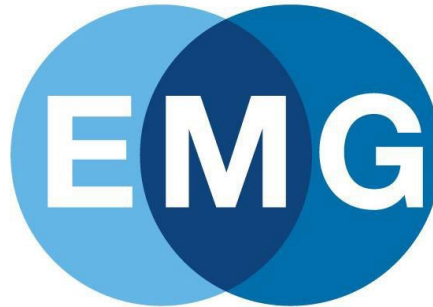




Emerging Markets Group

EMG Working Paper Series

WP-EMG-01-2023

**‘Financial integration and Exchange Market
Pressure’**

Kate Phylaktis and Muhammad Aftab

August 2024

Emerging Markets Group Bayes
Business School City University
106 Bunhill Row London EC1Y 8TZ UK
www.bayes.city.ac.uk/emg/

Financial integration and Exchange Market Pressure

Kate Phylaktis^{a*1}

Muhammad Aftab^{b2}

Abstract

This study examines the role of financial integration on exchange market pressure (EMP) across a representative group of forty-two advanced and emerging markets over the period 2000-2019, which covers the global financial crisis, which has heightened monetary and economic policy uncertainty. We use a novel measure of financial integration, namely the uncovered equity return differential versus the US, which is based on the Uncovered Equity Parity and is available at a monthly frequency. Our analysis is based on panel cointegration and several robustness tests and it shows that indeed financial integration has a significant effect on the EMP of advanced markets as well as of emerging markets. Our main results include: (i) There is a long-run relationship between financial integration and EMP; (ii) Financial integration reduces EMP in the case of emerging markets and increases EMP in the case of advanced markets reflecting the empirical results on the validity of Uncovered Equity Parity for the latter group of countries; (iii) The speed of adjustment to long-run equilibrium is very fast undermining the results of previous studies based on lower frequency data; (iv) The impact of financial integration is sustained when taking into account real integration, and economic policy uncertainties; (v) Financial integration continued to impact EMP even during the global financial crisis; and (vi) Financial integration has a decreasing impact on EMP across both emerging and advanced markets when the countries adopt a flexible exchange rate regime.

Keywords: Financial integration, Exchange market pressure, Policy uncertainty, flexible exchange rate regime

^a Bayes Business School (formerly Cass), City University of London. *Corresponding author Kate Phylaktis, K.Phylaktis@city.ac.uk, Bayes Business School, City University of London, 106 Bunhill Row, London, EC1Y 8TZ, UK, +44 (0)20 7040 8735.

^b Department of Management Sciences, COMSATS University Islamabad, maftab55@gmail.com

1. Introduction

Financial integration is one of the important channels of globalisation³ (Cernat and Vranceanu, 2002). It takes place through free cross-border capital flows. While some economists view it as contributing to exchange rate volatility and making economies more vulnerable to external factors, there is limited empirical evidence to support this (see e.g Glick and Hutchison, 2011). Our study attempts to fill this gap by examining the impact of financial integration on exchange market pressure (EMP). EMP has been highly volatile and more so during the global financial crisis (see Figure 1). The question arises whether financial integration has contributed to that.

There has been an attempt to measure the pressures on the exchange market by summing up the observed change in the exchange rate with an estimated counterfactual of the magnitude of the change in the exchange rate associated with the observed intervention in the foreign exchange market rate by the central bank of the country to influence movements in the exchange rate (Eichengreen et al. 1994, 1995; Klaassen and Jager, 2011; Patnaik, Felman, and Shah, 2017; Pentecost et al., 2001; Weymark, 1995).⁴ This measurement has been named Exchange Market Pressure (EMP).⁵ It should be noted that some other studies have added another component to the measure, namely the interest rate differential to cover the possibility that the monetary authorities might raise interest rates to alleviate pressures on the exchange rate (Akram and Byrne (2015). Thus, EMP is a suitable measure for gauging conditions in the foreign exchange market regardless of exchange rate regime in an economy (Girton and Roper, 1977; Patnaik et al., 2017; Weymark, 1998).

³ The other important channel is real integration, which takes place through the trade of goods and often proxied by the economy's exports minus imports over GDP.

⁴ More details about the EMP are given in section 2, when we discuss the variables in our model.

⁵ This measure was pioneered by Girton and Roper (1977).

Many researchers have attempted to identify the determinants of EMP and analyse its relationship with various economic variables. For example, variables such as output growth, domestic credit, and price stability have been identified as some of the main domestic macroeconomic factors, which exert influence on EMP to various degrees (Aizenman and Binici, 2016; Feldkircher, Horvath, and Rusnak, 2014; Gochoco-Bautista and Bautista, 2005).

In this paper, we examine the role of financial integration in determining the EMP, which has not been examined extensively in the literature, given its importance in exerting pressure on the foreign exchange market. This factor is particularly relevant to the current era of globalization and the trend towards deglobalization, as controls on capital flows are being used more widely as policy measures to control the volatility of capital flows (Aftab, Ahmad, Ismail, and Phylaktis, 2021). Although we are concentrating on the financial channel of economic integration to influence the EMP, there is also the real channel, which can cause changes in the exchange rate through the trade of goods, while financial integration affects EMP through the cross-border capital flows. It should be borne in mind that financial integration as well as the real channel, can strengthen the currency, they can also expose the currency to external shocks, which can increase its volatility.

We have come across three studies, which have looked at the impact of measures related to financial integration on EMP namely, Aizenman and Binici (2016), Akram and Byrne (2015), and Aftab and Phylaktis (2022). Aizenman and Binici (2016) examine the role of capital flows (gross and net) as well as the impact of capital controls after controlling for internal and external factors, in explaining the EMP of OECD countries and a group of emerging economies over the period 2000-2014. Using quarterly data and a dynamic panel model they report that while the effect of net capital flows on EMP is muted, short-term gross portfolio inflows and outflows comprise important factors that account for variations in EMP. Short-term portfolio flows and long-term foreign direct investment flows have a significant

impact on EMP in emerging market economies and no significant effect in OECD countries. Their results show that capital controls seem to reduce EMP significantly, the economic size of this impact is however highly dependent on institutional quality. They also find that external factors play a significant role in explaining the EMP of both OECD and emerging economies with a greater effect in the latter. Their measure of capital controls is taken from Fernández et al. (2016). This data set includes capital control restrictions on both inflows and outflows of 10 asset categories for 100 countries over the period 1995–2013 based primarily on the analysis of the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

Similarly, Akram and Byrne (2015) investigate the impact of capital controls on EMP allowing for the impact of a range of macroeconomic factors, policy variables, and trade openness in 40 countries including both advanced and emerging economies over the period 1977-2012 using annual data. Capital controls are proxied by the Chinn and Ito (2008) capital account openness index, which is again based on capital account restrictions reported in the IMF's Annual Reports (AREAER). They report that capital controls have an important impact on the EMP in advanced economies and less so in emerging market economies. They report that the differences in the effects of capital account openness in advanced and emerging market economies may be due to the depth and development of the financial sector, strong checks and balances, and the quality of regulatory institutions in advanced countries (Eichengreen and Rose, 2014). Capital controls appear to be less relevant during times of acute market stress, which may be partly due to their slow-moving nature. They also report that trade openness increases EMP for both emerging and advanced markets. A weak export sector reduces foreign capital inflows and increases foreign exchange vulnerability.

Finally, Aftab and Phylaktis (2022) examine the role of both real and financial integration on EMP in a group of emerging markets in South East Asia. They use a measure of financial

integration based on the premise that prices of assets, with the same attributes, command the same expected return irrespective of where they are domiciled. Thus, in the absence of financial market impediments, this will lead to the equalization of prices in different markets (De Brouwer, 2005). One advantage of their measure is that it is available at a monthly frequency, which allows for more accurate variations over time compared to previous studies. They also test the robustness of their results by taking into account the uncertainty of government policies in the US and the global economy. They also make methodological contributions by using a new measure of EMP developed by Patnaik et al. (2017), which takes care of the weaknesses of the existing EMP measures, which are inconsistent owing to their non-matching scale approach of the components. This measure offers consistent units - with a percentage change of the exchange rate that is suitable for cross-country comparisons and analysis across time. They also use an estimation approach, namely the autoregressive distributed lag variable modeling (ARDL) technique suggested by Pesaran et al. (2001), which is appropriate for mixed order integration variables avoiding the information loss by taking the first difference of non-stationary series (Bahmani-Oskooee, Hosny, and Kishor, 2015). Earlier studies have either ignored the unit root issue or taken the first difference (Aizenman et al., 2016; Akram and Byrne, 2015; Patnaik and Pundit, 2019). Furthermore, their approach separates the short-run and long-run effects which is more appropriate in a world where policy uncertainty is very high. Finally, Aftab and Phylaktis's (2022) study relies on monthly data as opposed to quarterly, or annual data used in related studies, (e.g. Aizenman and Binici, 2016; Akram and Byrne, 2015) which are prone to an aggregation bias owing to the low frequency (Taylor, 2001). Furthermore, the monthly data capture the time variation of economic integration more accurately. Their findings show the overall buffering role of financial integration (as well as real integration) on EMP, albeit with a country-level heterogeneity, when investigating the

issue at the country level. These results are supported by a panel analysis and remain robust during the global financial crisis.

In the current study, we test whether the results found on the impact of financial integration on EMP for a group of emerging South East Asian countries in Aftab and Phylaktis (2022) can be generalised by conducting our analysis on a group of forty-two advanced and emerging markets over the period 2000-2019.⁶ The advanced markets are drawn from the OECD countries, while the emerging markets are taken from the countries included in the MSCI EM INDEX. We also use the EMP measure developed by Patnaik et al. (2017), which addresses the weaknesses of the existing EMP measures, which are inconsistent owing to their non-matching scale approach to the components. Similar to Aftab and Phylaktis (2022), we use in this study a de facto measure of financial integration, which states that in the absence of financial market impediments, it will lead to the equalization of prices of similar assets in different markets. More precisely, our financial integration measure is the equity return differential between the sample country and the United States, which is available at a monthly frequency. As far as methodology is concerned, we also use a panel ARDL estimation that allows estimating a model containing mixed order variables (i.e. $I(0)$ & $I(1)$) at level, thus, avoiding information loss by taking first differences.

