**Does Central Bank Transparency Curb Foreign Exchange Vulnerability?**

**Muhammad Aftab**[1]

**Kate Phylaktis**[2]

**Abstract**

The study examines the impact of Central Bank Transparency (CBT) on foreign exchange market vulnerability, by focusing on exchange market pressure (EMP). Using panel ARDL-based analysis, and a sample of 32 countries, 12 developed markets (DMs), and 20 emerging markets (EMs) over the period 2000-2019, we find that enhanced CBT is associated with a reduction in EMP, which is robust to including US monetary and economic policy uncertainty measures, and financial development. No supporting evidence is found that during times of high uncertainty the impact of CBT on EMP is greater. The flexibility of the exchange rate regime and financial integration are found to support CBT's reduction of EMP in EMs but not in DMs.

*JEL* Codes: E52, E58, F31

Keywords: Exchange Market Pressure, Central Bank Transparency, Monetary Uncertainty, Economic Uncertainty, Financial Development, Exchange Rate Regime, Financial Integration

[1] Muhammad Aftab is an Assistant Professor of Finance at Department of Management Sciences, COMSATS University Islamabad. (Email: maftab@comsats.edu.pk).

[2]Corresponding author, Kate Phylaktis is a Professor of International Finance at Faculty of Finance, Bayes (formerly Cass) Business School, City University of London. (Email: k.phylaktis@city.ac.uk).

"…..Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough."

Mario Draghi, (2012)

## 1. Introduction

In this paper, we investigate the impact of Central Bank Transparency (CBT) on foreign exchange market vulnerability, by focusing on exchange market pressure (EMP). Central banks stand as guardians of monetary policy, entrusted with the crucial task of maintaining exchange rate stability while minimizing vulnerabilities, which may threaten financial stability. Central banks implement monetary policy through open-market operations (actual monetary policy) and open-mouth operations (verbal statements, which provide information, or future guidance about future monetary policy decisions), which is referred to as monetary policy transparency, or central bank transparency (Dincer et al., 2022), or indeed central bank communications (Fratzscher, 2006). Central banks continue to move in the direction of greater transparency in their conduct of monetary policy. This is true for countries of different income levels and irrespective of monetary policy strategy. As a result, CBT has increased over time in importance (Dincer et al., 2022). A similar upward trend is observed in our sample of countries as well for both developed and emerging markets (see Figure 1).

Transparency of central bank decision-making has increased rapidly in recent years with the adoption of inflation targeting by the central banks of New Zealand, Canada, the U.K., and Sweden.[3] Nowadays, most central banks put a much larger weight on their communication with the public than they used to do. An important trigger for increased transparency has been the requirement for greater accountability by independent central banks (De Haan et al., 2007).

The discussion on the role of central bank communication has been extended to exchange rates. Monetary authorities in the United States and the euro area have abandoned *actual* interventions in the FX market since 1995 and have shifted towards the use of communication, or *oral* interventions, to convey their stance on exchange rates. A classic

[3] Also, central banks with different monetary policy strategies became more transparent, as documented by Poole (2005) for the case of the Federal Reserve.

example of that is the announcement at the Global Investment Conference in London by Mario Draghi on the 26th of July in 2012, which was in the middle of the European debt crisis that the "ECB will do whatever it takes to support the Euro".[4] In contrast, Japan has periodically conducted substantial purchases, or sales in foreign exchange (FX) markets, that is it performed *actual* intervention in the FX market (Fratzscher, 2006).

Thus, CBT (*oral* intervention in the FX market) is one of the two policy tools available to monetary authorities to influence the exchange rates, the other one is *actual* intervention in the FX markets by the monetary authorities.

Several studies have studied the impact of CBT on the volatility of exchange rates (e.g. Eichler and Littke, 2018; Fratzscher, 2006; Weber, 2019). These studies as well as others do not consider the impact of *actual* intervention in the FX markets in their investigation. As Fratzscher, (2006) notes based on G3 (USA, Japan, and the Euro area) over the period 1990-2003 the two policy tools have different impacts. In particular, communication is found to reduce exchange rate volatility and uncertainty, whereas actual interventions tend to increase it. Overall, this underlines a key difference between these two policy tools. At the same time, it brings out the importance of considering *actual* intervention when investigating the impact of CBT on exchange rates, an issue, which was not done in any of the previous studies. Our study fills that gap by examining the impact of CBT on EMP. EMP measures 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 FX market by the central bank of the country to influence movements in the exchange rate (Eichengreen et al., 1995; Klaassen and Jager, 2011; Patnaik, Felman, and Shah, 2017; Pentecost et al., 2001; Weymark, 1995). Our study is the first one that attempts to take into account actual FX market intervention in investigating the impact of CBT on exchange rates.

The importance of actual and future monetary policy for exchange rates becomes apparent when one considers the flexible price monetary model to exchange rate determination Frankel–Bilson model (Frenkel, 1981; Hakkio and Pearce, 1985; Engel and West, 2005). According to it, the exchange rate between two currencies is determined by differences in money growth, differences in GDP growth between the two countries, and the expected change in the spot rate. The expected change in the spot rate in turn will depend on the current value

[4] There was an immediate positive response by the financial markets (BBC news, 26th July 2012).

of the exchange rate and the expected exchange rate, which will embody the fluctuations in the expected changes in macroeconomic variables or news. However, studies show that only monetary surprises affect the exchange rates (see e.g. Fatum and Scholnick, 2008). This latter component of exchange rate determination is what connects central bank open-mouth operations, that is CBT and exchange rates.

In our econometric methodology, we apply, the panel bounds testing approach to cointegration, which takes care of potential endogeneity issues and produces unbiased estimates when some of the variables have possible endogeneity problems (Harris and Sollis, 2003; Menegaki, 2019; Smith, 2020). Previous studies, which investigated the impact of CBT on exchange rate volatility did not take care of the endogeneity concerns satisfactorily. For example, Eichler and Littke (2018) report that "Despite the large amount of robustness analysis presented in our paper we still cannot completely rule out that our results concerning the impact of central bank communication are suffering from endogeneity issues".

Our sample of countries consists of thirty-two advanced and emerging markets. Using annual data over the period 2000 to 2019 which incorporate the effects of the global financial crisis (GFC) as well as various control variables, which have been found to affect EMP, and applying the panel bounds testing approach to cointegration which takes care of potential endogeneity issues, we find (i) enhanced CBT is associated with a reduction in EMP, which is robust to including US economic and monetary policy uncertainty measures; (ii) The study uncovers the sustained relieving effects of CBT during the crisis and non-crisis periods, emphasizing the effectiveness of information disclosure in both normal and turbulent times; (iii) The study, however, does not find supporting evidence that during times of high uncertainty the impact of CBT on EMP is greater; (iv) Our results show that financial development enhances the effectiveness of CBT in reducing EMP across both DMs and EMs. This implies that well-developed financial systems amplify the benefits of CBT leading to more stable exchange markets; (v) the flexibility of the exchange rate regime, is found to support CBT's reduction of EMP in EMs but not in DMs; (vi) financial integration, measured by the uncovered equity parity (UEP) is found to enhance the buffering effect of CBT on EMP in EMs, but it more than offsets it in DMs resulting in an increased effect. This finding aligns with existing studies based on the impact of financial integration, measured by the UEP on EMP, which show that the effects of financial integration differ between DMs and EMs (Phylaktis and Aftab, 2024). Specifically, increased financial integration with the US reduces EMP in EMs

but raises it in DMs confirming that US investors chase returns in EMs while rebalance portfolios to mitigate FX risk in DMs.

