer duration than the high-inflation-targeting regime. They provide evidence that financial stress has a statistically significant impact on monetary policy in the studied economies. Although they used a different model, our results are consistent with theirs.

Conclusions

We examined the differences in the impact of financial stress on economic growth, financial stability and monetary stability between advanced and emerging economies.

We found that financial stress had an impact on all the variables analysed, being more significant in advanced economies. We thus posit that financial stress affects economic growth, financial stability and monetary stability more in advanced economies.

We found a negative relationship between the stress index and economic growth, with the impact of the stress index being much greater in advanced economies. Notably, our results are consistent with most studies in the literature; however, they are more pronounced, given the methodology used for the composition of the FSI (that was calculated homogeneously for the 14 economies using the variables available in all of them.)



Note(s): Impulse: Response, confidence intervals were performed with 1000 Monte Carlo iterations
Source(s): Own elaboration

Figure 3.
 IRFs of the extended model for emerging economies

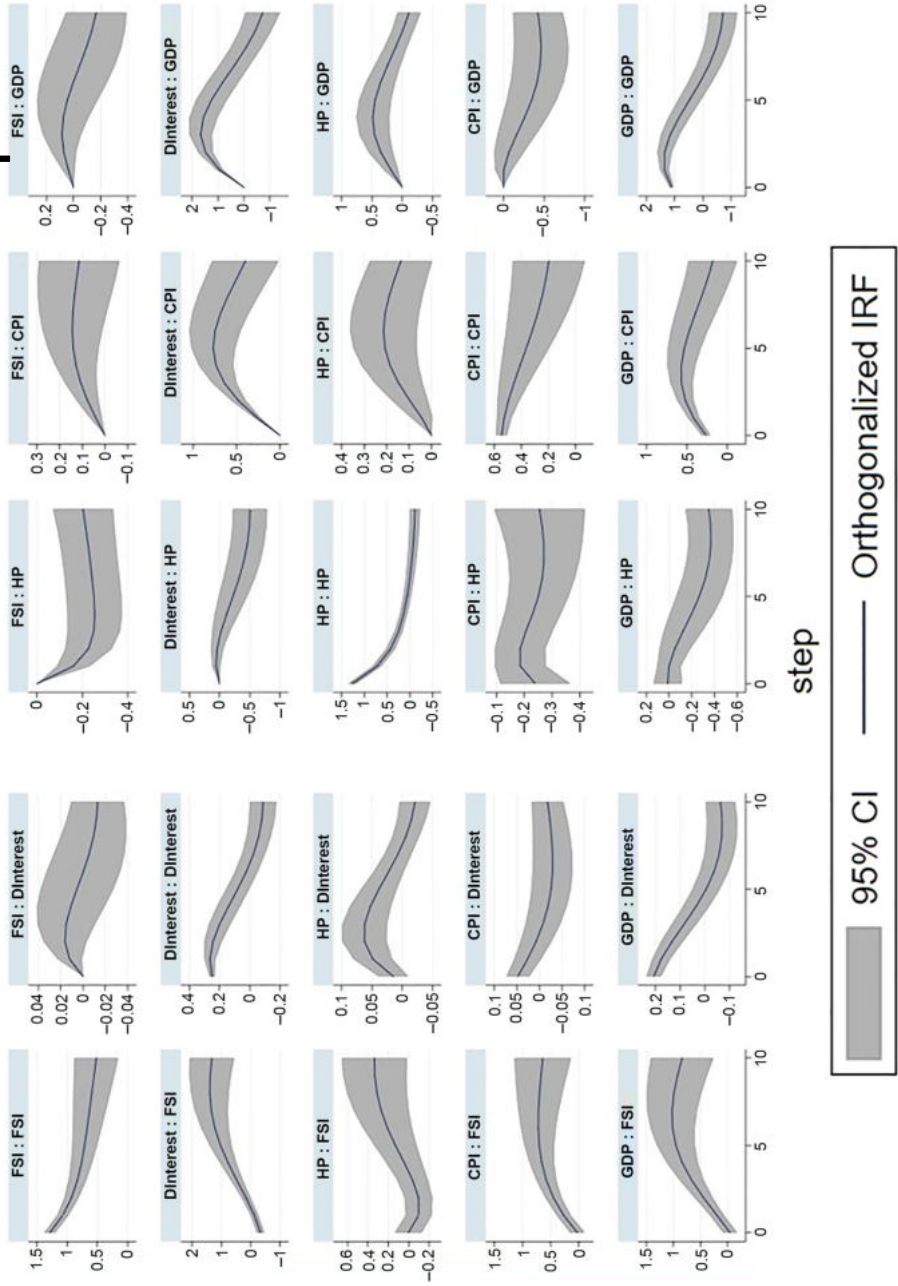


Figure 4.
IRFs of the extended model for advanced economies

Note(s): Impulse: Response, confidence intervals were performed with 1000 Monte Carlo iterations
Source(s): Own elaboration

