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The Effectiveness of Trilemma Policy Choice in the Presence of Macroprudential Policies: Evidence from Emerging Economies

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Abstract

This paper examines the effectiveness of the trilemma policy choice, in the presence of macroprudential policies in ten emerging market economies. We address this issue due to the extensive use of macroprudential policies to maintain financial stability in the aftermath of global financial crisis. Our overall findings suggest that adoption of macroprudential policies with monetary policy helps to maintain macroeconomic stability in 6 out of 10 cases, and with capital account openness is effective only in 3 cases. Our findings suggest that the emerging economies' policymakers can optimize the effectiveness of trilemma policy choice by giving more weightage to macroprudential policies along with exchange rate stability and monetary policy.

Key words: Trilemma, Macroprudential Policy, Monetary Policy Independence, Policy Mix.

JEL Classification E32; F33; F41,

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1. Introduction

The macroeconomic policy trade-off, the impossible trinity or policy trilemma developed by Mundell (1963), received very much attention in mainstream macroeconomics both in academic and policy circles. The theory suggests that the policymaker has to choose two out of three policies from his policy options that contain exchange rate stability, monetary policy independence, and capital account openness. The earlier studies support the existence of the trilemma, i.e., if a country wants to achieve monetary policy independence and exchange rate stability, it has to close the capital account (Obstfeld *et al.*, 2005; Rose, 1996). On the other hand, if it wants to achieve monetary policy independence and capital account openness, it has to choose flexible exchange rate policies. However, higher the capital account openness of many economies during the last two decades and its repercussions reduced the flexibility of choosing the optimum policy instrument mix. For instance, many floating exchange rate economies unable to attain monetary policy independence during the capital flows associated with the post-global financial crisis, 2008-09. And thus, independence in monetary policy can be achieved by managing the capital account, irrespective of the exchange rate regime (Rey, 2015; Farhi and Werning, 2014).

This is more evident in emerging economies, where domestic financial conditions react faster and stronger to global financial shocks than to the changes in domestic monetary policy rates. Therefore, conducting a timely and quick monetary policy becomes a serious challenge (Bruno and Shin, 2015; Georgiadis and Mehl, 2016). It is argued that the monetary policy has a limited impact during the period of global financial shocks. While introducing capital flow management may also support stabilizing the economy in the presence of global financial shock in a flexible exchange rate regime, the increased importance of macroprudential policies in recent years helps to mitigate the risks associated with global financial shocks and thus continue to adhere to an open capital account regime (Warjiyo and Juhro, 2019; Korinek and Sandri (2016); Juhro and Goeltom, 2015; Farhi and Werning, 2014)[1]. In other words, managing financial stability using macroprudential policies may help the central bank to optimize its benefits from choosing policy options from the trilemma combinations. Thus, macroeconomic stability can be maintained by achieving monetary stability along with financial system stability (Smets, 2014). Therefore, the present study tries to examine the effectiveness of the trilemma policies in the presence of macroprudential policies[2] in emerging market economies.

The emerging economies' policymakers face many challenges to maintain the macroeconomic stability as the asset price movements in the countries are sensitive to international capital flows, especially to portfolio flows; these economies' financial cycle often deviates from the economic cycle due to excessive credit boom/bust, subsequently affect financial stability. This was more prevalent during the global financial crisis and its aftermath, these economies experienced an unprecedented change in the magnitude of capital flows. Subsequently, the many emerging economies adopted macroprudential policies to curb the pro-cyclicality of credit growth, to minimize the systemic risk and thereby increase the financial sector's resilience (Jung *et al.*, 2017; Lubis *et al.*, 2019; Warjiyo and Juhro, 2019; Galati and Moessner, 2018). Since many of the emerging economies follow inflation targeting (IT) framework, the global financial crisis reignited the view that central banks' focus on inflation targeting may be insufficient to bring about macroeconomic stability and may need to be complemented with targets for financial measures such as credit, leverage, or various asset prices (Leduc and Natal, 2018). Thus understanding the effectiveness of macroprudential policies in the case of IT economies is also crucial for choosing the optimum mix of the policies to maintain macroeconomic stability.