The remaining paper is organized as. The next section reviews the literature, Section 3 discusses the research model, Section 4 elaborates on the estimation strategy, Section 5 provides details about data along with preliminary results, and Section 6 discusses the empirical results. Finally, Section 7 concludes the paper.

## 2. Review of literature

As mentioned earlier most of the studies on the impact of CBT on exchange rates have focused on the volatility of exchange rates, apart from Kim (2018).[5] For example, Eichler and Littke (2018) study the transparency of monetary policy on the bilateral exchange rates of 62 currencies over the period 1998-2010 and report that information availability regarding monetary policy decreases exchange rate volatility.

Weber (2019) studies the effect of CBT on the volatility of exchange rates using annual data for a group of countries consisting of both developing and developed countries over the period 1998 to 2010. He uses, as the unconditional volatility measure, the SD of a variable, and for the conditional volatility a measure based on ARCH-type models. He reports that the effect of central bank transparency on exchange rate volatility depends on a country's financial development, for the proportion of forex activity not related to the real economy is higher and as a result, more trading activity could be affected by news, in highly developed countries. He claims that this could explain why his results show that there is no effect of CBT in the full sample and the developing countries sample, while transparency increases exchange rate fluctuations in developed countries. It should be borne in mind that Weber (2019) looks into the volatility of exchange rate changes, due only to oral CBT, while he is not taking into account actual CBT on exchange rates. He also controls for capital controls provided by Fernández et al. (2016)[6] **,** which is a measure of financial integration and for the type of the exchange rate system provided by Ilzetzki et al. (2017) who focuses on *de facto* ER regimes and is thus a

[5] It should be noted that there is another related strand of literature, which explores the impact of communications on exchange rates (see e.g.Conrad and Lamla, 2010; Fratzscher, 2008). It is believed that CBT plays a major role in communications (Dincer et al 2022).

[6] The restrictions index (covers both inflow and outflow restrictions). The range of this index runs from zero (no restrictions) to one (maximum restrictions). For a discussion of the measures of financial integration see Phylaktis and Aftab (2024).

more accurate representation of the exchange rate regime of a country than the standard de *jure* ER classifications reported by the International Monetary Fund. As Weber (2019) explains countries with flexible exchange rate regimes, might be less willing to intervene in the FX market to reduce exchange rate volatility.

According to Dominguez and Panthaki (2006), Fratzscher (2008) and subsequently Weber (2019), news and CB communication have more impact during times of high uncertainty. For example, Weber (2019) uses the standard deviation of inflation as a measure of uncertainty but finds it to be statistically insignificant.

It has already been mentioned that the results in Fratzscher (2006) based on G3 (USA, Japan, and the Euro area) using daily data over the period 1990-2003 indicate that communication has not only exhibited a significant contemporaneous effect on exchange rates, but also has moved forward exchange rates up to a horizon of 6 months in the desired direction. Moreover, communication (oral intervention) is found to reduce exchange rate volatility and uncertainty whereas actual interventions tend to raise it. Overall, this underlines a key difference between these two policy tools and suggests that communication tends to be a fairly effective policy tool over the medium-term and possibly in the long-run.

Kim (2018), on the other hand, studies the effects of transparency on currency crises and finds that CBT reduces the currency crisis risk.

In this study, we investigate the impact of CBT (oral intervention) on EMP, which takes into account actual exchange market intervention as well. The results of the studies above motivate us to investigate the following questions in our framework, starting with our main question.

1. What is the effect of CBT on EMP?
2. Is the impact of CBT on EMP higher during times of high uncertainty?
3. Does financial development affect the impact of CBT on EMP?
4. Does the flexibility of the exchange rate regime affect the impact of CBT on EMP?
5. Does financial integration affect the impact of CBT on EMP?

## 3. Research model and variables

Following the theory that links the exchange rate with news (Frenkel, 1981; Hakkio and Pearce, 1985; Engel and West, 2005), we introduce central bank transparency in the empirical model following the pattern of Aftab and Phylaktis's (2022) as.

$$EMP_{i,t} = \alpha_o + \beta_1 FC_t + \beta_2 CBT_{i,t} + \sum_1^k \beta_k X_{k,i,t} + \varepsilon_{i,t} \quad (1)$$

where *i* refers to the country and *t* refers to the time, EMP refers to exchange market pressure, FC is the dummy variable to capture the global financial crisis effect, CBT is the central bank transparency, X is the matrix of control variables, such as trade openness (TO), interest rate differential (ID), equity return differential (ER), economic activity (EA), inflation rate (IF), financial development (FD), and oil price (OL), which have been found to impact EMP (Aftab and Phylaktis, 2022, and Phylaktis and Aftab, 2024).

We discuss variables in the model, beginning with the dependent variable, EMP, and the main independent variable, CBT, along with control variables.

*EMP* measures overall foreign exchange pressure, which 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) improves it by proposing a structural model that depends on the country-specific conditions and uses 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:

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

where the first component is the log changes in the exchange rate, the second component is the changes in foreign currency reserves scaled on lagged seasonally adjusted money supply, and the third component is the interest rate differential, which is occasionally used to influence the exchange rate. 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 exchange rate changes, which did not take place because of interventions in the foreign currency market by the central bank and is represented by

$$EMP_t = \Delta x_t + \rho_t I_{t,} \tag{3}$$

where $\Delta x_t$ is the percentage exchange rate changes, $I_t$ is foreign exchange intervention in billions of dollars, and $\rho_t$ is a conversion factor that gauges exchange rate changes of one-billion-dollar intervention. It is influenced by market size and liquidity, being larger for small and less liquid FX markets than large and more liquid markets (Patnaik et al., 2017, p.66).

*CBT* plays a crucial role in enhancing financial system transparency, allowing economic agents to form informed expectations. This is particularly relevant for exchange rates (ERs), which are significantly influenced by news. News models, as suggested by Frenkel (1981) indicate that ER changes result from shifts in swap rates and unexpected news, a view supported by the efficient market hypothesis (Weber, 2019). This means that when new information becomes available, it is rapidly incorporated into ERs, leading to immediate adjustments. Hakkio and Pearce (1985) provide evidence that the divergence between forward and spot ERs is due to unexpected news. Engel and West (2005) add another layer to this understanding by proposing that ERs reflect the discounted value of prospects including both observable fundamentals and unobservable factors. By promoting transparency, CBT helps market participants to interpret better and to react to information, leading to more stable and predictable ER movements. Clear and consistent communication from central banks may reduce uncertainty and speculative behavior, allowing for more accurate market expectations. On the other hand, transparency might introduce more uncertainty, as market participants continuously adjust their positions based on transparent information about economic conditions and central bank policies (IMF CBT Code, 2020).

*TO* stands for trade openness and is measured by an economy's exports minus imports divided by GDP. It causes changes in the exchange rate and foreign reserves, which both constitute the EMP measure, through the trade of goods. Depending on the trade balance, trade openness can increase, or decrease the EMP.

*ER* gauges stock market performance through the return differential of domestic and US stock markets in terms of domestic currency, reflecting financial integration based on

uncovered equity parity (UEP) developed by Hau and Rey (2006). We adopt the uncovered equity return parity condition to predict whether equity market differentials converge with increased financial integration (Aftab and Phylaktis, 2022). Depending on the direction of capital flows, financial integration can increase, or decrease the EMP.

*ID* denotes the domestic real interest rate minus the US real interest rate, and controls for potential real interest parity effects, influencing cross-border capital flows. An increase in the ID attracts foreign investments, thus relieving the EMP.