Differences in the impact of financial stress

Response variable/ forecast horizon	Emerging economies Impulse variable					Advanced economies Impulse variable				
	GDP	CPI	HP	Interest	FSI	GDP	CPI	HP	Interest	FSI
GDP										
10	0.5009	0.0287	0.0076	0.4553	0.0074	0.3266	0.0587	0.0276	0.5853	0.0018
20	0.5026	0.0273	0.0071	0.4529	0.0100	0.3124	0.0621	0.0253	0.5919	0.0083
CPI										
10	0.1175	0.6414	0.0062	0.2039	0.0309	0.2463	0.2098	0.0132	0.5022	0.0258
20	0.1590	0.5811	0.0066	0.2223	0.0307	0.2306	0.2002	0.0135	0.5146	0.0410
HP										
10	0.1072	0.0183	0.7164	0.1535	0.0044	0.0441	0.1365	0.6637	0.0437	0.1120
20	0.1304	0.0187	0.6831	0.1634	0.0043	0.0911	0.1406	0.4681	0.1846	0.1153
Interest										
10	0.0185	0.1072	0.0073	0.8561	0.0109	0.2343	0.0188	0.1297	0.7271	0.0068
20	0.0203	0.1085	0.0073	0.8522	0.1172	0.2352	0.0187	0.0142	0.7249	0.0069
FSI										
10	0.0940	0.0970	0.0140	0.0180	0.7770	0.1443	0.2210	0.0039	0.1920	0.4309
20	0.1655	0.0892	0.1251	0.0564	0.6763	0.1691	0.1677	0.0090	0.3751	0.2790

Table 7.
Variance decomposition (FEVD) of the extended model

Source(s): Own elaboration

Inflation had a positive relationship with financial stress and a statistically significant effect on the economic activity of advanced economies. This can be attributed to the high amount of imported goods in these economies, which in high-financial stress scenarios (where the local currency depreciates) increases the local price basket.

Another important point to highlight is the relationship between the interest rate and financial stress, which shows mixed results; there is a negative relationship in the case of emerging economies, which is consistent with past research where a reduction in the interest rate occurs in scenarios of the financial crisis due to the reduction in consumption. In the case of advanced economies, we found that there is no relationship between financial stress and the interest rate. However, this can be attributed to the composition of our sample (being mostly European economies where the existing recession made them apply negative interest rate policies to reactivate the financial system regardless of the level of financial stress in the economy).

Overall, our results show that high levels of advanced economies' indebtedness to banks generate insolvency and high levels of public debt, which, in turn, increase the impact of financial stress on these economies. Meanwhile, for the emerging economies analysed, due to the low fiscal deficits that allow for greater penetration of their monetary policies to mitigate episodes of financial stress, the effect of financial stress shocks to them is diminished. Therefore, the FSI should be adapted to each economic sector and monitored by central banks to avoid liquidity problems, and monetary policy should focus on the export sector in cases of external transmission of financial stress, increasing money demand and external reserves.

Furthermore, the results obtained in this research are quite relevant for economies with high-trade openness, whose markets are exposed to the economic, financial and political problems of other economies (because financial markets are becoming increasingly integrated). Likewise, it is possible to analyse the impact of financial tensions in different economic sectors and apply appropriate measures to mitigate the impact of future economic crises.

Finally, the FSI constructed here can be incorporated as a non-conventional policy tool of economic relevance in the context of macro-prudential regulation, so central banks and policymakers can develop supervisory frameworks to examine financial stability and

soundness. To reduce financial stress in their economies, central banks or monetary authorities should prioritise the stability of their banking sectors and the solvency of their financial sectors.