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[1] In order to provide a clear definition, Korinek and Sandri (2016) present the difference between capital control and macroprudential measures. Capital control applies exclusively to financial transactions between residents and non-residents whereas macroprudential regulation limits the domestic agents to borrow either from domestic or foreign lenders

[2] The macroprudential policy has been defined as ''the use of primarily prudential tools to limit the systemic risk-the risk of disruptions to the provision of financial services that is caused by an impairment of all or parts of the financial system and can cause serious negative consequences for the real economy'' (IMF, 2013). It includes a range of instruments, such as measures to address sector-specific risks (e.g., loan-to-value (LTV) and debt-to-income (DTI) ratios), counter-cyclical capital requirements, dynamic provisions, reserve requirements, liquidity tools, and measures to affect foreign-currency based or residency-based financial transactions.

The available literature in this context may be classified into three strands. The first strand of studies assesses categorical trilemma configurations and found the countries that follow fixed exchange rate attain higher monetary policy as compared to floating exchange rate countries (Frankel *et al.*, 2004; Herwartz and Roestel, 2017; Miniane and Rogers, 2007; Rodriguez, 2017) and capital control fosters the independence (Obstfeld *et al.*, 2005; Shambaugh, 2004). The second strand of literature analyses the evaluation of country-specific trilemma configurations over time and testing their binding nature (Aizenman *et al.*, 2008, 2010, 2011a, 2011b; Aizenman and Ito, 2012; Hsing, 2012). Similarly, some studies looked into the role of international reserves on trilemma configuration and found that high reserve holding economies are able relax to the trilemma constraint as compared to the low level of reserve holding economies (Akcelik *et al.*, 2014; Juhro and Goeltom, 2015; Steiner, 2017) and helps to improve the monetary policy independence (Taguchi, 2011).

The recent strand of studies emphasized the role of global financial cycles on trilemma constraints. They argued that a flexible exchange rate might not absorb external shocks during the global financial cycle. Thus, independent monetary policy is possible only if the capital account is managed directly or indirectly through macroprudential policies. If the global financial cycle causes financial instability, macroprudential instruments can be used to stabilize the financial sector by limiting its exposure to foreign currency (Cho and Hahm, 2014). Hence countries face a dilemma instead of the trilemma, between independent monetary policy and free capital mobility (Caputo and Herrera, 2017; Edwards, 2015; Rey, 2015; Taylor, 2016).

There have been studies that examine the effectiveness of macroprudential policies in the context of an open economy. Several studies support the effectiveness of macroprudential policies in curbing credit growth (Aguirre and Repetto, 2017; Gómez et al, 2017; Cabello et al, 2017). It is also found that macroprudential policies, particularly borrower based measure such as loan-to-value ratio, may limit the domestic growth in the midst of monetary policy loosening condition (Zhang and Tressel, 2017), and these policies may not be beneficial to tame the cross-border borrowing (Cerutti *et al.*, 2017; Cizel *et al.*, 2019). These borrower-based measures may not also work effectively to tackle global liquidity shock (Erdem *et al.*, 2017; Fendoğlu, 2017). In addition, in the presence of sudden flood in capital flows, countercyclical capital regulation may be effective to maintain macroeconomic and financial stability. Hence, a set of macroprudential instruments are needed to tackle different targets such as domestic credit growth and foreign currency mismatch (Lim *et al.*, 2011). This measure may need to be complemented with other measures such as capital flow management (Agénor *et al.*, 2014).

Similarly, there have been studies that support macroprudential policies to improve the effectiveness of monetary policies. For instance, it is argued that there is a limited effect of monetary policy in small-open economies due to the global financial flows, especially during the monetary policy tightening as the lending volume of poorly-capitalized, higher risk-taking and less liquid banks are more sensitive to a tightening of monetary policy. Thus, macroprudential policies to "lend a hand" to monetary policy in containing credit booms (Bruno and Shin, 2015; Rey, 2015; Cao and Dinger, 2018; Mimir and Sunel,2019; Carvallo and Pagliacci, 2016). According to Gambacorta and Murcia (2017) macroprudential policies influences the transmission of monetary policy as it alters lending conditions and, thus, consumption decisions. Similarly, by influencing credit conditions, macroprudential policies may affect real interest rates, indirectly modifying the monetary policy stance, even in the absence of any direct changes to policy rates. In the same vein, Svensson (2014) argued that monetary policy characterized by "leaning-against-the-wind" may erode financial stability. Likewise, Korinek and Simsek (2016) macroprudential policies help to reduce excessive leverage which mitigates liquidity traps where monetary policy is limited. Whereas Repullo and Suarez (2013) argued that the impact of monetary policy and macroprudential policies can either complement or conflict with each other as monetary policy is largely based on a business cycle whereas macroprudential policies is on credit cycle, and these two cycles do not always coincide. Similarly, Gambacorta and Murcia (2019) found that macroprudential policies have a greater effect on credit growth if the monetary policy is implemented in the same direction.