*EA* denotes economic activity and is based on industrial production. It affects EMP, by reducing preceding speculative attacks on a currency that result in depreciation of the currency (Eichengreen et al., 1995). Thus, higher EA reduces speculative flows and EMP (Aftab and Phylaktis, 2022; Aizenman et al., 2012; Aizenman and Binici, 2016).

*IF*, the inflation rate, influences EMP, an increase in it triggers currency depreciation (Ahmed et al., 2017) and motivates central banks to target price stability (White, 2006).

*FD* stands for financial development, and it is measured by credit to the private sector. It impacts EMP by contributing to price stability and reducing financial vulnerability (Jeanneau and Tovar, 2008) and EMP.

*OL* controls for energy market effects, impacting EMP based on whether the country is a net oil importer or exporter (Aftab and Phylaktis, 2022). An increase in oil prices raises EMP for importers and reduces it for exporters (Gevorkyan, 2019).

## 4. Methodology

As our study variables are of a mixed order (e.g. I(0), I(1)) as shown in the Appendix Table A1, we use a panel autoregressive distributed lag (ARDL) estimation approach. This approach also provides unbiased estimates when some of the variables have endogeneity problems (Harris and Sollis, 2003; Menegaki, 2019; Smith, 2020). The error correction specification of (1) is as follows.

$$\begin{aligned}\Delta EMP_{i,t} = {} & \alpha_o + \alpha_1 FC_t + \sum_{j=1}^{n1} \alpha_{2,i} \Delta EMP_{i,t-j} + \sum_{j=0}^{n2} \alpha_{3,i} \Delta CBT_{i,t-j} + \sum_{j=0}^{n3} \alpha_{4,i} \Delta TO_{i,t-j} + \sum_{j=0}^{n4} \alpha_{5,i} \Delta ID_{i,t-j} \\ & + \sum_{j=0}^{n5} \alpha_{6,i} \Delta ER_{i,t-j} + \sum_{j=0}^{n6} \alpha_{7,i} \Delta EA_{i,t-j} + \sum_{j=0}^{n7} \alpha_{8,i} \Delta IF_{i,t-j} + \sum_{j=0}^{n8} \alpha_{9,i} \Delta FD_{i,t-j} \\ & + \sum_{j=0}^{n9} \alpha_{10,i} \Delta OL_{i,t-j} + \beta_0 EMP_{i,t-1} + \beta_1 CBT_{i,t-1} + \beta_2 TO_{i,t-1} + \beta_3 ID_{i,t-1} + \beta_4 ER_{i,t-1} \\ & + \beta_5 EA_{i,t-1} + \beta_6 IF_{i,t-1} + \beta_7 FD_{i,t-1} + \beta_8 OL_{i,t-1} + \xi_{i,t} \end{aligned} \quad (4)$$

We estimate (4), using ordinary least square. The first differenced variables signify the short-run effects, the long-run effects are provided by the lagged coefficients ($\beta_1 - \beta_8$) normalized on $\beta_0$. Pesaran et al. (2001) recommend the presence of cointegration to draw the meanings from the long-run estimates. The null and alternative hypothesis of cointegration is as follows.

$$F_{EP}(EMP|CBT, TO, ID, ER, EA, IF, FD, OL)$$

$$H_o: \frac{\beta_1}{\beta_o} = \frac{\beta_2}{\beta_o} = \frac{\beta_3}{\beta_o} = \frac{\beta_4}{\beta_o} = \frac{\beta_5}{\beta_o} = \frac{\beta_6}{\beta_o} = \frac{\beta_7}{\beta_o} = \frac{\beta_8}{\beta_o} = 0 \text{ and } H_1: \frac{\beta_1}{\beta_o} \neq \frac{\beta_2}{\beta_o} \neq \frac{\beta_3}{\beta_o} \neq \frac{\beta_4}{\beta_o} \neq \frac{\beta_5}{\beta_o} \neq \frac{\beta_6}{\beta_o} \neq \frac{\beta_7}{\beta_o} \neq \frac{\beta_8}{\beta_o} \neq 0 \quad (5)$$

To test the cointegration hypothesis, we use the lagged error correction term (ECMt-1) defined as.

$$ECM_{t-1} = EMP_{t-1} - \frac{\beta_1}{\beta_o} CBT_{t-1} - \frac{\beta_2}{\beta_o} TO_{t-1} - \frac{\beta_3}{\beta_o} ID_{t-1} - \frac{\beta_4}{\beta_o} ER_{t-1} - \frac{\beta_5}{\beta_o} EA_{t-1} - \frac{\beta_6}{\beta_o} IF_{t-1} - \frac{\beta_7}{\beta_o} FD_{t-1} - \frac{\beta_8}{\beta_o} OL_{t-1} \quad (6)$$

The negatively significant coefficient attached to the ECMt-1 establishes the existence of cointegration.

## 5. Data and preliminary analysis

We selected a sample of thirty-two countries comprising twelve advanced markets (Australia, Canada, Denmark, Hong Kong, Israel, Japan, New Zealand, Norway, Singapore, Sweden, Switzerland, United Kingdom) and twenty emerging markets (Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Saudi Arabia, South Africa, Thailand, Turkey) based on the MSCI market classification. Our sample period is from 2000 to 2019 and is driven by data availability constraints. Data were sourced from various sources including Baker et al. (2016), Dincer (2022), FRED Louis, Husted et al. (2020), IMF financial statistics, Patnaik et al. (2017), Reuters, and the World Bank. Variable definitions and sources are detailed in Table 1A in the Appendix.

Figure 1 illustrates fluctuations in the (EMP) over the period, a critical concern for FX stability. Concurrently, Figure 2 demonstrates an upward trend in CBT over the same timeframe. We aim to explore the relationship between these trends and EMP fluctuations. Panel unit root analysis of the variables in our study is presented in Table A2 in the Appendix, revealing unit root issues at the level for some variables like economic activity, yet all variables

are stationary at first differences. Given this mixed-order integration, we employ the bounds-testing approach to cointegration as outlined in the methodology section.

## 6. Results

Our research strategy is to present the results in a way that answers the questions we listed in Section 2.

### *6.1 Does CBT impact EMP?*

The estimation results of model 1 are reported in Table 1. We refer to these results as our base model results. We present results for the full sample and then separately for the DMs and EMs. As Pesaran et al. (2001) point out, the meaningfulness of the estimates relies on the presence of cointegration. The ECMt-1 coefficients are negative and significant in the full sample and both subsamples and that establishes the existence of cointegration (Kremers et al. 1992). The full sample estimates show that the coefficient of CBT is negative and statistically significant, which implies that improvements in CBT reduce EMP. This finding is also supported by the sub-sample analysis of DMs and EMs. It corroborates the earlier findings of Eichler and Littke (2018), which look at the exchange rate volatility. This is however opposite to the findings of Weber (2019) for the case of advanced markets.[7]

The effect of the global financial crisis (GFC) was significant for the full sample as well as subsamples. This substantiates the fact the GFC intensified the pressure on the FX markets (Cho et al., 2016). Now we move to the effect of other control variables. The trade openness relieves the pressure on the FX in the full sample and EMs subsample analysis which is in line with Aftab and Phylaktis (2022). However, this is not the case for DMs. The interest rate differentials and equity return differentials relieve the EMP. The effect of economic activity and inflation rate is contributory to the EMP in all significant cases. Credit to the private sector relieves the EMP in the full sample and DMs subsample while aggravating it in the EMs subsample. The effect of oil price increases the EMP in the full sample and DMs subsample only where it is significant. In the subsequent sections, we conduct some robustness checks.