The broader sample allows us to investigate a variety of questions, which have not been investigated in detail in the earlier literature, such as those listed below:

1. What is the impact of financial integration on EMP subject to various control variables such as economic activity, inflation, credit to the private sector that proxies for financial development, and oil prices?

⁶ In 2019 these markets constituted 64.16% of the world GDP (<https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>).

2. Is there a difference in the impact of financial integration on EMP between advanced markets and emerging markets?
3. Is there a difference in the impact of financial integration on EMP if there is real integration as well?
4. Are the results robust when including economic policy uncertainty measures, such as the US monetary policy uncertainty, the US economic policy uncertainty, and global economic policy uncertainty?
5. What has been the impact of financial integration on EMP during the Global Financial Crisis?
6. Does the adoption of a flexible exchange rate regime affect the impact of financial integration on EMP?

Thus, we are making three contributions to the literature. First, we provide a detailed analysis of the impact of financial integration on EMP based on a broad sample. Secondly, we use a novel measure of financial integration based on the Uncovered Equity Parity. It is considered a *de facto* measure of financial integration and belongs to the class of financial integration measures, which are based on the divergence from the law of one price (Adam et al., 2002), which is available at a monthly frequency and can pick more accurately the impact of financial integration on EMP. Thirdly, we explore whether the flexibility of the exchange rate regime affects the impact of financial integration on EMP, which has not been examined before. Akram and Byrne (2015) controlled for the flexibility of the exchange rate regime when examining the impact of financial integration on EMP, but their approach does not take into account the intertwined relationship between the flexibility of the exchange rate regime and financial integration.

Our main results can be summarised as follows: (i) There is a long-run relationship between financial integration and EMP; (ii) Financial integration reduces EMP in the case of emerging

markets and increases EMP in the case of advanced markets reflecting the empirical results of Uncovered Equity Parity for the latter group of countries; (iii) The speed of adjustment to long-run equilibrium is very fast undermining the results of previous studies based on lower frequency data; (iv) The impact of financial integration is sustained when taking into account real integration, and economic policy uncertainties; (v) Financial integration continued to impact EMP even during the global financial crisis; and (vi) Financial integration has a decreasing effect on EMP across both emerging and advanced markets when the countries adopt a flexible exchange rate regime.

Thus, our results confirm the overall decreasing effect of financial integration (as well as real integration) on EMP in the case of emerging markets as in Aftab and Phylaktis (2022), whose analysis was based only on a small group of emerging markets. Our results show however that this is not the case in advanced markets where financial integration maintains its role in EMP, but this time it increases EMP. However, when we take into account the flexibility of the exchange rate regime in conjunction with financial integration, the impact of financial integration on EMP is negative for all countries.

We do not compare our results to those of earlier studies (i.e. Akram and Byrne, 2015; Aizenman and Binici, 2016) as our study shows that the speed of adjustment based on the size of the negatively significant coefficient of ECM_{t-1} , which establishes the presence of cointegration (Kremers et al. 1992), a necessary condition for relying on the estimates of our models (Pesaran et al., 2001) indicates that 97% and 82% of disequilibrium adjusts within a month for advanced and emerging markets respectively.⁷ This fast adjustment underlines the importance of using higher frequency data and undermines the results of earlier studies, Akram

⁷ Aftab and Phylaktis (2022) found similar fast adjustment, namely over 76% of disequilibrium is adjusted within a month.

and Byrne, (2015) and Aizenman and Binici, (2016), which use annual and quarterly data respectively.

The study is organised as follows: Section two discusses the model and the variables, while section three explains the methodology. Section four presents the data and the preliminary results, followed by section five, which reports the empirical findings. Finally, section six concludes the paper.

2. The model and the variables

To study the impact of financial integration on EMP, we follow Aftab and Phylaktis (2022) and craft the model as:

$$EMP_{i,t} = \alpha_o + \beta_1 FC_t + \beta_2 ER_{i,t} + \beta_3 ID_{i,t} + \beta_4 EA_{i,t} + \beta_5 IF_{i,t} + \beta_6 CP_{i,t} + \beta_7 OL_t + \varepsilon_{i,t} \quad (1)$$

In the current panel setting, i denotes each cross-section (i.e., country) and t denotes time series, EMP is exchange market pressure and it is the dependent variable, ER is equity return differential, which measures financial integration. It is the main independent variable. The control variables are, ID (the real interest rate differential), EA (economic activity), IF (rate of inflation), CP (credit to the private sector), and OL (oil price). We include also a dummy, FC to encapsulate the GFC effect, which takes the value of one for the period October 2007 to March 2009 and zero otherwise.

We discuss below the variables in the model starting with the dependent variable, EMP , and continuing with our main independent variable, ER , and the control variables.

EMP measures overall foreign exchange pressure that can be triggered by exchange rate changes, or foreign exchange intervention by the monetary authorities. Girton and Roper (1977) who pioneered the measure, define it as the sum of exchange rate changes and changes in the foreign currency reserves. They assigned equal weights to both components. Weymark

(1997, 1998) improve it by proposing a structural model that depends on the country-specific conditions and used them to assign weights. Eichengreen et al. (1996) make the measure simple by adding the interest rate differentials and introducing the weighting scheme that assigns individual standard deviations of each component as weight such that the more volatile component does not dominate in the measure. The measure is given below:

$$EMP_t = \frac{1}{\sigma_{\Delta e}} (\ln e_t - \ln e_{t-1}) - \frac{1}{\sigma_{\Delta RES}} \frac{\Delta RES_t}{Money_{t-1}} + \frac{1}{\sigma_{\Delta r}} \Delta(r_t - r^{US}_t) \quad (2)$$

where the first component is the log changes in the exchange rate, the second component is the changes in reserves scaled on lagged seasonally adjusted money supply, and the third component is the interest rate differential. All three components are weighted on each component's standard deviation.

The Girton and Roper (1977) monetary model measures EMP directly with the main objective of gauging the exchange rate disequilibrium from its target level that can be corrected through exchange rate changes, or changes in reserves. However, there is a major issue with the existing EMP measures that they combine foreign exchange interventions that are in dollars with exchange rate changes that are in terms of percentage. Thus, the resultant measure is units inconsistent. Patnaik et al. (2017) develop an EMP index that resolves this issue. This measure is useful to spot and forecast crises and is suitable for cross-country analysis. Specifically, this measure is the combination of observed exchange rate changes and the halted exchange rate changes through interventions expressed as:

$$EMP_t = \Delta x_t + \rho_t I_t, \quad (3)$$

where Δx_t is the exchange rate changes in percentage, I_t is foreign exchange intervention in billions of dollars, and ρ_t is a conversion factor that captures the exchange rate changes due to a one-billion-dollar intervention. This factor is affected by the size and liquidity of the foreign

exchange market. It is larger for small and less liquid foreign exchange markets than large and more liquid foreign exchange markets. It is estimated for each market over time (Patnaik et al., 2017).⁸

ER measures the stock market performance by taking the return differential of the domestic stock market return and the US stock market return, both in domestic currency. This is our measure of financial integration and is based on the Uncovered Equity Parity (UEP) developed by Hau and Rey (2004, 2006), and explained in detail in subsequent paragraphs.

We will put this measure in the context of other measures of financial integration. It should be noted, however, that there is no single definition of financial integration, and the literature proposes several frameworks to identify and measure it (Nardo et al., 2022).

As explained in Aftab and Phylaktis (2022), there are two types of measures of financial integration; *de jure* financial integration and *de facto* financial integration. The former is based on the actual restrictions and regulations submitted by national governments to the International Monetary Fund, and the latter relates to what is happening based on either the quantities of assets or the prices of assets. A common proxy used for the quantity of assets is the international assets and liabilities position as a fraction of GDP. If the ratio is high, it implies that an economy is financially open to the rest of the world (Lane and Milesi-Ferretti, 2003; 2017). If the *de facto* financial integration is based on the prices of assets, then the financial integration measures are based on the divergence from the law of one price (Adam et al., 2002). According to the law of one price, identical assets should be traded at the same price in different locations, and with financial market integration there should be no room for unexploited international arbitrage and the same asset in different locations in different currencies should only reflect differences in exchange rates. If the law of one price does not hold and financial

⁸ Patnaik et al., (2017, p.66) provide details on this conversion factor.

investment is non-discriminatory, then investors will be free to exploit any arbitrage opportunity to restore the law of one price (Baele et al., 2004).

Thus, this approach to international financial integration is based on the premise that unrestricted international capital flows, through seeking the best available return, would lead to an equalisation of the rates of return across countries. In effect, this measure applies the law of one price to financial assets, whereby assets with identical cash flows should command the same return. Three forms of this measure have been used, based alternatively on the conditions of covered interest parity (CIP), uncovered interest parity (UIP), and real interest parity (RIP). Using the CIP condition implies that unrestricted international capital flows tend to equalise nominal interest rates across countries when they are contracted in a common currency while using the UIP condition implies that unrestricted international capital flows tend to equalise nominal interest rates across countries despite exposure to foreign exchange risk. Similarly, using the RIP condition implies that free capital mobility tends to equalise real interest rates across countries. The RIP assumes that the (change in) the real exchange rate is constant (i.e. the relative purchasing power parity hypothesis holds). As emphasized in Chinn and Frankel (1995), Phylaktis (1999), and Obstfeld and Taylor (2003), the RIP hypothesis is important because it is based on the existence of frictionless markets and is thus a testable implication of financial integration. It follows then that a test of the real interest rate differential can tell us about the degree of market integration. Aftab and Phylaktis (2022) use the RIP as a measure of financial integration.^{9,10} Normally, interest rate differentials move towards convergence and synchronization across economies with an increase in financial integration. The speed of adjustment to convergence can also be taken as a measure of financial integration (Phylaktis, 1999). Given an interest rate differential in favour of the domestic market, there will be a capital

⁹ For a derivation of the RIP, see Phylaktis (1999).