The overall conclusion from the above studies clearly suggests that the macroprudential policies are crucial to maintaining financial stability when the economy exposed to global financial conditions and the effectiveness of monetary policy improves with the macroprudential policies. However, none of these studies specifically address how the trilemma policy choice behaves in the presence of macroprudential policies. In other words, there is a shortage of studies connecting the macroprudential policies with the central bank's trilemma policy choice. Hence, addressing the research issues may help for informed policymaking. Given this context, the present study specifically addresses the following questions (1) how effective is the trilemma policy choice in achieving macroeconomic stability, in the presence of macroprudential policies? What is the interactive effect of macroprudential policies with monetary policy and financial liberalization policies on macroeconomic stability? Does the effectiveness of the policies vary across countries vary with respect to the central banks' monetary policy strategy, i.e. inflation targeting? Our approach to addressing these questions as follows. (1) We select ten emerging economies, Brazil, China, Hungary, India, Indonesia, Malaysia, Poland, Russia, Thailand and Turkey that follow macro prudential policies. (2) We construct four time-series models, which include macroeconomic instability proxied by output deviation, inflation deviation, and the credit cycle, as dependent variables; and macroprudential policies and other policy variables as independent variables. (3) We estimate these models based on Auto-Regressive Distributed Lagged (ARDL) method.

Our empirical findings reveal that (1) the interaction effect of macroprudential policy with monetary policy helps to maintain macroeconomic stability through stabilizing the domestic credit cycle in 6 out of 10 emerging economies. (2) macroprudential policy enhances the effectiveness of the monetary policy on inflation deviation in the case of Brazil and India. (3) The interaction effect of macroprudential policy with capital account openness helps stabilize financial instability in 3 out of 10 countries, i.e., in India, Hungary, and Malaysia. (4) Exchange rate stability improves the macroeconomic stability among most economies. (5) Monetary policy independence helps to stabilize the credit cycle and output deviation in the case of Brazil and Indonesia, indicating monetary policy independence helps to stabilize the macroeconomic instability.

We contribute to the existing literature in many ways. First, this may be one of the first attempts to examine the importance of trilemma policy choice in achieving macroeconomic stability, in the presence of macroprudential policies. Second, our findings suggest that complementing macroprudential policy with monetary policy along with capital account openness helps to maintain macroeconomic stability in the emerging economies. Third, our findings also suggest that for emerging economies, managing policy trilemma in an open economy blighted with high uncertainty is indeed relevant to the implementation of a more flexible inflation targeting framework. The rest of the paper is organized as follows: section 2 and 3 present empirical model and variable construction, and data. Section 4 and 5 discuss the empirical methodology and findings. Section 6 concludes.

2. Empirical Model and Variable construction

In order to understand the effectiveness of the trilemma policies in the presence of macroprudential policies, we run feasible empirical exercises by following Gerali, et al. (2010), Angelini, et al. (2011) and Cecchetti and Kohler (2012) who suggest the coordinated formulation of a monetary and macroprudential policy mix provides the most optimal solution. Accordingly, we assume the global shocks transmit to a small open economy due to the exogenous change in the global factors and alter the capital flows and which subsequently affect the exchange rate and liquidity condition of the economy. Further, it exacerbates liquidity risk and undermines the banking industry capacity to extend credit for the economy, through the international bank lending channel[3] and portfolio channel[4] (Bernanke & Gertler, 1995; Hills et al., 2019; Warjiyo & Juhro, 2019). As the liquidity risk alters the co-movements of the credit and business cycles, the central bank employs macroprudential policy instruments, alone with trilemma choice to main the stability in output, inflation and credit growth.

Given this background, we construct various empirical models to examine how various choices regarding the three policies affect final macroeconomic policy goals, namely,

[3] The International bank lending channel assumes the global financial shocks, associated with global monetary policy affect the liquidity condition of the domestic economy through international banks as they alter the domestic lending due to variations in the cost of funds abroad.