### *6.2 Is the impact of CBT on EMP higher during times of high uncertainty?*

[7] It should be noted that we run the estimation on actual exchange rate changes, instead of EMP, which includes actual intervention in the FX market by the monetary authorities and found that the impact of CBT is different to that of our base model in the full sample and EMs subsample (see Table A3 in the Appendix) confirming the importance of taking into account actual intervention in the FX market. This undermines the results of previous studies, which did not account for actual intervention.

Policy uncertainty affects the unsystematic component of the exchange rates (Beckmann and Czudaj, 2017).[8] Following that reasoning, we investigate whether the policy uncertainty affects the CBT impact on EMP by bringing changes in the economic environment (Carrière-Swallow and Céspedes, 2013) and whether news and Central Bank communication have more impact during times of high uncertainty (Dominguez and Panthaki, 2006); Fratzscher, 2008; Weber, 2019). To capture this potential impact of policy uncertainty, we follow two approaches. First, we extend our base model by incorporating US monetary and economic policy uncertainty, one at a time, to examine whether these policy uncertainties affect the impact of CBT on EMP. These measures are based on the natural language processing of news-based terms in the press pioneered by Baker et al. (2016). [9] Secondly, we examine the impact of CBT on EMP during crisis times and normal times to see whether the impact of CBT on EMP is greater during crisis periods.

For the first exercise, the results show that by adding MU and EU to the base model (we find them to be statistically significant for all samples, and CBT maintains its impact on EMP (see Table 2). This is not surprising, as it confirms the results of studies on the spillover effects of US policies on the rest of the world (Bhattarai et al., 2020; Lakdawala et al., 2021). However, the coefficients on the whole are not larger than those of the base model (see Table 1). Thus, our hypothesis is not accepted. The overall model diagnostics show some improvements after the inclusion of the uncertainty terms, and the ECMt-1 is significant, indicating fast convergence to the long-run relationship.

For the second exercise, we compare the impact of CBT on EMP during crisis times and normal times to see whether the impact of CBT on EMP is greater during crisis periods, as hypothesized above. Crisis episodes affect investors' risk aversion and investment decisions, as noted by Phylaktis and Aftab (2024). We adopt the approach initially suggested by Banti and Phylaktis (2015) and subsequently adopted by Aftab and Phylaktis (2022), creating two dummies labelled FC and NFC covering the crisis and non-crisis periods, respectively. The FC takes the value of one during the crisis period and zero during the rest of the period, while the NFC takes a value of zero during the crisis period and one during the rest of the period. After creating these two variables, we create two interactions, CBT*FC and CBT*NFC, and replace CBT in the main model with them. Table 3 reports the results.

[8] The other important components of exchange rate changes are expected component or fundamentals (Engel and West, 2005).
[9] For details, please see the Table 1A in the Appendix.

Notably, CBT relieves EMP during both crisis and non-crisis periods. The same results are observable in the subsample analysis of developed and emerging markets. This supports the efficacy of information disclosures during both normal and turbulent times. However, the coefficient is greater during the NFC for the full sample and the two subsamples, rejecting the hypothesis that during times of high uncertainty the impact of CBT on EMP is greater. In conclusion, we do not find supporting evidence that the impact of CBT on EMP is higher during times of high uncertainty.

*6.3 Does financial development affect the impact of CBT on EMP?*

A country's level of financial development may influence the impact of CBT on EMP as the proportion of foreign exchange activity not related to the real economy tends to be higher in countries with greater financial development (Weber, 2019). This also associates with the efficient processing of information in advanced markets compared to developing markets (Borges, 2010; Fratzscher, 2006; Kim and Shamsuddin, 2008). By improving market efficiency, risk diversification, access to capital, and institutional strength, we expect that financial development will make CBT effective in stabilizing the exchange rate and reducing EMP. We examine this conjecture by interacting the financial development measure with CBT and substituting CBT in equation (1) with the interaction term. The Results show that financial development enhances the effectiveness of CBT in reducing EMP across the full sample as well as in the DMs and EMs subsamples (see Table 4). This implies that well-developed financial systems amplify the benefits of central bank transparency, leading to more stable exchange markets.

*6.4 Does the impact of CBT on EMP depend on the flexibility of the exchange rate regime?*

We investigate next whether foreign exchange (FX) regimes influence the impact of CBT on EMP, as FX regimes play a significant role in defining a country's external exposure (Aizenman et al., 2016) and the central bank's policy choices (Obstfeld et al., 2005). Ilzetzki et al. (2019) note that exchange rate regimes are not fully liberalized across the countries even in the 21$^{st}$ century, and many countries have exchange rate regimes with various levels of flexibility. We use the coarse regime classification provided by Ilzetzki et al. (2019) that rates the regime from one to six with one being fully fixed to six being fully flexible (see Appendix Table A4 ). We interact the FX regime (FXR) variable with CBT and substitute CBT in the model specification with the interaction term. Table 5 shows the flexibility of the FX regime continues to support a reduction in EMP through CBT in the case of the full sample and the

EMs subsample but not in the case of the DMs subsample.[10] It might be because DMs intervene less in the FX market to support the exchange rate through both oral and actual interventions. Evidence gives support to that conjecture. For example, New Zealand and Poland have abstained from intervening and can be considered pure floaters. The US, Japan, and the EU have intervened in the market at different points in time, but their interventions have shown a diminishing trend in frequency while increasing in size. While the European Central Bank has intervened on two occasions, both in the year 2000;[11] the UK and Switzerland have not intervened since 1992, except in 2000, in a coordinated action to support the euro (De Gregorio and Tokman, 2004).

*6.5 Does financial integration affect the impact of CBT on EMP?*

In our last exercise, we investigate whether financial integration affects the impact of CBT on EMP. Financial integration increases the need for transparent central banks to reduce information asymmetry, allowing both domestic and international investors to understand monetary policy directions, which helps stabilize market expectations and reduce speculative attacks[12]. Reduced information asymmetry decreases the likelihood of abrupt capital movements driven by rumors, or uncertainties, thereby reducing the EMP.[13]

We interact financial integration (denoted by ER based on the UEP) with CBT and substitute CBT in equation (1) with the interaction term. Table 6 reports the results of the effects of financial integration. The results indicate that financial integration moderates the CBT effect on EMP. The coefficient is negative and statistically significant for the full sample and the EMs subsample, but positively significant for DMs. This implies that financial integration enhances the buffering effect of CBT on EMP in EMs, while more than offsetting it in DMs, resulting in an increase. This finding aligns with existing studies based on the (UEP), which show that the effect of financial integration differs between advanced and emerging markets (Fuertes and Phylaktis, 2019; Phylaktis and Aftab, 2024). Specifically, increased financial integration with

[10] The diagnostics support the meaningfulness of the estimates, as notable from the faster rate of adjustments to equilibrium based on $ECM_{t-1}$.
[11] As mentioned earlier the ECB intervened again more recently in 2012.
[12] For instance, Mexican central bank monetary stance is much influenced by financial integration (Bank of Mexico, 2020).
[13] It should also be noted that financial integration weakens domestic policymakers' influence, making monetary policy more dependent on foreign conditions and increasing the risk of economic disruptions (Bank for International Settlements, 2019).

the US reduces EMP in EMs but raises it in DMs, confirming that US investors chase returns in emerging markets while rebalance portfolios to mitigate FX risk in advanced markets.

## 7. Conclusion

This study contributes to the literature by shedding light on the relationship between CBT and foreign exchange market vulnerability, it applies an econometric technique, which takes care of possible endogeneity issues. The study attempts to take into account actual intervention in FX markets by investigating the effects of CBT on EMP, which measures 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 FX market by the central bank of the country to influence movements in the exchange rate. The study finds supporting evidence that the results of studies on the impact of CBT on exchange rates, which do not take into account actual intervention in the FX market, should be treated with caution.