References

- Adrian, T., Moench, E. and Shin, H.S. (2010), "Macro risk premium and intermediary balance sheet quantities", *IMF Economic Review*, Vol. 58 No. 1, pp. 179-207.
- Allen, W.A. and Wood, G. (2006), "Defining and achieving financial stability", *Journal of Financial Stability*, Vol. 2 No. 2, pp. 152-172.
- Apostolakis, G. and Papadopoulos, A.P. (2015), "Financial stress spillovers across the banking, securities and foreign exchange markets", *Journal of Financial Stability*, Vol. 19, pp. 1-21.
- Apostolakis, G.N., Giannellis, N. and Papadopoulos, A.P. (2019), "Financial stress and asymmetric shocks transmission within the Eurozone. How fragile is the common monetary policy?", *The North American Journal of Economics and Finance*, Vol. 50, 101006.
- Arellano, M. and Bover, O. (1995), "Another look at the instrumental variable estimation of error-components models", *Journal of Econometrics*, Vol. 68 No. 1, pp. 29-51.
- Balakrishnan, R., Danninger, S., Elekdag, S. and Tytell, I. (2011), "The transmission of financial stress from advanced to emerging economies", *Emerging Markets Finance and Trade*, Vol. 47, Sup. 2, pp. 40-68.
- Blot, C., Creel, J., Hubert, P. and Labondance, F. (2020), "The role of ECB monetary policy and financial stress on Eurozone sovereign yields", *Empirical Economics*, Vol. 59 No. 3, pp. 1189-1211.
- Bollerslev, T. (1986), "Generalized autoregressive conditional heteroskedasticity", *Journal of Econometrics*, Vol. 31 No. 3, pp. 307-327.
- Breitung, J. (2005), "A parametric approach to the estimation of cointegration vectors in panel data", *Econometric Reviews*, Vol. 24 No. 2, pp. 151-173.
- Brunnermeier, M.K. (2009), "Deciphering the liquidity and credit crunch 2007-2008", *Journal of Economic Perspectives*, Vol. 23 No. 1, pp. 77-100.
- Cardarelli, R., Elekdag, S. and Lall, S. (2011), "Financial stress and economic contractions", *Journal of Financial Stability*, Vol. 7 No. 2, pp. 78-97.
- Cevik, E.I., Dibooglu, S. and Kutan, A.M. (2013), "Measuring financial stress in transition economies", *Journal of Financial Stability*, Vol. 9 No. 4, pp. 597-611.
- Cipollini, A. and Mikaliunaite, I. (2020), "Macro-uncertainty and financial stress spillovers in the Eurozone", *Economic Modelling*, Vol. 89, pp. 546-558.
- Claessens, S. and Habermeier, K. (2013), "The interaction of monetary and macroprudential policies", International Monetary Fund, Vol. 29.
- Creel, J., Hubert, P. and Labondance, F. (2015), "Financial stability and economic performance", *Economic Modelling*, Vol. 48, pp. 25-40.
- Das, M.U.S., Yossifov, M.P., Podpiera, R. and Rozhkov, D. (2005), "Quality of financial policies and financial system stress (No. 5-173)", International Monetary Fund.
- Davig, T. and Hakkio, C. (2010), "What is the effect of financial stress on economic activity?", *Federal Reserve Bank of Kansas City, Economic Review*, Vol. 95 No. 2, pp. 35-62.
- Dhal, S., Kumar, P. and Ansari, J. (2011), "Financial stability, economic growth, inflation and monetary policy linkages in India: an empirical reflection", *Reserve Bank of India Occasional Papers*, Vol. 32 No. 3, pp. 1-35.
- Eldomiatty, T., Saeed, Y. and AboulSoud, S. (2020), "The associations between stock prices, inflation rates, interest rates are still persistent: empirical evidence from stock duration model", *Journal of Economics, Finance and Administrative Science*, Vol. 25 No. 49, pp. 149-161.