[4] The portfolio channel assumes that global monetary policy shock affects the relative creditworthiness of domestic and foreign borrowers and thus affect the liquidity condition in the economy.

output growth stability, inflation stability, and financial stability, in the presence of macroprudential policies. For empirical estimation purposes, we measure these policy goals in terms of the deviation of these variables from its trend, i.e., output deviation, inflation deviation, and credit deviation (credit cycle). A lower deviation of these policy variables from their trend indicates higher stability. .[5]

$$\mathrm{Y_t} = \beta_0 + \beta_1 \mathrm{MI_t} + \beta_2 \mathrm{ERS_t} + \beta_3 \mathrm{KAO_t} + \varepsilon_t \quad \text{Model (1)}$$

$$\mathrm{Y_t} = \beta_0 + \beta_1 \mathrm{MI_t} + \beta_2 \mathrm{ERS_t} + \beta_3 \mathrm{KAO_t} + \beta_4 \mathrm{MPI_t} + \beta_5 \mathrm{VIX_t} + \varepsilon_t \quad \text{Model (2)}$$

$$\mathrm{Y_t} = \beta_0 + \beta_1 \mathrm{MI_t} + \beta_2 \mathrm{ERS_t} + \beta_3 \mathrm{KAO_t} + \beta_4 \mathrm{MPI_t} + \beta_5 \mathrm{VIX_t} + \beta_6 (\mathrm{MI_t} * \mathrm{MPI_t}) + \varepsilon_t \quad \text{Model(3)}$$

$$\mathrm{Y_t} = \beta_0 + \beta_1 \mathrm{MI_t} + \beta_2 \mathrm{ERS_t} + \beta_3 \mathrm{KAO_t} + \beta_4 \mathrm{MPI_t} + \beta_5 \mathrm{VIX_t} + \beta_6 (\mathrm{KAO_t} * \mathrm{MPI_t}) + \varepsilon_t \quad \text{Model (4)}$$

Where $\mathrm{Y_t}$ *includes (output deviation, inflation deviation, and credit cycle)*. Similarly, $\beta_1, \ldots \beta_6$ are the parameters to be estimated. β_0 is the intercept; t denotes time and ε_t stands for the error term. Model 1 includes key trilemma policy choices such as monetary policy independence denoted by MI, Exchange rate stability (ERS), capital account openness (KAO). Greater monetary policy independence is expected to reduce the deviation of policy goals from its target ($\beta_1 < 0$). However, the effect of the exchange rate stability is expected to reduce the macroeconomic policy target depends upon capital account openness and the amount of reserves that a country holds (Aizenman *et al.*, 2011b). Meanwhile, the impact of capital account openness on policy target variables may be positive or negative depending upon the shocks i.e. whether a real shock or financial shock dominates for an economy. In case of a real shock dominates, the deviation from the macroeconomic target will be negative, whereas in case of financial shock dominates, the deviation from the macroeconomic target will be positive. Model 2 is an extended model that incorporate macroprudential policy index (MPI) and the global risk conditions proxied by VIX. While, in Model 3 and Model 4, we include the interaction effect of macro prudential policies along with monetary policy independence ($\mathrm{MI_t} * \mathrm{MPI_t}$) and with capital account openness ($\mathrm{KAO_t} * \mathrm{MPI_t}$).

[5] The term of macroeconomic stability, in a general perspective, refers to a state of the economy with minimal vulnerability to shocks and, thus, high prospects for sustained growth. It exists when the relationships of key economic variables are in balance. Empirically, it can take the form of low volatility of key macroeconomic variables or sustainability in their behavior (deviation from its trend).

Where the dependent variables such as output deviation, inflation deviation, and the credit cycle are measured using a filtering technique by Christiano-Fitzgerald (CF) Filter (Christiano and Fitzgerald, 2003). Similarly, we follow Aizenman *et al.* (2011a) to construct indices related to trilemma policies such as MI, ERS and KAO. These variables are defined as follows.

Monetary policy independence $(\mathrm{MI_t}) = 1 - \frac{Corr(i_{it}, i_{jt}) - (-1)}{1-(-1)}$.