Using a sample of thirty-two countries, twelve DMs, and twenty EMs the empirical findings support the notion that enhanced CBT is associated with a reduction in EMP, which is robust to including US monetary and economic policy uncertainty measures. The study uncovers the sustained relieving effects of CBT during the crisis and non-crisis periods, emphasizing the effectiveness of information disclosure in both normal and turbulent times. The study however does not find supporting evidence that during times of high uncertainty the impact of CBT on EMP will be greater. Furthermore, our results show that financial development enhances the effectiveness of CBT in reducing EMP across both DMs and EMs. This implies that well-developed financial systems amplify the benefits of CBT leading to more stable exchange markets.

Another factor, in the assessment of CBT effects on exchange market vulnerability in EMs is the flexibility of the exchange rate regime, which is found to support its reduction. This is not however the case in DMs.

Finally, financial integration, measured by the (UEP) is found to enhance the buffering effect of CBT on EMP in EMs, while more than offsetting it in DMs resulting in an increased effect. This finding aligns with existing studies based on the impact of financial integration, measured by the UEP on EMP, which show that the effect of financial integration differs between DMs and EMs (Phylaktis and Aftab, 2024). Specifically, increased financial

integration with the US reduces EMP in EMs but raises it in DMs confirming that US investors chase returns in emerging markets while rebalancing portfolios to mitigate FX risk in DMs.

Overall, this research advances our understanding of the relationship between CBT and foreign exchange market vulnerability, providing valuable insights for policymakers and researchers alike.

**References**


Aftab, M., & Phylaktis, K. (2022). Economic integration and exchange market pressure in a policy uncertain world. *Journal of International Money and Finance*, *128*, 102701.

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., 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.

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The Quarterly Journal of Economics*, 131(4), 1593-1636.

Bank For International Settlements. (2019). Unconventional monetary policy tools: a cross-country analysis (CGFS Papers No 63). https://www.bis.org/publ/cgfs63.pdf

Bank of Mexico. (2020). Financial market development, monetary policy and financial stability in emerging market economies (Mexico) (BIS Papers No 113) https://www.bis.org/publ/bppdf/bispap113.pdf

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.

Bhattarai, S., Chatterjee, A., & Park, W. Y. (2020). Global spillover effects of US uncertainty. *Journal of Monetary Economics*, *114*, 71-89.

Borges, M. R. (2010). Efficient market hypothesis in European stock markets. *The European Journal of Finance*, *16*(7), 711-726.

Carrière-Swallow, Y., & Céspedes, L. F. (2013). The impact of uncertainty shocks in emerging economies. *Journal of International Economics*, 90(2), 316-325.

Cho, J. W., Choi, J. H., Kim, T., & Kim, W. (2016). Flight-to-quality and correlation between currency and stock returns. *Journal of Banking & Finance*, *62*, 191-212.

Conrad, C., & Lamla, M. J. (2010). The high-frequency response of the EUR-USD exchange rate to ECB communication. *Journal of Money, Credit and Banking*, *42*(7), 1391-1417.

De Gregorio Rebeco, J., & Tokman, A. (2004). Flexible Exchange Rate Regime and Forex Interventions: The Chilean Case. *Documentos de Política Económica (Banco Central de Chile)*, (11), 1.

De Haan, J., Eijffinger, S. C., & Rybiński, K. (2007). Central bank transparency and central bank communication: Editorial introduction. *European Journal of Political Economy*, *23*(1), 1-8.

Dincer, N., Eichengreen, B., & Geraats, P. (2022). Trends in monetary policy transparency: further updates. *International Journal of Central Banking*, *18*(1), 331-348.

Dominguez, K. M., & Panthaki, F. (2006). What defines 'news' in foreign exchange markets?. *Journal of International Money and Finance*, *25*(1), 168-198.

Draghi, M. (2012). Speech by Mario Draghi, President of the European Central Bank at the Global Investment Conference in London on 26 July 2012. https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html

Eichengreen, B., Rose, A. K., & Wyplosz, C. (1995). Exchange market mayhem: the antecedents and aftermath of speculative attacks. *Economic policy*, *10*(21), 249-312.

Eichengreen, B., Rose, A. K., & Wyplosz, C. (1996). Speculative, Speculative attacks on pegged exchange rates: An empirical exploration with special reference to the European Monetary System, in: M.B. Canzoneri, P.R. Masson and V.U. Grilli, eds., Transatlantic economic issues (Cambridge University Press, Cambridge).

Eichler, S., & Littke, H. C. (2018). Central bank transparency and the volatility of exchange rates. *Journal of International Money and Finance*, *89*, 23-49.

Engel, C., & West, K. D. (2005). Exchange rates and fundamentals. *Journal of Political Economy*, 113(3), 485-517.

Engel, C., & West, K. D. (2005). Exchange rates and fundamentals. *Journal of political Economy*, *113*(3), 485-517.

Fatum, R., & Scholnick, B. (2008). Monetary policy news and exchange rate responses: Do only surprises matter? *Journal of Banking & Finance*, *32*(6), 1076-1086.

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.

Fratzscher, M. (2006). On the long-term effectiveness of exchange rate communication and interventions. *Journal of International Money and Finance*, *25*(1), 146-167.

Fratzscher, M. (2008). Communication and exchange rate policy. *Journal of Macroeconomics*, *30*(4), 1651-1672.

Frenkel, J. A. (1981). Flexible exchange rates, prices, and the role of" news": lessons from the 1970s. *Journal of Political Economy*, *89*(4), 665-705.

Gevorkyan, A. V. (2019). Exchange market pressure and primary commodity–exporting emerging markets. *Applied Economics*, 51(22), 2390-2412.

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.

Hakkio, C. S., & Pearce, D. K. (1985). The reaction of exchange rates to economic news. *Economic Inquiry*, *23*(4), 621-636.

Harris, R., & Sollis, R. (2003). Applied time series modelling and forecasting. Wiley.

Hau, H., and Rey, H. (2006). Exchange rates, equity prices, and capital flows. *Review of Financial Studies,* 19(1), 273-317.

Husted, Lucas, John Rogers, and Bo Sun (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.

IMF CBT Code. (2020). IMF Executive Board Approves New Central Bank Transparency Code [Press release 20/258]. https://www.imf.org/en/News/Articles/2020/07/30/pr20258-imf-executive-board-approves-new-central-bank-transparency-code

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.

Kim, J. H., & Shamsuddin, A. (2008). Are Asian stock markets efficient? Evidence from new multiple variance ratio tests. *Journal of Empirical Finance*, *15*(3), 518-532.

Klaassen, F., & Jager, H. (2011). Definition-consistent measurement of exchange market pressure. *Journal of International Money and Finance*, *30*(1), 74-95.

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.

Lakdawala, A., Moreland, T., & Schaffer, M. (2021). The international spillover effects of US monetary policy uncertainty. *Journal of International Economics*, *133*.

Menegaki, A. N. (2019). The ARDL method in the energy-growth nexus field; best implementation strategies. *Economies*, 7(4), 105.

Obstfeld, M., Shambaugh, J. C., & Taylor, A. M. (2005). The trilemma in history: tradeoffs among exchange rates, monetary policies, and capital mobility. *Review of economics and statistics*, *87*(3), 423-438.

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.

Phylaktis, K., & Aftab, M. (2024). Financial integration and exchange market pressure. In *Handbook of Financial Integration* (pp. 312-339). Edward Elgar Publishing.