-
- Engle, R. (2001), "GARCH 101: the use of ARCH/GARCH models in applied econometrics", *Journal of Economic Perspectives*, Vol. 15 No. 4, pp. 157-168.
- Hadri, K. (2000), "Testing for stationarity in heterogeneous panel data", *The Econometrics Journal*, Vol. 3 No. 2, pp. 148-161.
- Haefckel, S. and Skarholt, A. (2011), "A Swedish financial stress index", *Stockholm School of Economics*.
- Harris, R.D.F. and Tzavalis, E. (1999), "Inference for unit roots in dynamic panels where the time dimension is fixed", *Journal of Econometrics*, Vol. 91, pp. 201-226.
- Holtz-Eakin, D., Newey, W. and Rosen, H.S. (1988), "Estimating vector autoregressions with panel data", *Econometrica: Journal of the Econometric Society*, Vol. 56 No. 6, pp. 1371-1395.
- Hung, N.T. (2019), "Return and volatility spillover across equity markets between China and Southeast Asian countries", *Journal of Economics, Finance and Administrative Science*, Vol. 24 No. 47, pp. 66-81.
- Illing, M. and Liu, Y. (2006), "Measuring financial stress in a developed country: an application to Canada", *Journal of Financial Stability*, Vol. 2 No. 3, pp. 243-265.
- Im, K.S., Pesaran, M.H. and Shin, Y. (2003), "Testing for unit roots in heterogeneous panels", *Journal of Econometrics*, Vol. 115 No. 1, pp. 53-74, doi: [10.1016/S0304-4076\(03\)00092-7](https://doi.org/10.1016/S0304-4076(03)00092-7).
- Jaramillo, L., Mulas-Granados, C. and Jalles, J.T. (2017), "Debt spikes, blind spots, and financial stress", *International Journal of Finance and Economics*, Vol. 22 No. 4, pp. 421-437.
- Kırcı Çevik, N., Koç Yurtkur, A. and Dibooglu, S. (2019), "The relationship between price stability and financial stability: evidence from major emerging economies", *Global Economic Review*, Vol. 48 No. 1, pp. 25-45.
- Landgren, O. and Crooks, J. (2018), "An Analysis of financial stress in the Chinese economy: a TVAR approach", Master's thesis, University of Lund, Sweden.
- Levin, A., Lin, C.F. and Chu, C.S.J. (2002), "Unit root tests in panel data: asymptotic and finite-sample properties", *Journal of Econometrics*, Vol. 108 No. 1, pp. 1-24.
- Love, I. and Zicchino, L. (2006), "Financial development and dynamic investment behavior: evidence from panel VAR", *The Quarterly Review of Economics and Finance*, Vol. 46 No. 2, pp. 190-210.
- Malega, J. (2015), "Modelling of financial stress index in the Czech Republic using vector autoregression analysis", Master's thesis, Charles University, Prague.
- Mallick, S.K. and Sousa, R.M. (2013), "The real effects of financial stress in the Eurozone", *International Review of Financial Analysis*, Vol. 30, pp. 1-17.
- Mallik, G. and Chowdhury, A. (2001), "Inflation and economic growth: evidence from four south Asian economies", *Asia-Pacific Development Journal*, Vol. 8 No. 1, pp. 123-135.
- Mroua, M. and Trabelsi, L. (2020), "Causality and dynamic relationships between exchange rate and stock market indices in BRICS countries: panel/GMM and ARDL analyses", *Journal of Economics, Finance and Administrative Science*, Vol. 25 No. 50, pp. 395-412.
- Ozcelebi, O. (2020), "Assessing the impacts of financial stress index of developed countries on the exchange market pressure index of emerging countries", *International Review of Economics and Finance*, Vol. 70, pp. 288-302.
- Park, C.Y. and Mercado, R.V. (2014), "Determinants of financial stress in emerging market economies", *Journal of Banking and Finance*, Vol. 45, pp. 199-224.
- Phillips, P.C. and Perron, P. (1988), "Testing for a unit root in time series regression", *Biometrika*, Vol. 75 No. 2, pp. 335-346.
- Polat, O. and Ozkan, I. (2019), "Transmission mechanisms of financial stress into economic activity in Turkey", *Journal of Policy Modeling*, Vol. 41 No. 2, pp. 395-415.
- Rodríguez-Moreno, M. and Peña, J.I. (2013), "Systemic risk measures: the simpler the better?", *Journal of Banking and Finance*, Vol. 37 No. 6, pp. 1817-1831.

-
- Sandahl, J.F., Holmfeldt, M., Rydén, A. and Strömqvist, M. (2011), "An index of financial stress for Sweden", *Sveriges riksbank economic review*, Vol. 2, pp. 49-67.
- Schinasi, G.J. (2004), *Defining Financial Stability*, IMF Working Paper, Vol. 187.
- Sharpe, W.F. (1964), "Capital asset prices: a theory of market equilibrium under conditions of risk", *The Journal of Finance*, Vol. 19 No. 3, pp. 425-442.
- Smets, F. (2014), "Financial stability and monetary policy: how closely interlinked?", *International Journal of Central Banking*, Vol. 10 No. 2, pp. 263-300.
-
- Stiglitz, J.E. (2003), *Globalization and Its Discontents*, W.W. Norton & Company, New York.
- Stolbov, M. and Shchepeleva, M. (2016), "Financial stress in emerging markets: patterns, real effects, and cross-country spillovers", *Review of Development Finance*, Vol. 6 No. 1, pp. 71-81.
- Tng, B.H. (2017), "Financial stress in the ASEAN-5 economies: macro-financial vulnerabilities and the role of monetary policy/Tng Boon Hwa", Doctoral dissertation, University of Malaya, Malaysia.
- Van Roye, B. (2011), "Financial stress and economic activity in Germany and the Euro area (No. 1743)", Kiel Working Paper.
- Verick, S. and Islam, I. (2010), "The great recession of 2008-2009: causes, consequences and policy responses", *From the Great Recession to Labour Market Recovery*, pp. 19-52.
- Yiu, M.S., Ho, W.Y.A. and Jin, L. (2010), "A measure of financial stress in Hong Kong financial market—the financial stress index", Hong Kong Monetary Authority Research Note 02/2020, March.

Corresponding author

Flavio César Valerio Roncagliolo can be contacted at: 20132323@aloe.ulima.edu.pe