¹⁰ There is evidence, albeit for a different time period that indeed the real exchange rate is stationary for the Pacific Basin countries (Phylaktis and Kassimatis, 1994).

inflow from the US market to the domestic market to take advantage of the higher interest rates, decreasing pressures on the domestic currency (i.e. appreciating the exchange rate and reducing the EMP) (Aizenman and Binici, 2016; Balakrishnan et al., 2013).¹¹

However, the assumptions for the RIP do not hold for our sample of countries, unlike the Pacific Basin countries used in the Aftab and Phylaktis (2022), so we use instead a new equilibrium condition between exchange rates and risky assets (equities in this case), namely, the uncovered equity parity condition (UEP). According to the UEP, international local-currency equity return differentials are perfectly offset by foreign exchange (FX) fluctuations. This testable prediction emanates from the theory of Hau and Rey (2004, 2006) by assuming imperfect FX hedging, imperfectly elastic FX supply and that international investors follow portfolio rebalancing strategies; namely, an increase in foreign vis-à-vis domestic equity returns persuades investors to repatriate some of their foreign-equity wealth due to a desire to reduce their FX exposure which, in turn, induces the foreign currency to depreciate and restores parity in equity returns. As in the case of the RIP hypothesis, it is based on the existence of frictionless markets. It follows then that a test of UEP as in the interest rate differential conditions can tell us about the degree of market integration. Normally, equity market differentials move towards convergence and synchronization across economies with an increase in financial integration.¹² Thus, financial integration depending on the direction of cross-border capital flows increases, or relieves pressure on the exchange rate and the EMP.

ID is defined as the domestic real interest rate minus the foreign (US) real interest rate and is included to control for potential RIP effects. As explained above, an increase in the domestic real interest rate relative to the US real interest rate increases the *ID* and encourages

¹¹ It should be noted that in this study we define the exchange rate as domestic currency per one unit of foreign currency, that is the US dollar.

¹² As it has already been mentioned, the speed of adjustment to convergence can be taken as a measure of financial integration (Phylaktis, 1999).

foreign investors to invest in the domestic market to take advantage of the higher interest rate reducing the exchange rate and the EMP in the domestic economy.

EA is economic activity measurement based on industrial production. *EA* has an important role in defining the EMP (Alvarez-Plata and Schrooten, 2004). A decrease in *EA* precedes successful speculative attacks on a currency that result in depreciation (Eichengreen et al., 1995). Therefore, an increase in *EA* is expected to reduce speculative flows and the EMP (Aftab and Phylaktis, 2022; Aizenman et al., 2012; Aizenman and Binici, 2016).

IF is the rate of inflation that controls the price level in the economy. The increase in the overall price level causes the currency to depreciate (Ahmed et al., 2017) and motivates the central bank to target price stability (White, 2006). Thus, an increase in *IF* is expected to increase EMP.

CP is the private sector credit and it controls the effects of financial development in an economy owing to the important role it plays in bringing price stability and reducing financial vulnerability (Jeanneau and Tovar, 2008). We expect *CP* to reduce EMP.

OL controls the energy market effects in the model. Oil price influences the foreign exchange vulnerability depending on whether the country is a net oil importer, or exporter (Aftab and Phylaktis, 2022). The increase in oil price increases the EMP in the net oil importing country and reduces the EMP in the net oil exporting country (Gevorkyan, 2019).

3. Methodology

To estimate (1), we use the panel ARDL approach suggested by Pesaran et al. (1999, 2001). This approach is suitable for mixed orders cases (i.e. I(0) and I(1)) as it is the case with the variables in this study¹³. The error correction specification of this approach for our model is.

$$\begin{aligned} \Delta EMP_{i,t} = & \beta_o + \beta_1 FC_t + \sum_{j=1}^{n1} \beta_{2,i} \Delta EMP_{i,t-j} + \sum_{j=0}^{n2} \beta_{3,i} \Delta ER_{i,t-j} + \sum_{j=0}^{n3} \beta_{4,i} \Delta ID_{i,t-j} \\ & + \sum_{j=0}^{n4} \beta_{5,i} \Delta EA_{i,t-j} + \sum_{j=0}^{n5} \beta_{6,i} \Delta IF_{i,t-j} + \sum_{j=0}^{n6} \beta_{7,i} \Delta CP_{i,t-j} + \sum_{j=0}^{n7} \beta_{8,i} \Delta OL_{i,t-j} \\ & + \gamma_0 EMP_{i,t-1} + \gamma_1 ER_{i,t-1} + \gamma_2 ID_{i,t-1} + \gamma_3 EA_{i,t-1} + \gamma_4 IF_{i,t-1} + \gamma_5 CP_{i,t-1} \\ & + \gamma_6 OL_{i,t-1} + \xi_{i,t} \end{aligned} \quad (4)$$

We use ordinary least squares to estimate (4). The short-run effects are gathered from the coefficients attached to the first differenced variables while the long-run estimates are captured from the lagged coefficients $(\gamma_1 - \gamma_8)$ normalized on γ_o . The meaningfulness of the long-run estimates relies on the presence of cointegration. The null hypothesis of no cointegration and the alternative hypotheses of cointegration presence are as follows.

$$F_{EMP}(EMP|ER, ID, EA, IF, CP, OL)$$

$$H_o: \frac{\gamma_1}{\gamma_o} = \frac{\gamma_2}{\gamma_o} = \frac{\gamma_3}{\gamma_o} = \frac{\gamma_4}{\gamma_o} = \frac{\gamma_5}{\gamma_o} = \frac{\gamma_6}{\gamma_o} = 0 \text{ and } H_1: \frac{\gamma_1}{\gamma_o} \neq \frac{\gamma_2}{\gamma_o} \neq \frac{\gamma_3}{\gamma_o} \neq \frac{\gamma_4}{\gamma_o} \neq \frac{\gamma_5}{\gamma_o} \neq \frac{\gamma_6}{\gamma_o} \neq 0 \quad (5)$$

We use the error correction term (ECM_{t-1}) to test the presence of cointegration calculated as.

$$\begin{aligned} ECM_{t-1} = & EMP_{t-1} - \frac{\gamma_1}{\gamma_o} ER_{t-1} - \frac{\gamma_2}{\gamma_o} ID_{t-1} - \frac{\gamma_3}{\gamma_o} EA_{t-1} - \frac{\gamma_4}{\gamma_o} IF_{t-1} - \frac{\gamma_5}{\gamma_o} CP_{t-1} \\ & - \frac{\gamma_6}{\gamma_o} OL_{t-1} \end{aligned} \quad (6)$$

If the estimated ECM_{t-1} is negative and significant, one can accept the H_1 (Kremers et al. 1992).

4. Data and the preliminary results

¹³ Another advantage of this approach is to gather unbiased estimates when some regressors have endogeneity issue (Aftab and Phylaktis, 2022; Harris and Sollis 2003; Menegaki, 2019; Smith, 2020).

Our sample of countries consists of twenty-one advanced markets drawn from the OECD list and twenty-one emerging markets drawn from the MSCI emerging markets classification. In total, we have forty-two countries, which represent 64.16% of the global economy. The advanced markets are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Sweden, Switzerland, and the United Kingdom. and the Emerging markets are Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Saudi Arabia, South Africa, Thailand, and Turkey. We use monthly data over the period January 2000 to December 2019. The choice of this period is largely based on the data availability. We retrieve data from Baker et al. (2016), Davis (2016), FRED Louis, Husted et al. (2020), IMF financial statistics, Patnaik et al. (2017), Reuters, and World Bank. More details about the definitions of the variables and the source are reported in Table 1A of the Appendix.

Preliminary analysis shows that EMP fluctuates a lot in both the advanced markets-and emerging markets over the sample period (see Figure 1). This is especially the case during the financial crisis. The objective of the current study is to explore the role of financial integration in these dynamics along with an important set of control variables. We start by examining the unit root properties of the variables in our study. Table 1 reports the results and shows that all the variables are stationary at level except for the economic activity which is stationary at the first difference, based on the augmented Dicky Fuller test. Thus, the study variables are of mixed order, which guides this research to use the ARDL approach that is flexible to this issue (Bahmani-Oskooee, Hosny, and Kishor, 2015).