Poole, W. (2005). How predictable is Fed policy? *Federal Reserve Bank of St. Louis Review*, 87(6), pp. 659-68.

Smith, R. P. (2020). *A note on ARDL models.* Unpublished manuscript.

Weber, C. S. (2019). The effect of central bank transparency on exchange rate volatility. *Journal of International Money and Finance*, *95*, 165-181.

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 the degree of exchange market intervention in a small open economy. *Journal of International Money and Finance*, *16*(1), 55-79.

Weymark, D. N. (1998). A general approach to measuring exchange market pressure. *Oxford Economic Papers*, 50(1), 106-121.

White, W. R. (2006). *Is Price Stability Enough?* BIS Working Paper 205, 1-18.

| **Table 1: Main estimates** | | | |
|---|---|---|---|
| | 1-Full sample | 2-Developed | 3-Emerging |
| *a. Long-run estimates* | | | |
| C | 4.295(15.82)*** | 4.185(8.628)*** | 4.342(1.517)*** |
| FC | .005(2.136)** | .012(3.556)*** | .011(3.594)*** |
| **CBT** | **-.002(6.263)*** ** | **-.002(3.596)*** ** | **-.003(6.961)*** ** |
| TO | -.007(2.011)** | .011(1.69)* | -.007(1.778)* |
| ID | -.0001(1.335) | -.001(3.203)*** | -.0003(2.259)*** |
| ER | -.211(7.895)*** | -.135(1.855)* | -.24(9.542)*** |
| EA | .02(7.459)*** | .015(3.602)*** | .012(3.899)*** |
| IF | .007(3.015)*** | -.002(.483) | .012(4.886)*** |
| FD | -.002(1.743)* | -.005(2.509)*** | .004(2.165)*** |
| OL | .002(2.217)** | .005(3.972)*** | -.0002(.14) |
| *b. Diagnostics* | | | |
| ECMt-1 | -.946(15.821)*** | -.904(8.68)*** | -.985(10.5)*** |
| RMSE | .013 | .011 | .013 |
| LL | 2187.72 | 850.655 | 1357.72 |
| N | 608 | 228 | 380 |

This table provides the main model estimates based on the ARDL approach. Panel *a* provides long run estimates while panel *b* provides the diagnostic statistics. The t-statistics are given in parentheses in their absolute form. ***, **, * show the level of significance at 1%, 5%, and 10% respectively.
ECMt-1 is lagged error correction term that shows the speed of adjustment to the long run relationship, RMSE is the root mean square error that measures residuals spread, and LL is the log likelihood ratio that gauges the fitness of the model.
Abbreviations: C(constant), FC (Financial crisis dummy), CBT (Central Bank Transparency), EU (Economic policy uncertainty), MU (Monetary policy uncertainty), TO (trade openness), ID (interest rate differential), ER (equity return differential), EA (Economic activity), IF (rate of inflation), FD (financial development), OL (oil price).

| **Table 2: Estimates including US economic and monetary uncertainty** | | | | | | |
|---|---|---|---|---|---|---|
| | With US monetary policy uncertainty | | | With US economic policy uncertainty | | |
| | 1-Full sample | 2-Developed | 3-Emerging | 1-Full sample | 2-Developed | 3-Emerging |
| *a. Long run estimates* | | | | | | |
| C | 4.256(14.63)*** | 4.063(8.016)*** | 4.447(9.986)*** | 4.441(16.519)*** | 2.971(5.98)*** | 4.768(11.788)*** |
| FC | -.003(1.134) | .007(.707) | .02(2.79)*** | .007(4.621)*** | -.055(17.377)*** | .016(5.914)*** |
| **CBT** | **-.001(2.93)*** ** | **-.003(5.585)*** ** | **-.004(8.681)*** ** | **-.002(6.484)*** ** | **.001(1.133)** | **-.003(6.56)*** ** |
| EU | - | - | - | -.01(9.46)*** | -.007(5.5.779)*** | -.005(3.882)*** |
| MU | -.01(5.382)*** | -.005(2.254)** | .01(6.213)*** | - | - | - |
| *Control variables included* | | | | | | |
| *b. Diagnostics* | | | | | | |
| ECMt-1 | -.922(14.642)*** | -.884(8.056)*** | -1.023(9.988)*** | -.972(16.518)*** | -.659(5967)*** | -1.077(11.773)*** |
| RMSE | .012 | .01 | .014 | .012 | .01 | .013 |
| LL | 2243.825 | 894.624 | 1375.627 | 2266.05 | 872.758 | 1408.741 |
| N | 608 | 228 | 380 | 608 | 228 | 380 |

This table provides the main model estimates including the US monetary and economic policy uncertainties. Panel *a* provides long run estimates while panel *b* provides the diagnostic statistics. The t-statistics are given in parentheses in their absolute form. ***, **, * show the level of significance at 1%, 5%, and 10% respectively.

ECMt-1 is a lagged error correction term that shows the speed of adjustment to the long run relationship, RMSE is the root mean square error that measures residuals spread, and LL is the log-likelihood ratio that gauges the fitness of the model.

Abbreviations: C(constant), FC (Financial crisis dummy), CBT (Central Bank Transparency), EU (Economic policy uncertainty), MU (Monetary policy uncertainty).

| **Table 3: CBT effects for crisis and non-crisis periods** | | | |
|---|---|---|---|
| | 1-Full sample | 2-Developed | 3-Emerging |
| *a. Long run estimates* | | | |
| C | 4.318(15.977)*** | 4.239(8.819)*** | 4.359(10.499)*** |
| **CBT*FC** | **-.002(3.643)*** ** | **-.001(1.656)*** | **-.002(3.093)*** ** |
| **CBT*NFC** | **-.002(6.444)*** ** | **-.003(4.216)*** ** | **-.003(6.96)*** ** |
| *Control variables included* | | | |
| *b. Diagnostics* | | | |
| ECMt-1 | -.952(15.981)*** | -.912(8.878)*** | -.991(10.484)*** |
| RMSE | .013 | .011 | .013 |
| LL | 2190.007 | 852.506 | 1360.235 |
| N | 608 | 228 | 380 |

This table provides estimates for central bank transparency during crisis and non-crisis periods. Panel *a* provides long run estimates while panel *b* provides the diagnostic statistics. The t-statistics are given in parentheses in their absolute form. ***, **, * show the level of significance at 1%, 5%, and 10% respectively.

ECMt-1 is a lagged error correction term that shows the speed of adjustment to the long run relationship, RMSE is the root mean square error that measures residuals spread, and LL is the log-likelihood ratio that gauges the fitness of the model.

Abbreviations: C(constant), FC (Financial crisis dummy), CBT (Central Bank Transparency), FC(Financial crisis period), NFC (Non-financial crisis period)

| **Table 4: CBT effects considering financial development** | | | |
|---|---|---|---|
| | 1-Full sample | 2-Developed | 3-Emerging |
| *a. Long run estimates* | | | |
| C | 4.298(14.027)*** | 4.313(9.806)*** | 4.511(9.856)*** |
| FC | .014(2.754)*** | .008(.904) | .019(3.259)*** |
| **CBT*FD** | **-.0002(9.0968)*** ** | **-.0001(6.131)*** ** | **-.0001(6.388)*** ** |
| *Control variables included* | | | |
| *b. Diagnostics* | | | |
| ECMt-1 | -.969(14.095)*** | -.947(9.856)*** | -1.033(9.858)*** |
| RMSE | .013 | .011 | .014 |
| LL | 2194.068 | 876.6 | 1341.923 |
| N | 608 | 228 | 380 |

This table provides the CBT effects considering the financial integration. Panel *a* provides long run estimates while panel *b* provides the diagnostic statistics. The t-statistics are given in parentheses in their absolute form. ***, **, * show the level of significance at 1%, 5%, and 10% respectively.
ECMt-1 is a lagged error correction term that shows the speed of adjustment to the long run relationship, RMSE is the root mean square error that measures residuals spread, and LL is the log-likelihood ratio that gauges the fitness of the model.
Abbreviations: C(constant), FC (Financial crisis dummy), CBT (Central Bank Transparency), FD (financial development)

| **Table 5: CBT effects considering FX regimes** | | | |
|---|---|---|---|
| | 1-Full sample | 2-Developed | 3-Emerging |
| *a. Long run estimates* | | | |
| C | 4.524(17.373)*** | 4.518(6.597)*** | 4.356(10.539)*** |
| FC | .003(1.546) | .002(.406) | .009(2.843)*** |
| **CBT*FXR** | **-.0002(3.09)*** ** | **-.00004(.328)** | **-.0005(4.873)*** ** |
| *Control variables included* | | | |
| *b. Diagnostics* | | | |
| ECMt-1 | -.978(17.379)*** | -.893(6.639)*** | -.969(10.524)*** |
| RMSE | .012 | .01 | .013 |
| LL | 2187.089 | 849.538 | 1354.905 |
| N | 608 | 228 | 380 |

This table provides the CBT effects considering the foreign exchange regimes. Panel *a* provides long run estimates while panel *b* provides the diagnostic statistics. The t-statistics are given in parentheses in their absolute form. ***, **, * show the level of significance at 1%, 5%, and 10% respectively. ECMt-1 is a lagged error correction term that shows the speed of adjustment to the long run relationship, RMSE is the root mean square error that measures residuals spread, and LL is the log-likelihood ratio that gauges the fitness of the model.
Abbreviations: C(constant), FC (Financial crisis dummy), CBT (Central Bank Transparency), FXR (FX regime)

| **Table 6: CBT effects considering financial integration** | | | |
|---|---|---|---|
| | 1-Full sample | 2-Developed | 3-Emerging |
| *a. Long run estimates* | | | |
| C | 4.385(14.734)*** | 4.755(10.419)*** | 4.466(8.919)*** |
| FC | .023(3.389)*** | .021(2.006)** | .025(3.053)*** |
| **CBT*ER** | **-.019(2.307)*** ** | **.103(4.664)*** ** | **-.0255(3.137)*** ** |
| *Control variables included* | | | |
| *b. Diagnostics* | | | |
| ECMt-1 | -.959(14.719)*** | -1.001(10.448)*** | -1.003(8.941)*** |
| RMSE | .013 | .01 | .014 |
| LL | 2161.813 | 867.434 | 1333.775 |
| N | 608 | 228 | 380 |

This table provides the CBT effects considering the financial integration. Panel *a* provides long run estimates while panel *b* provides the diagnostic statistics. The t-statistics are given in parentheses in their absolute form. ***, **, * show the level of significance at 1%, 5%, and 10% respectively.
ECMt-1 is a lagged error correction term that shows the speed of adjustment to the long run relationship, RMSE is the root mean square error that measures residuals spread, and LL is the log-likelihood ratio that gauges the fitness of the model.
Abbreviations: C(constant), FC (Financial crisis dummy), CBT (Central Bank Transparency), ER (Equity return differential)

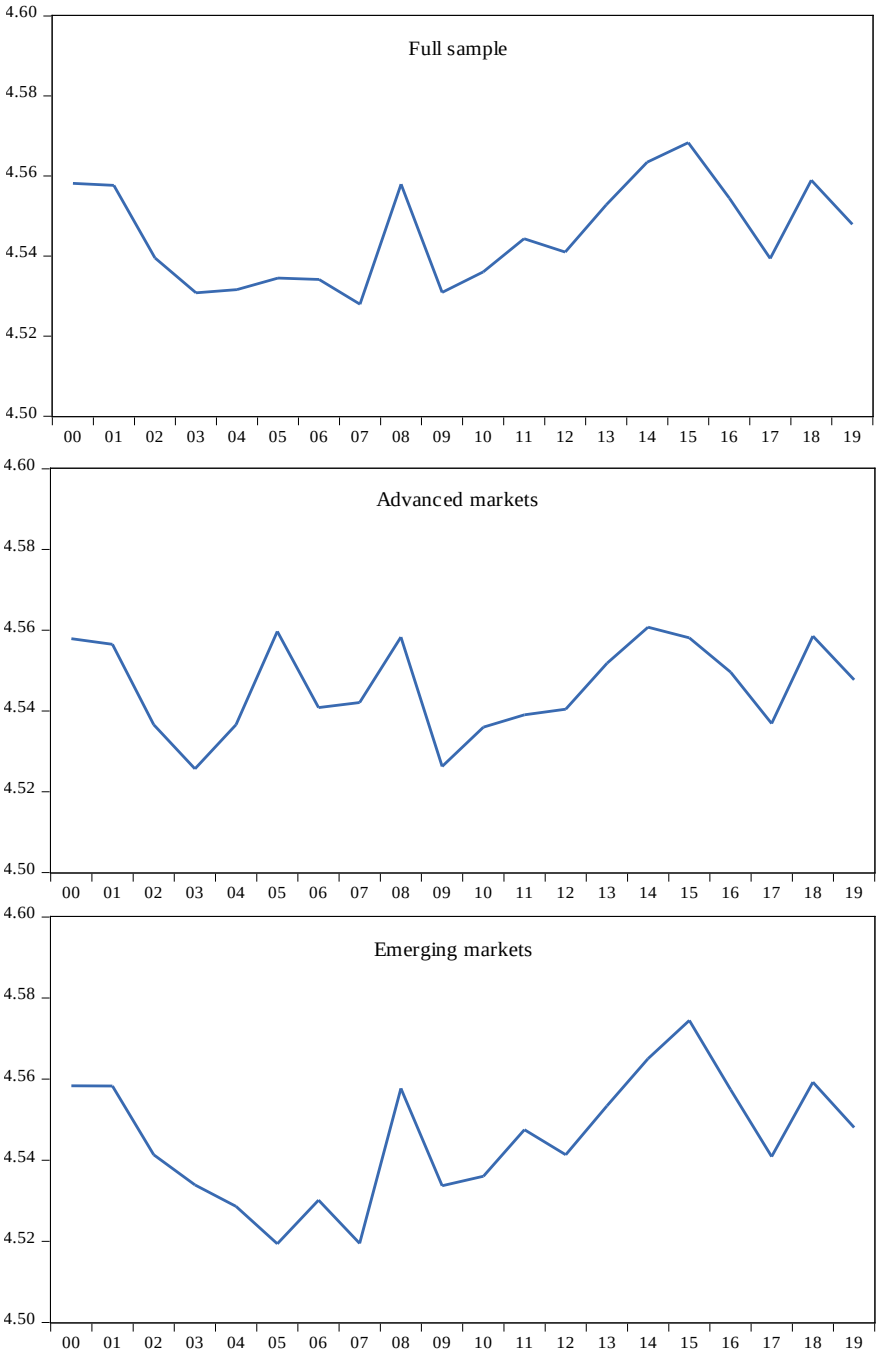



**Figure 1:** The graphs show the behavior of EMP over the period for the full sample, advanced markets, and emerging markets, respectively.