5. Empirical findings

We start by estimating the base model and then subsequently augmenting it to answer all our questions listed in the introduction. The results are reported in Panel I of Table 2. for the full sample, and then separately for the advanced markets and emerging markets to see whether financial integration impacts EMP differently in these two groups. We first note that the error correction term is negative and statistically significant and that supports the presence of a long-run relationship between financial integration and EMP as stated in Equation 1 (Kremers et al. 1992). The influence of financial integration as represented by ER is negative and statistically significant for the full sample. This implies that an increase in financial integration in our sample of equity markets with the US relieves their EMP. However, in the sub-sample analysis, this effect is only sustained in emerging markets. The results for the advanced markets show there is an increase in EMP with an increase in financial integration. This substantiates the earlier empirical literature, which shows that there is heterogeneity in global equity investors' behaviour concerning emerging markets, where their main motive is return chasing (Aftab, Ahmad, and Ismail, 2018; Fuertes, Phylaktis, and Yan, 2019), while in the advanced markets, the motive is to safeguard their FX risk through international portfolio rebalancing (Hau and Rey, 2006). Thus, when financial integration rises, that is the equity return differential is in favour of the advanced markets, US investors following portfolio rebalancing strategy and wanting to reduce their FX risk will repatriate funds to the US – outflows, from the advanced markets and inflows to the US, leading to a depreciation of the advanced market currency and an appreciation of the US \$. (exchange rate rises), leading to a positive impact on EMP. However, in the case of emerging markets when financial integration rises, that is the equity return differential is in favour of the emerging markets, US investors, following equity return strategy continue to invest in the emerging markets - inflows to emerging markets, outflows from the US (exchange rate falls) leading to a fall on EMP. However, in both cases, the results imply the strong linkages between the equity markets and

thus, the presence of financial integration. It should also be noted that all the control variables are statistically significant (although not always with the expected sign) apart from ID.¹⁴

We next incorporate the effect of real integration in equation (1) by augmenting the model with real integration, measured with TO. As Cavallo and Frankel (2008) note, financial and real channels go hand-in-hand in integration. Furthermore, Phylaktis and Ravazzolo (2002) find that when measuring financial and economic (real) integration with equity prices in a group of emerging markets, there is overwhelming evidence at the regional and global level that financial integration is accompanied by economic integration suggesting that economic integration provides a channel for financial integration. Moreover, improvements in exports and trade linkages are found to reduce the EMP (Akram and Byrne, 2015; Rose, 2005). This exercise also helps us to avoid the omitted variable bias in our earlier results. The results are reported in Panel II of Table 2. The financial integration effect sustains after the inclusion of real integration in the full sample as well as in advanced markets and emerging markets sub-samples. The effect of real integration is also negative and significant in the full sample and the sub-samples. This implies that improvements in the real integration of a market decrease the pressure on its FX market.

Diagnostics reported in Panel II of the table support the presence of the long-run relationship as the error correction term is negative and significant (Banerjee et al. 1998). The model shows improvements after the inclusion of real integration as noted by an increase in the error correction in absolute terms, implying faster adjustment to long-run equilibrium¹⁵, as well as a reduction in root mean square error and an increase in log-likelihood.

¹⁴ In order to ensure that ER is not getting the significance of ID, we run the models in Table 2 without ID. The results confirm the significance of financial integration on EMP (See Table 2A in the Appendix).

¹⁵ The error correction term shows the speed of adjustment. For instance, it is -.973 for advanced markets as shown in panel I of Table 2. This implies that 97.3% of the adjustment to the short-run deviations in the long run relationship takes place in a month. After the inclusion of real integration effect, the rate of adjustment is more quick as the ECM coefficient is -1.06. As the data are monthly, it implies that 53% of the adjustment to the short-run deviations in the long run relationship takes place within 15 days.

5.1 The effect of policy uncertainty

In our next exercise, we explore whether policy uncertainty has influenced investors' behavior and the impact of financial integration on EMP. Policy uncertainty links with unexpected changes that can link with the unsystematic element of the exchange rate changes (Beckmann and Czudaj, 2017). This way policy changes affect the EMP by changing the economic environment (Carrière-Swallow and Céspedes, 2013). As a result, we expand our basic model with three different types of policy uncertainty measures, US monetary and economic policy uncertainty measures, and finally, global policy uncertainty measures¹⁶.

The results are reported in Table 3. Of importance to us is the impact of financial integration that remains intact after the inclusion of policy uncertainty measures. There is improvement in the model as noted in many cases based on the improvement of diagnostic statistics. The effect of US monetary uncertainty is significantly negative in advanced markets only, while the effect of US and global economic uncertainties is negatively significant in all cases. This implies that an increase in policy uncertainty encourages the economic agents to take decisions like an increase in investment to overcome their expected future losses due to increased uncertainty. Meanwhile, funds flowing from the US in search of higher returns to other advanced and emerging economies relieve pressure on their FX market. Diagnostics support the presence of long-run relationships as notable through the significant error correction term. The model is improved following the inclusion of policy uncertainty measures.

5.2 The financial crisis effect

Financial crises are often associated with significant movements in exchange rates, which reflect both increasing risk aversion and changes in the perceived risk of investing in

¹⁶ These indices are text-based mining of terms related to uncertainty in the press by various authors (refer to Table 1A in the Appendix) following the approach introduced by Baker et al., (2016).

S&P-based certain currencies. The global financial crisis of 2007–09 was no exception. (Kohler, 2010). The increased risk aversion is highlighted by the increase in the implied volatility of S&P based on the VIX index (see Figure 3). The question arises whether financial integration relieves the pressure on the exchange rate during those volatile times. We examine this question by following the approach suggested by Banti and Phylaktis (2015) and applied also by Aftab and Phylaktis (2022). We define two dummy variables named financial crisis (FC) and non-financial crisis (NFC). The FC dummy takes a value of one during the global financial crisis period -October 2007 to March 2009, and zero otherwise. On the other hand, the NFC dummy takes a value of zero during the crisis period and one otherwise. We interact FC and NFC with financial integration and real integration variables.

Table 4 reports the results that show that financial integration and real integration have a significant effect on EMP during both FC and NFC times corroborating the earlier results in Table 2. Moreover, it is also notable that the absolute magnitude of the financial integration variable is higher during FC compared to NFC for the full sample, as, well as for the sub-samples. The same result is obtained when we include real integration. In other words, when equity markets are financially integrated, the capital flows resulting from an equity differential between the domestic equity market (advanced or emerging) and the US market will relieve the pressure on the exchange rate, especially when the exchange rate is highly volatile during a crisis.

5.3 Exchange rate regime effect

Finally, we examine whether the flexibility of the exchange rate regime affects the impact of financial integration on EMP as Aizenman et al. (2016) note that the role of open macroeconomic policies, like the exchange rate regimes, defines the sensitivity of the major economies to external shocks. Under a flexible exchange rate regime, the exchange rate is more

volatile, which increases the currency risk associated with an investment in foreign assets, reducing investors' appetite to take advantage of higher returns in foreign assets relative to domestic asset returns, irrespective of whether the motive is return-chasing as in the case of emerging markets (Aftab, Ahmad, and Ismail, 2018; Fuertes, Phylaktis, and Yan, 2019), or international portfolio rebalancing as in the case of advanced markets (Hau and Rey, 2006).

In this case, we use instead of ER in the base model depicted by Equation (1), an interactive term $ER*FXR$, where the FXR stands for the flexibility of the exchange rate regime. The measure of the flexibility of the exchange rate regime is based on the Ilzetzi et al (2019) coarse regime classification, which rates the exchange rate regime from one to six with one being a completely fixed exchange rate regime and six being a completely flexible regime (see Table 3A in the Appendix for details). Figure 2 shows the FX regime changes in advanced markets as well as in emerging markets over the sample period.

The results are reported in Panel I, in Table 5. As can be seen, the effect of financial integration is sustained when we interact it with the flexibility of the exchange rate regime in the full sample as well as in the sub-samples. However, it is interesting to note that the FX regime substitutes the financial integration effect of advanced markets when we compare the impact of financial integration on EMP in Table 2 with the impact of the interactive term of $ER*FXR$ in Table 5. This could be because stock returns and currency returns are negatively correlated and currency and stock risk, therefore, often offset one another, reducing the risk to a foreign investor (Conover, 2011). Thus, in all cases, financial integration reduces EMP. So, despite the currency risk, financial integration encourages sufficient capital flows to reduce pressure on the exchange rate and EMP. Moreover, the negative effect of financial integration is sustained when we introduce real integration (see Panel II in Table 5). The diagnostics show improvements after the inclusion of real integration in the model.

The IMF de facto AREAER dataset considers euro members to follow flexible exchange rate regimes, while Ilzetzki et al (2019) consider them as having fixed exchange rate regimes. Owing to this disagreement we exclude the euro-member countries from the advanced market's sample and repeat the exercise to test the robustness of our results. The results are reported in Table 4A of the Appendix and show support for the earlier results.

6. Conclusion

Aftab and Phylaktis (2022) find that financial integration reduces the EMP in the Asian emerging markets context. This study is motivated to explore whether these findings can be generalised based on a broader sample of advanced and emerging markets. Unlike previous studies, we use a different measure of financial integration based on the uncovered equity parity. We find that indeed financial integration is associated with EMP in advanced and emerging markets. These results improve and sustain after the introduction of real integration in the model. The effects of the US and global policy uncertainty are more pronounced than the effects of US monetary policy uncertainty on EMP. The inclusion of the uncertainty measures in the base model again improves and reinforces our main findings. Furthermore, our results sustain during crisis and non-crisis periods. Our final exercise was to explore whether the flexibility of the exchange rate regime affects the impact of financial integration on EMP. We find an interesting result that financial integration decreases EMP across both emerging and advanced markets when the exchange rate regime is flexible. Thus, countries adopting a flexible exchange rate regime might reduce the impact of cross-border capital flows on their economy, especially in the current times of substantial international capital flows.

References

- Adam, K., Jappelli, T., Menichini, A., Padula, M., & Pagano, M. (2002). Analyse, compare, and apply alternative indicators and monitoring methodologies to measure the evolution of capital market integration in the European Union. *Report to the European Commission, 2002*, 1-95.
- Aftab, M., Ahmad, R., Ismail, I., & Phylaktis, K. (2021). Economic integration and the currency and equity markets nexus. *International Journal of Finance & Economics*, 26(4), 5278-5301.
- Aftab, M., & Phylaktis, K. (2022). Economic Integration and Exchange Market Pressure in a Policy Uncertain World. *Journal of International Money and Finance*, 123.
- Aftab, M., Ahmad, R., & Ismail, I. (2018). Examining the uncovered equity parity in the emerging financial markets. *Research in International Business and Finance*, 45, 233-242.
- Ahmed, S., Coulibaly, B., & Zlate, A. (2017). International financial spillovers to emerging market economies: How important are economic fundamentals?. *Journal of International Money and Finance*, 76, 133-152.
- Aizenman, J., & Binici, M. (2016). Exchange market pressure in OECD and emerging economies: Domestic vs. external factors and capital flows in the old and new normal. *Journal of International Money and Finance*, 66, 65-87.
- Aizenman, J., Chinn, M. D., & Ito, H. (2016). Monetary policy spillovers and the trilemma in the new normal: Periphery country sensitivity to core country conditions. *Journal of International Money and Finance*, 68, 298-330.
- Aizenman, J., Lee, J., & Sushko, V. (2012). From the great moderation to the global crisis: exchange market pressure in the 2000s. *Open Economies Review*, 23(4), 597-621.
- Akram, G. M., & Byrne, J. P. (2015). Foreign exchange market pressure and capital controls. *Journal of International Financial Markets, Institutions and Money*, 37, 42-53.
- Alvarez-Plata, P., & Schrooten, M. (2004). Misleading indicators? The Argentinean currency crisis. *Journal of Policy Modeling*, 26(5), 587-603.
- Baele, L., Ferrando, A., Hördahl, P., Krylova, E., & Monnet, C. (2004). *Measuring financial integration in the euro area* (No. 14). ECB occasional paper.
- Bahmani-Oskooee, M., Hosny, A., & Kishor, N. K. (2015). The exchange rate disconnect puzzle revisited. *International Journal of Finance & Economics*, 20(2), 126-137.
- Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The Quarterly Journal of Economics*, 131(4), 1593-1636.
- Balakrishnan, R., Nowak, S., Panth, S., & Wu, Y. (2013). Surging capital flows to emerging Asia: Facts, impacts and responses. *Journal of International Commerce, Economics and Policy*, 4(02).

- Banerjee, A., Dolado, J. and Mestre, R. (1998), “Error-Correction Mechanism Tests in a Single Equation Framework,” *Journal of Time Series Analysis*, 19, 267–85.
- Banti, C. & Phylaktis, K. (2015). FX market illiquidity, funding liquidity constraints and international capital flows. *Journal of International Money and Finance*, 56, 114-134.
- Beckmann, J., & Czudaj, R. (2017). Exchange rate expectations and economic policy uncertainty. *European Journal of Political Economy*, 47, 148-162.
- Bekaert, G., & Harvey, C. R. (2017). Emerging equity markets in a globalizing world. Available at SSRN 2344817.
- Carrière-Swallow, Y., & Céspedes, L. F. (2013). The impact of uncertainty shocks in emerging economies. *Journal of International Economics*, 90(2), 316-325.
- Cavallo, E. A., & Frankel, J. A. (2008). Does openness to trade make countries more vulnerable to sudden stops, or less? Using gravity to establish causality. *Journal of International Money and Finance*, 27(8), 1430-1452.
- Cernat, L., & Vranceanu, R. (2002). Globalisation and development: New evidence from Central and Eastern Europe. *Comparative Economic Studies*, 44(4), 119-136.
- Chinn, M. D., & Frankel, J. A. (1995). Who drives real interest rates around the Pacific Rim: the USA or Japan?. *Journal of International Money and Finance*, 14(6), 801-821.
- Chinn, M. D., & Ito, H. (2008). A new measure of financial openness. *Journal of comparative policy analysis*, 10(3), 309-322.
- Conover, C. M. (2011). Investment issues in emerging markets: a review. *Research Foundation Literature Reviews*, 6(1), 1-27.
- Davis, S. J. (2016). An index of global economic policy uncertainty (No. w22740). National Bureau of Economic Research. 1-11.
- De Brouwer, G. (2005). Monetary and financial integration in Asia: empirical evidence and issues. *Asian Economic Cooperation and Integration: Progress, Prospects, and Challenges*, 269-293.
- Eichengreen, B., Rose, A. and Wyplosz, C. (1996) contagious currency crises: first tests, *Scandinavian Journal of Economics*, 98, 463–84.
- Eichengreen, B., & Rose, A. (2014). Capital controls in the 21st century. *Journal of International Money and Finance*, 48, 1-16.
- Eichengreen, B., & Rose, A. (2014). Capital controls in the 21st century. *Journal of International Money and Finance*, 48, 1-16.
- Feldkircher, M., Horvath, R., & Rusnak, M. (2014). Exchange market pressures during the financial crisis: A Bayesian model averaging evidence. *Journal of International Money and Finance*, 40, 21-41.
- Fernández, A., Klein, M. W., Rebucci, A., Schindler, M., & Uribe, M. (2016). Capital control measures: A new dataset. *IMF Economic Review*, 64(3), 548-574.

- Ferreira, P., & Dionísio, A. (2015). Revisiting covered interest parity in the European Union: The DCCA Approach. *International Economic Journal*, 29(4), 597-615.
- Fuertes, A. M., Phylaktis, K., & Yan, C. (2019). Uncovered equity “disparity” in emerging markets. *Journal of International Money and Finance*, 98, 1-22.
- Gevorkyan, A. V. (2019). Exchange market pressure and primary commodity-exporting emerging markets. *Applied Economics*, 51(22), 2390-2412.
- Gochoco-Bautista, M. S., & Bautista, C. C. (2005). Monetary policy and exchange market pressure: The case of the Philippines. *Journal of Macroeconomics*, 27(1), 153-168.
- Girton, L., & Roper, D. (1977). A monetary model of exchange market pressure applied to the postwar Canadian experience. *The American economic review*, 67(4), 537-548.
- Glick, R., & Hutchison, M. (2011). The illusive quest: Do international capital controls contribute to currency stability? *International Review of Economics & Finance*, 20(1), 59-70.
- Harris, R., & Sollis, R. (2003). Applied time series modelling and forecasting. Wiley.
- Hau, H., & Rey, H. (2004). Can portfolio rebalancing explain the dynamics of equity returns, equity flows, and exchange rates?. *American Economic Review*, 94(2), 126-133.
- Hau, H., and Rey, H. (2006). Exchange rates, equity prices, and capital flows. *Review of Financial Studies*, 19(1), 273-317.
- Husted, L., Rogers, J. and Sun, B. (2020). Monetary Policy Uncertainty, *Journal of Monetary Economics*, 115, 20-36.
- Ilzetzki, E., Reinhart, C. M., & Rogoff, K. S. (2019). Exchange arrangements entering the twenty-first century: Which anchor will hold?. *The Quarterly Journal of Economics*, 134(2), 599-646.
- Jeanneau, S., & Tovar, C. E. (2008). Latin America’s local currency bond markets: an overview. *BIS Papers No. 36: New Financing Trends in Latin America: A Bumpy Road towards Stability*, 46-64.
- Klaassen, F., & Jager, H. (2011). Definition-consistent measurement of exchange market pressure. *Journal of International Money and Finance*, 30(1), 74-95.
- Kohler, M. (2010). Exchange rates during financial crises. *BIS Quarterly Review*, March.
- Kremers, J. J., Ericsson, N. R., & Dolado, J. J. (1992). The power of cointegration tests. *Oxford Bulletin of Economics and Statistics*, 54(3), 325-348.
- Lane, M. P. R., & Milesi-Ferretti, M. G. M. (2017). *International financial integration in the aftermath of the global financial crisis*. International Monetary Fund.
- Lane, P. R., & Milesi-Ferretti, G. M. (2003). International financial integration. *IMF Staff Papers*, 50(1), 82-113.
- Menegaki, A. N. (2019). The ARDL method in the energy-growth nexus field; best implementation strategies. *Economies*, 7(4), 105.
- Nardo, M., Ossola, E., & Papanagiotou, E. (2022). Financial integration in the EU28 equity markets: Measures and drivers. *Journal of Financial Markets*, 57, 100633.

- Obstfeld, M., & Taylor, A. M. (2003). Sovereign risk, credibility and the gold standard: 1870–1913 versus 1925–31. *The Economic Journal*, 113(487), 241-275.
- Patnaik, I., & Pundit, M. (2019). Financial Shocks and Exchange Market Pressure. Asian Development Bank Economics Working Paper Series, (581).
- Patnaik, I., Felman, J., & Shah, A. (2017). An exchange market pressure measure for cross country analysis. *Journal of International Money and Finance*, 73, 62- 77.
- Pentecost, E. J., Van Hooydonk, C., & Van Poeck, A. (2001). Measuring and estimating exchange market pressure in the EU. *Journal of International Money and Finance*, 20(3), 401-418.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326.
- Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94(446), 621-634.
- Phylaktis, K. (1999). Capital market integration in the Pacific Basin region: an impulse response analysis. *Journal of International Money and Finance*, 18(2), 267-287.
- Phylaktis, K., & Kassimatis, Y. (1994). Does the real exchange rate follow a random walk? The Pacific Basin perspective. *Journal of International Money and Finance*, 13(4), 476-495.
- Phylaktis, K., & Ravazzolo F., (2002)"Measuring Financial and Economic Integration with Equity Prices in Emerging Markets, *Journal of International Money and Finance*, 21(6), 879-903.
- Rose, A. K. (2005). One reason countries pay their debts: renegotiation and international trade. *Journal of Development Economics*, 77(1), 189-206.
- Smith, R. P. (2020). *A note on ARDL models*. Unpublished manuscript.
- Taylor, A. M. (2001). Potential pitfalls for the purchasing-power-parity puzzle? Sampling and specification biases in mean-reversion tests of the law of one price. *Econometrica*, 69(2), 473-498.
- Weymark, D. N. (1995). Estimating exchange market pressure and the degree of exchange market intervention for Canada. *Journal of International Economics*, 39(3-4), 273-295.
- Weymark, D. N. (1997). Measuring exchange market pressure and intervention in interdependent economies A two-country model. *Review of International Economics*, 5, 72-82
- Weymark, Diana N. (1998). A General Approach to Measuring Exchange Market Pressure. *Oxford Economic Papers*, 50, 106-121.
- White, W. R. (2006). *Is Price Stability Enough?* BIS Working Paper 205, 1-18.