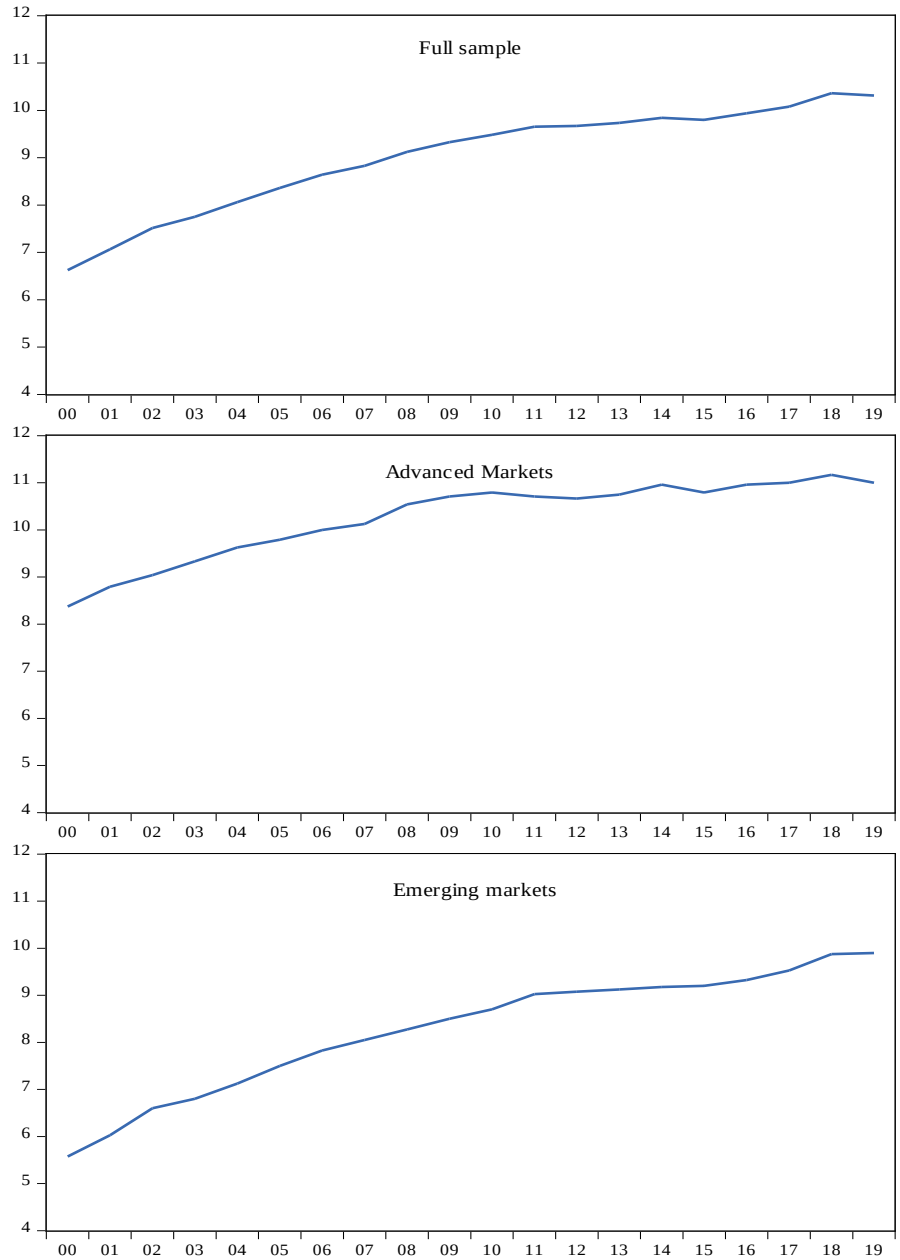



**Figure 2:** The graphs show the evolution of CBT over the period for the full sample, advanced markets, and emerging markets, respectively.

## Appendix

| Table A1: 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 | Central bank transparency | An index that gauges central bank transparency based on central bank information disclosure considering five transparency dimensions (economic, operational, policy, political, and procedural). | Dincer et al. (2022) |
| 3 | 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. It measures financial integration. | Reuters |
| 4 | 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 |
| 5 | Interest rate differential | It is the difference between the domestic real interest rate and the US real interest rate. | IMF IFS |
| 6 | 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) |
| 7 | 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) |
| 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 | Financial development | Credit to the private sector measures the 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 A2: Unit root analysis** | | | | |
|---|---|---|---|---|
| | At level | | At first difference | |
| | Constant | Constant and trend | Constant | Constant and trend |
| EMP | -7.957(.000)*** | -7.552(.000)*** | -15.84(.000)*** | -12.518(.000)*** |
| CBT | -2.357(.009)*** | -.757(.224) | -10.929(.000)*** | -8.716(.000)*** |
| EU | -1.825(.034)*** | -4.783(.000)*** | -6.217(.000)*** | -2.956(.002)*** |
| MU | 4.457(1.000) | 5.141(1.000) | -13.859(.000)*** | -15.557(.000)*** |
| TO | -2.591(.005)*** | -4.464(.000)*** | -10.706(.000)*** | -10.195(.000)*** |
| ID | -5.215(.000)*** | -4.457(.000)*** | -12.594(.000)*** | -9.693(.000)*** |
| ER | -5.558(.000)*** | -8.039(.000)*** | -18.122(.000)*** | -14.919(.000)*** |
| EA | -.692(.244) | -.301(.381) | -9.33(.000)*** | -7.431(.000)*** |
| IF | -7.136(.000)*** | -4.998(.000)*** | -15.322(.000)*** | -12.124(.000)*** |
| FD | -4.054(.000)*** | 1.083(.861) | -5.887(.000)*** | -6.782(.000)*** |
| OL | -4.636(.000)*** | 3.568(.999) | -8.039(.000)*** | -7.802(.000)*** |

This table shows the unit root results relying on Augmented Dickey-Fuller test in panel framework. Based on its some variables have unit root at level but there is no such issue at first difference with all the variables. *** shows the significance level at 1%. P-values are in the parenthesis. Abbreviations: EMP (Exchange market pressure), CBT (Central Bank Transparency), EU (Economic policy uncertainty), MU (Monetary policy uncertainty), TO (trade openness), ID (interest rate differential), ER (equity return differential), EA (Economic activity), IF (rate of inflation), FD (financial development), OL (oil price).

| **Table A3: Main estimates with exchange rate changes as dependent variable** | | | |
|---|---|---|---|
| | 1-Full sample | 2-Developed | 3-Emerging |
| *a. Long-run estimates* | | | |
| C | .595(15.846)*** | .955(8.621)*** | .587(13.843)*** |
| FC | .036(2.728)*** | .047(2.281)** | .041(2.402)*** |
| **CBT** | **.003(8.776)*** ** | **-.007(5.094)*** ** | **.003(9.057)*** ** |
| *Control variables included* | | | |
| *b. Diagnostics* | | | |
| ECMt-1 | -1.176(15.442)*** | -1.089(8.459)*** | -1.259(13.533)*** |
| RMSE | .016 | .013 | .017 |
| LL | 1732.984 | 731.878 | 1036.396 |
| N | 589 | 228 | 361 |

This table provides the main model estimates based on bounds testing approach to cointegration. Panel *a* provides long run estimates while panel *b* provides the diagnostic statistics. The t-statistics are given in parentheses in their absolute form. ***, **, * show the level of significance at 1%, 5%, and 10% respectively.

ECMt-1 is a lagged error correction term that shows the speed of adjustment to the long run relationship, RMSE is the root mean square error that measures residuals spread, and LL is the log-likelihood ratio that gauges the fitness of the model.

Abbreviations: C(constant), FC (Financial crisis dummy), CBT (Central Bank Transparency)

| Table A4: 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 factor 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) | |