Table 1: Full sample unit root analysis		
	At level	At first difference
EMP	-32.072(.000)***	-56.783(.000)***
ER	-67.969(.000)***	-61.265(.000)***
TO	-2.444(.000)***	-13.543(.000)***
ID	-7.655(.000)***	-45.679(.000)***
UM	-43.064(.000)***	-61.287(.000)***
UE	-33.098(.000)***	-59.66(.000)***
GE	10.386(.000)***	-71.245(.000)***
EA	-.491(.312)	-33.202(.000)***
IF	-28.005(.000)***	-57.901(.000)***
CP	-2.346(.009)***	-28.24(.000)***
OL	-5.22(.000)***	-59.373(.000)***
The table is based on the panel unit root test (augmented Dickey-Fuller) and it shows that some variables are not stationary at level. However, all variables are stationary at the first difference. ***, **, * show level of significance at 1%, 5%, and 10% respectively. Variables abbreviations: EMP (exchange market pressure), ER(stock return differential), TO(trade openness), ID(interest rate differential), UM(the US monetary policy uncertainty), UE(the US economic policy uncertainty), GE(global economic policy uncertainty), EA(economic activity), IF(inflation rate), CP(credit to the private sector), OL(oil price)		

Table 2: ARDL estimates						
	Panel I With financial integration			Panel II With financial and real integration		
	Full Sample	Advanced	Emerging	Full Sample	Advanced	Emerging
Long-run estimates						
C	3.868(24.239)***	4.455(19.665)***	3.821(15.664)***	4.158(20.406)***	4.895(17.137)***	3.882(16.252)***
FC	.003(2.73)**	.003(1.895)*	.003(1.593)	.001(.4)	.002(.888)	.0003(.097)
ER	-.075(4.583)***	.132(8.049)***	-.21(14.233)***	-.064(3.951)***	.082(4.784)***	-.317(14.05)***
TO	-	-	-	-.011(4.091)***	-.01(2.881)***	-.01(1.50)
ID	.00002(.231)	.0003(.748)	.00001(.084)	-.0001(.729)	-.0002(.565)	-.00005(.486)
EA	.012(4.88)***	.01(4.1)***	.01(2.096)**	.01(4.645)***	.009(3.904)***	.01(1.528)
IF	.002(1.384)	.005(2.456)***	-.0003(.181)	.001(.873)	.003(1.605)	-.0003(.144)
CP	-.004(4.035)***	-.003(2.316)**	-.005(2.709)***	-.005(4.619)***	-.003(2.799)***	-.005(2.491)***
OL	.002(2.538)***	.002(2.14)**	-.001(.47)	.002(2.5)***	.002(1.908)*	-.0005(.269)
Diagnostics						
ECM_{t-1}	-.839(24.281)***	-.973(19.718)***	-.822(15.678)***	-.89(20.428)***	-1.066(17.14)***	-.835(16.278)***
RMSE	.058	.034	.073	.056	.033	.072
LL	20633.66	11488.75	9224.465	21003.73	11722.48	9273.9
No. of obs.	9749	4906	4843	9706	4884	4843
No. of countries	42	21	21	42	21	21
The table shows long-run panel ARDL estimates. T-values are in their absolute form in parentheses. ***, **, * show level of significance at 1%, 5%, and 10% respectively. ECM_{t-1} is an error correction term. Its negative and significant coefficient establishes the presence of cointegration (Kremers et al. 1992). RMSE is the root mean square error that measures the spread of residuals, LL is log-likelihood that measures the model goodness of fit. Variables abbreviations: FC(the global financial crisis), ER(stock return differential), TO(trade openness), ID(interest rate differential), EA(economic activity), IF(inflation rate), CP(credit to the private sector), OL(oil price)						

Table 3: Panel ARDL estimates including uncertainty measures									
	Panel I By including UM			Panel II By including UE			Panel III By including GE		
	Full Sample	Advanced	Emerging	Full Sample	Advanced	Emerging	Full Sample	Advanced	Emerging
Long-run estimates									
C	4.099(19.869)	5.238(14.4)***	3.763(14.918)***	4.148(20.65)***	4.888(17.216)***	3.826(15.679)***	4.087(20.539)***	4.815(17.207)***	3.796(15.625)***
FC	.001(.474)	.003(1.149)	.0005(.201)	.001(.252)	.002(.821)	.0002(.049)	.0003(.129)	.001(.652)	-.0004(.115)
ER	-.065(3.957)***	.075(4.585)***	-.329(13.55)***	-.083(5.023)***	.058(3.251)***	-.321(14.174)***	-.095(5.609)***	.058(3.198)***	-.325(14.316)***
TO	-.01(4.386)***	-.01(3.01)***	-.008(1.736)*	-.01(3.457)***	-.01(2.344)**	-.01(1.41)	-.01(2.682)***	-.01(1.833)*	-.006(1.303)
ID	-.0001(.926)	-.0005(1.629)*	-.00004(.399)	-.00004(.315)	-.0001(.377)	-.00002(.148)	-.00004(.389)	-.0003(.885)	-.000004(.033)
EA	.011(4.811)***	.01(4.501)***	.008(1.56)	.008(3.589)***	.008(3.279)***	.006(1.093)	.008(3.502)***	.008(3.121)***	.007(1.317)
IF	.002(1.085)	.002(.775)	-.0004(.19)	.002(1.497)	.004(2.029)**	.00004(.018)	.002(1.522)	.004(2.069)**	.0002(.094)
CP	-.005(4.891)***	-.003(2.551)***	-.005(2.604)***	-.002(2.287)**	-.002(1.61)	-.002(1.165)	-.001(.977)	-.001(.735)	-.001(.651)
OL	.003(2.667)***	.001(.692)	.0005(.219)	.001(.817)	.001(.929)	-.002(1.185)	.00004(.038)	.0005(.508)	-.003(1.338)
UM	.001(1.397)	-.001(1.628)*	.0001(.099)	-	-	-	-	-	-
UE	-	-	-	-.004(5.069)***	-.003(3.34)***	-.005(2.659)***	-	-	-
GE	-	-	-	-	-	-	-.004(4.519)***	-.003(3.034)***	-.005(2.479)***
Diagnostics									
ECM_{t-1}	-.886(19.88) ***	-1.142(14.41)***	-.808(14.937)***	-.902(20.279) ***	-1.066(17.219)***	-.826(15.705)***	-.895(20.545) ***	-1.056(17.209)***	.826(15.649)***
RMSE	.055	.031	.071	.055	.032	.071	.055	.032	.071
LL	21203.66	11975.08	9354.57	21169.7	11797.24	9347.278	21177.44	11810.74	9343.906
No. of obs.	9706	4862	4843	9706	4884	4843	9706	4884	4843
No. of countries	42	21	21	42	21	21	42	21	21
The table shows long-run panel ARDL estimates. T-values are in their absolute form in parentheses. ***, **, * show level of significance at 1%, 5%, and 10% respectively. ECM_{t-1} is an error correction term. Its negative and significant coefficient establishes the presence of cointegration (Kremers et al. 1992). RMSE is the root mean square error that measures the spread of residuals, LL is log-likelihood that measures the model goodness of fit. Variables abbreviations: FC(the global financial crisis), ER(stock return differential), TO(trade openness), UM(the US monetary policy uncertainty), UE(the US economic policy uncertainty), GE(the global economic policy uncertainty), TO (trade openness), ID(interest rate differential), EA (economic activity), IF (inflation rate), CP (credit to the private sector), OL(oil price)									

Table 4: Panel ARDL estimates for the crisis and non-crisis periods						
	Panel I With financial integration			Panel II With financial and real integration		
	Full Sample	Advanced	Emerging	Full Sample	Advanced	Emerging
Long-run estimates						
C	3.773(23.363)***	4.379(18.686)***	3.618(13.676)***	4.063(20.533)***	4.735(17.715)***	3.753(15.695)***
ER*FC	-.149(3.72)***	.134(3.048)***	-.61(9.657)***	-.149(3.349)***	.106(2.095)**	-.572(8.859)***
ER*NFC	-.04(2.502)***	.127(7.798)***	-.293(11.918)***	-.068(4.103)***	.064(3.635)***	-.288(12.398)***
TO*FC	-	-	-	-.015(4.931)***	-.014(3.776)***	-.011(1.869)*
TO*NFC	-	-	-	-.009(3.317)***	-.009(2.666)***	-.005(1.106)
ID	.00002(.174)	.0004(1.377)	.00002(.178)	-.0001(.842)	-.0002(.684)	-.00003(.3)
EA	.01(4.498)***	.01(3.91)***	.011(2.371)**	.01(4.468)***	.01(3.914)***	.008(1.624)*
IF	.002(1.412)	.005(2.694)***	-.001(.452)	.001(.926)	.003(1.673)*	-.001(.41)
CP	-.004(3.5)***	-.002(1.735)*	-.006(3.158)***	-.004(3.962)***	-.003(2.442)***	-.004(2.294)**
OL	.002(2.618)***	.002(1.935)**	.001(.601)	.001(1.096)	.001(1.21)	-.001(.794)
Diagnostics						
ECM_{t-1}	-.82(23.40)	-.959(18.733)***	-.776(13.684)***	-.881(20.553)	-1.033(17.718)***	-.809(15.716)***
RMSE	.057	.034	.072	.055	.032	.071
LL	20798.41	11559.95	9340.395	21381.35	11904.73	9443.47
No. of obs.	9749	4906	4843	9706	4884	4843
No. of countries	42	21	21	42	21	21
The table shows long-run panel ARDL estimates. T-values are in their absolute form in parentheses. ***, **, * show level of significance at 1%, 5%, and 10% respectively. ECM_{t-1} is an error correction term. Its negative and significant coefficient establishes the presence of cointegration (Kremers et al. 1992). RMSE is the root mean square error that measures the spread of residuals, LL is log-likelihood that measures the model goodness of fit. FC takes value 1 for the period October 2007 to March 2009 & 0 otherwise meanwhile NFC takes value 0 for the period October 2007 to March 2009 & 1 otherwise. Variables abbreviations: FC(the global financial crisis), ER(stock return differential), TO (trade openness), ID(interest rate differential), EA (economic activity), IF (inflation rate), CP (credit to the private sector), OL(oil price)						

Table 5: Panel ARDL estimates considering FX regimes						
	Panel I With financial integration interaction with FX regime			Panel II With financial integration interaction with FX regime along with real integration		
	Full Sample	Advanced	Emerging	Full Sample	Advanced	Emerging
Long-run estimates						
C	4.04(22.46)***	4.41(21.59)***	3.81(15.16)***	4.35(19.76)***	4.86(17.38)***	.0004(.15)
FC	.003(2.28)**	.003(1.8)*	.004(1.61)	.001(.66)	.002(1.07)	3.88(15.63)***
ER*FXR	-.08(12.74)***	-.02(1.92)**	-.1(13.78)***	-.07(11.27)***	-.02(1.79)*	-.1(13.64)***
TO	-	-	-	-.01(3.85)***	-.01(3.34)***	-.01(2.13)**
ID	-.00004(.393)	.00001(.005)	-.0001(.589)	-.0001(1.181)	-.0004(1.226)	-.0001(.991)
EA	.011(5.018)***	.011(4.051)***	.012(2.512)***	.01(4.713)***	.01(4.067)***	.011(2.116)**
IF	.001(1.029)	.003(1.361)	.0002(.081)	.001(.785)	.002(.866)	.0003(.168)
CP	-.005(5.215)***	-.004(3.355)***	-.01(2.954)***	-.006(5.839)***	-.005(4.03)***	-.01(2.888)***
OL	.002(2.475)***	.003(2.413)**	-.001(.456)	.002(2.452)***	.002(2.359)**	-.0001(.041)
Diagnostics						
ECM_{t-1}	-.87(22.5)***	-.95(21.65)***	-.82(15.16)***	-.94(19.79)***	-1.05(17.38)***	-.83(15.66)***
RMSE	.06	.03	.07	.06	.03	.07
LL	20690.1	11469.57	9221.74	21045.97	11715.84	9271.68
No. of obs.	9749	4906	4843	9706	4884	4843
No. of countries	42	21	21	42	21	21
The table shows long-run panel ARDL estimates. T-values are in their absolute form in parentheses. ***, **, * show level of significance at 1%, 5%, and 10% respectively. ECM _{t-1} is an error correction term. Its negative and significant coefficient establishes the presence of cointegration (Kremers et al., 1992). RMSE is the root mean square error that measures the spread of residuals, LL is log-likelihood that measures the model goodness of fit. Variables abbreviations: FC(the global financial crisis), ER(stock return differential), TO(trade openness), ID(interest rate differential), EA(economic activity), IF(inflation rate), CP(credit to the private sector), OL(oil price)						

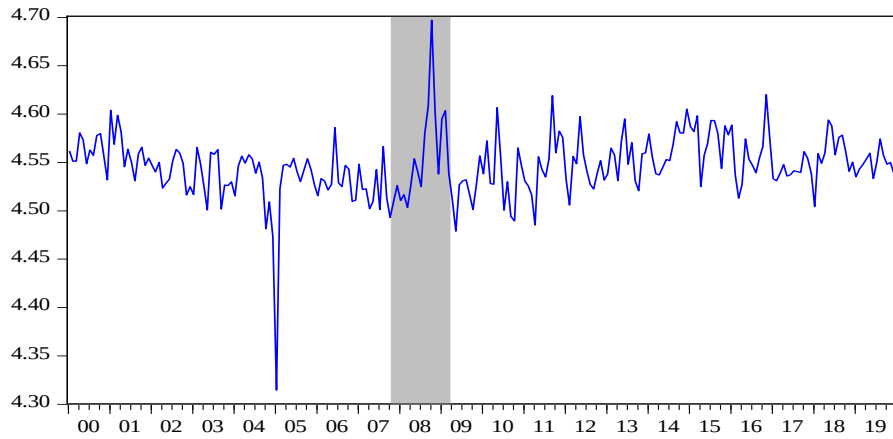
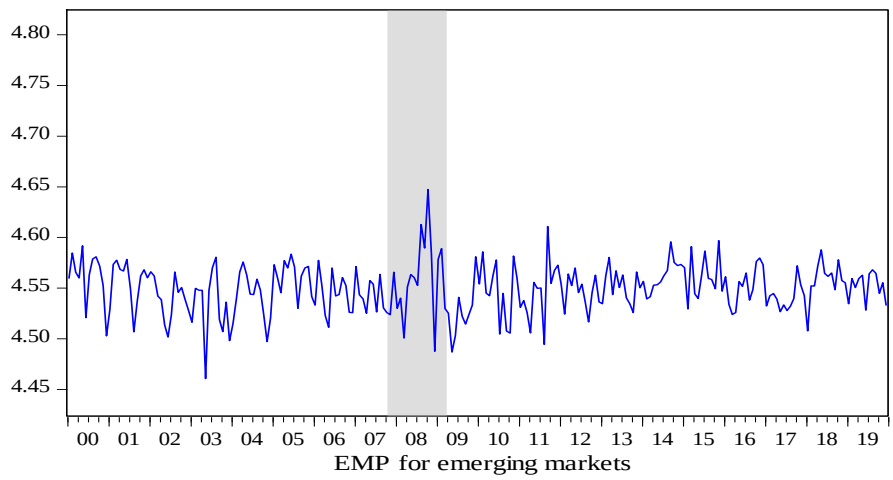
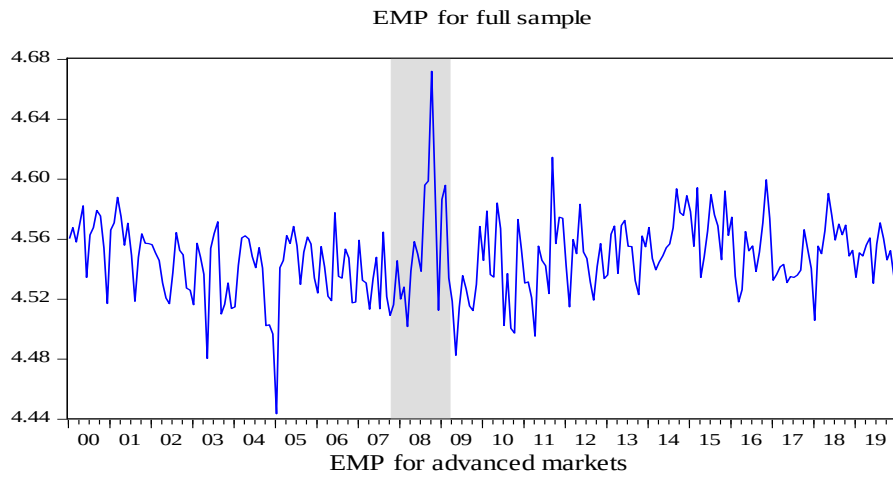


Figure 1: This figure shows the EMF behavior over the sample period. The shaded areas show the GFC period.

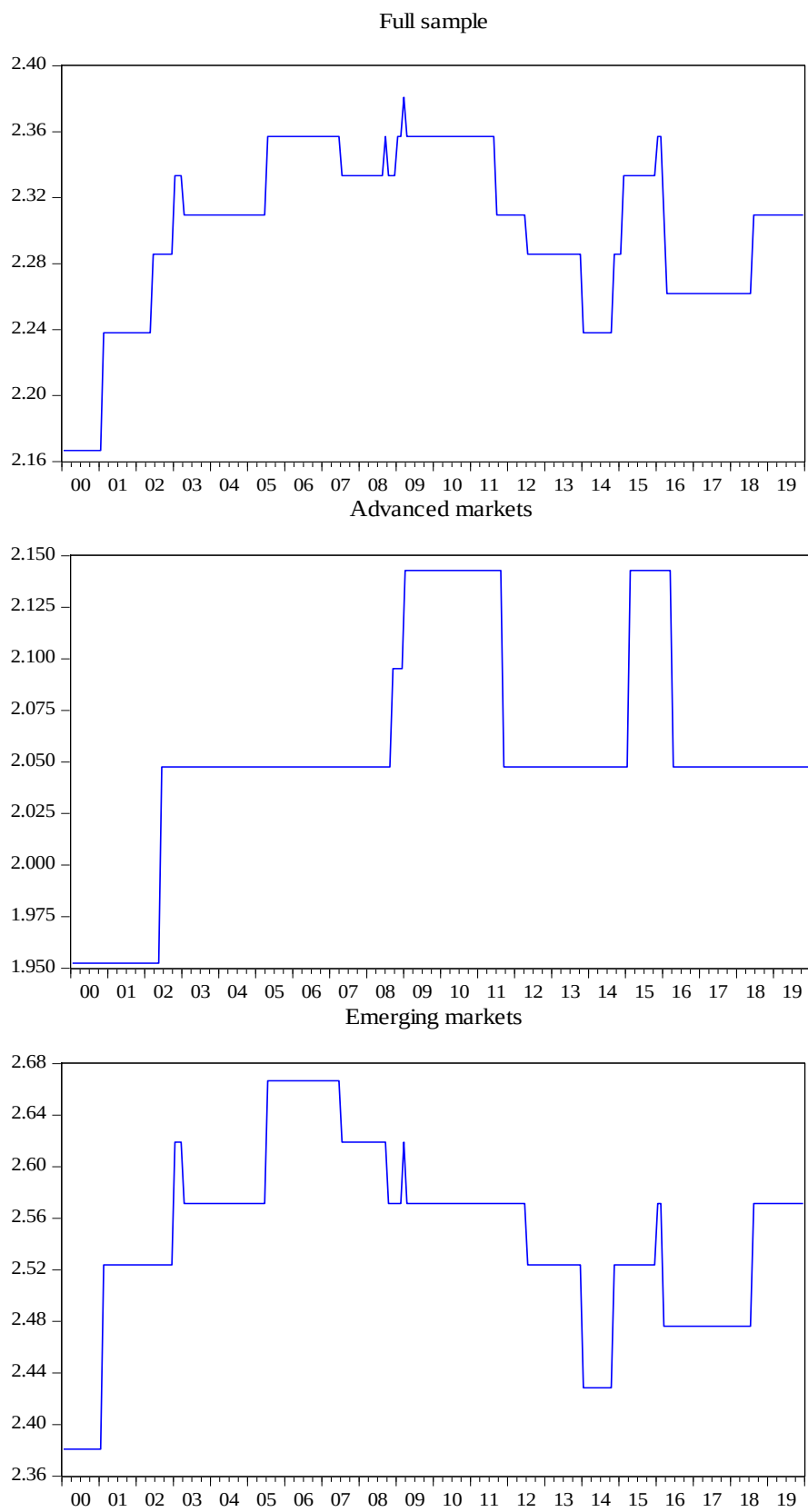


Figure 2: This figure shows the FX regime changes over the sample period.

Implied Volatility

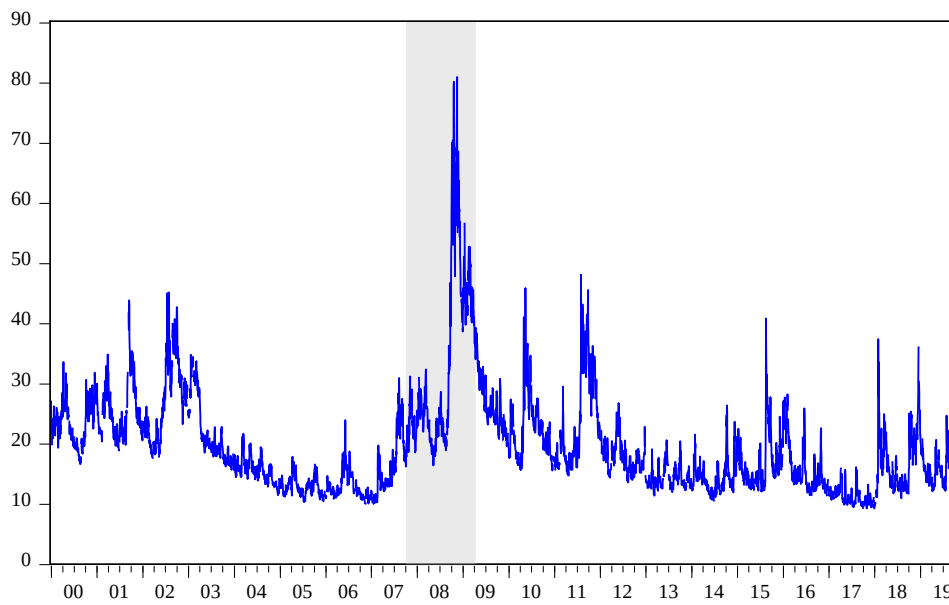


Figure 3: This figure shows the implied volatility of the S&P 500 based on the VIX index. The shaded area shows the global crisis period. (https://www.cboe.com/tradable_products/vix/vix_historical_data/)

Appendix

Table 1A: Variables and sources			
No.	Variable	Description	Source
1	Exchange market pressure	An index of exchange rate changes and international reserves of an economy. It measures the occurred and prevented exchange rate changes	Patnaik et al. (2017)
2	Equity return differentials	It measures the stock market performance by taking the log returns differential of the sample country stock market return and the USA stock market return in domestic currency.	Reuters
3	Trade openness	It is the ratio of an economy's exports minus imports divided by GDP. It measures trade openness or real integration.	World Bank
4	Interest rate differential	It is the difference between the domestic real interest rate and the US real interest rate. It measures the financial integration	IMF IFS
5	US monetary policy uncertainty	It measures the monetary policy uncertainty (MPU) in the USA. It is a news-based index that gauges the terms like, "uncertainty" or "uncertain," "monetary policy(ies)" or "interest rate(s)" or "Federal fund(s) rate" or "Fed fund(s) rate," and "Federal Reserve" or "the Fed" or "Federal Open Market Committee" or "FOMC" in the Wall Street Journal (WSJ), New York Times, and Washington Post.	Husted et al. (2020)
6	US economic policy uncertainty	It measures the economic policy uncertainty (EPU) of the US market. It is a news-based index that measures the terms like 'uncertainty' or 'uncertain', the terms 'economic' or 'economy', and one or more of the following terms: 'congress', 'legislation', 'white house', 'regulation', 'federal reserve', or 'deficit' in USA Today, the Miami Herald, the Chicago Tribune, the Washington Post, the Los Angeles Times, the Boston Globe, the San Francisco Chronicle, the Dallas Morning News, the Houston Chronicle, and the WSJ.	Baker et al. (2016)
7	Global economic uncertainty	It measures the global economic policy uncertainty (GPU). Following the same measurement approach as UE, it is GDP weighted average economic policy uncertainty of twenty-one economies (Australia, Brazil, Canada, Chile, China, Colombia, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States) that constitute the eighty percent of world GDP. (see Baker et al. (2016) for details)	Davis (2016)
8	Economic activity	It is an index of industrial production and it measures economic activity	World Bank
9	Inflation rate	It is the inflation rate, and it measures the changes in the overall general price level	IMF IFS
10	Credit to the private sector	It is a credit to the private sector, and it measures financial development.	IMF IFS
11	Oil price	It is the global Brent crude per barrel in local currency. It measures the influence of the energy market.	FRED St. Louis
These variable definitions are like those in Aftab and Phylaktis (2022).			

Table 2A: Panel ARDL estimates (without ID)						
	Panel I With financial integration			Panel II With financial and real integration		
	Full Sample	Advanced	Emerging	Full Sample	Advanced	Emerging
Long-run estimates						
C	4.074(21.534)***	4.47(20.435)***	3.835(15.522)***	4.174(21.152)***	4.974(19.408)***	3.887(16.154)***
FC	.004(3.368)***	.0042(7.04)***	.003(1.545)	.0007(.419)	.001(.656)	.0001(.054)
ER	-.087(5.233)***	.138(8.388)***	-.317(14.371)***	-.082(5.006)***	.089(5.362)***	-.313(14.172)***
TO	-	-	-	-.012(4.121)***	-.009(2.885)***	-.007(1.461)
EA	.011(4.975)***	.009(3.518)***	.09(1.894)*	.009(4.235)***	.008(3.436)***	.007(1.478)
IF	.004(2.578)***	.006(3.096)***	.0001(.074)	.002(1.578)	.005(2.407)***	-.0005(.311)
CP	-.004(4.002)***	-.002(1.775)*	-.005(2.477)***	-.004(3.904)***	-.002(2.147)**	-.005(2.3)**
OL	.001(1.467)	.001(1.452)	-.001(.495)	.002(1.815)*	.001(1.329)	-.0005(.257)
Diagnostics						
ECMt-1	-.884(21.568)***	-.978(20.491) ***	-.826(15.542) ***	-.906(21.179) ***	-1.086(19.432) ***	-.838(16.181) ***
RMSE	.057	.035	.074	.056	.034	.07
LL	20550.53	11386.67	9148.157	20751.15	11584.01	9199.82
No. of obs.	9712	4911	4843	9712	4890	4843
No. of countries	42	21	21	42	21	21
The table shows long-run panel ARDL estimates. T-values are in their absolute form in parentheses. ***, **, * show level of significance at 1%, 5%, and 10% respectively. ECMt-1 is an error correction term. Its negative and significant coefficient establishes the presence of cointegration (Kremers et al. 1992). RMSE is the root mean square error that measures the spread of residuals, LL is the log-likelihood that measures the model goodness of fit. Variables abbreviations: FC(the global financial crisis), ER(stock return differential), TO(trade openness), ID(interest rate differential), EA(economic activity), IF(inflation rate), CP(credit to the private sector), OL(oil price)						

Table 3A: Coarse classification codes	
1	No separate legal tender
1	Pre-announced peg or currency board arrangement
1	Pre-announced horizontal band that is narrower than or equal to +/-2%
1	De facto peg
2	Pre-announced crawling peg
2	Pre-announced crawling band that is narrower than or equal to +/-2%
2	De facto crawling peg
2	De facto crawling band that is narrower than or equal to +/-2%
3	Pre-announced crawling band that is wider than or equal to +/-2%
3	De facto crawling band that is narrower than or equal to +/-5%
3	Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)
3	Managed floating
4	Freely floating
5	Freely falling
6	Dual market in which parallel market data is missing.
Source: Ilzetzki et al (2019)	

Table 4A: Panel ARDL estimates considering FX regimes (excluding euro members)		
	Full Sample	Advanced
Long-run estimates		
C	4.126(17.61)***	4.289(13.752)***
FC	.001(.63)	.002(.548)
ER*FXR	-.094(15.506)***	-.078(7.724)***
Control variables included		
Diagnostics		
ECM _{t-1}	-.885(17.642)***	-.921(13.77)***
RMSE	.062	.044
LL	14769.43	5710.298
No. of obs.	7399	2804
No. of countries	32	12
The table shows long-run panel ARDL estimates. T-values are in their absolute form in parentheses. ***, **, * show level of significance at 1%, 5%, and 10% respectively. ECM_{t-1} is an error correction term. Its negative and significant coefficient establishes the presence of cointegration (Kremers et al., 1992). RMSE is the root mean square error that measures the spread of residuals, LL is log-likelihood that measures the model goodness of fit. Variables abbreviations: FC(the global financial crisis), ER(stock return differential), FXR(Foreign exchange regime)		