Where $\mathrm{MI_t}$ is defined as the reciprocal of the correlation of market interest rate in home country j and base country i. The value of MI ranges between 0 and 1, with the highest value indicating the greatest degree of monetary independence.

Similarly, the Exchange rate stability is defined as

$$ERS_{\mathrm{t}} = \frac{0.01}{0.01 + stdev(\Delta(\log(exchange\ rate))}$$

Capital account openness (KAO) can be measured by taking the total foreign capital flows (inflows and outflows) to GDP. We have drawn the stock of assets (foreign direct investment, foreign portfolio investment and debt investment) and liabilities (foreign direct investment, foreign portfolio investment and debt investment) from the international investment position. Thus, using the stock data in place of flow data makes our KAO index more robust as stock data is free from fluctuations caused by price and exchange rate changes (Lane and Milesi-Ferretti, 2001). Alternatively, for few economies like (China, Indonesia and Malaysia) in case of data unavailability, we used foreign direct investment as a percentage to GDP as a proxy for KAO.

3. Data

We select the ten emerging economies for the analysis which include Brazil, China, Hungary, India, Indonesia, Malaysia, Poland, Russia, Thailand, and Turkey. [6] These economies are chosen based on their intense usage of macroprudential policies as well as

[6] These economies include the 5 largest emerging economies by GDP (PPP), i.e. China, India, Russia, and Indonesia, and Brazil as per IMF's World Economic Outlook (WEO) database.

the availability of data related to all variables in Model 1 to Model 4. In addition, it is interesting that some emerging countries adhere to the IT framework which hypothetically gives more flexibility to exchange rate developments. Therefore, this study also observes the differences in the efficacy of policy choice in different exchange rate regimes (IT vs non-IT). Among these economies, 8 economies follow inflation targeting as their monetary policy strategy, except China, and Malaysia. Appendix III presents the comparison of monetary policy strategy (regime), exchange rate system, and capital account regime among the countries.[7]

The quarterly data related to the variables mainly drawn from International Financial Statistics (IFS), and CEIC. The macroprudential policy index is drawn from the database developed by (Cerutti *et al.*, 2017) and (Alam *et al.*, 2019). The period of estimation for each country varies with respect to the availability of the data (the details on the period of the data is provided in table 1 with country and appendix 1 as well). However, the ending period of the analysis is 2018 Quarter 4 due to the unavailability of MPI data. We use the total credit to non-financial sectors drawn from the BIS database to measure the financial cycle. Similarly, to calculate MI, we use the US federal fund rate as the proxy of interest rate base, which is drawn from the website of the Federal Reserve Bank of St. Louis. Finally, VIX, the proxy for global shocks is drawn from the website of the Federal Reserve Bank of St. Louis.

4. Econometric Methodology

The present paper uses various econometric methodologies to address the research questions. First, to measure output deviation, inflation deviation, and the credit cycle we follow Christiano-Fitzgerald (CF) Filter method to retrieve the cyclical components. Similarly, we use Narayan and Popp (2010) structural break test. Finally, to estimate the models, we utilize the Auto Regressive Distributed Lagged Model approach to cointegration.

[7] In fact, the monetary policy regime applied by a country may change over time. There are several strategic options in achieving monetary policy objectives. Each strategy has characteristics, according to the nominal indicators that are used as a basis or reference or intermediate goal in achieving its final goal (Miskhin, 2009).

4.1. Christiano-Fitzgerald (CF) Filter

CF filter is a widely used technique to derive the cyclical components of the time series in recent years. The objective function associated with the CF filter is the mean squared error. The advantage of the CF filter is that it is designed to work well on a larger class of time series, converges in the long run to the optimal filter, and in real-time applications outperforms the Baxter-King Filter and Hodrick-Prescott filter. Further, it has an asymmetrical weighting scheme that uses all observations for the calculation of the filtered values (Konstantakopoulou and Tsionas, 2014). Similarly, this filter produces more accurate results for long-term business cycle and is better suited for times series where characteristics of the cycles at the beginning and end are of importance (Rizvi and Arshad, 2017).

The CF filter is derived under the assumption that y_t follows a random walk. In contrast to alternative filter such as Baxter and King (1999) Filter, the symmetry restriction is not imposed on the coefficient of $y_t, T = 1, \dots \dots . T$, all of which may be non-zero in case of CF Filter. The simple way to calculate the CF filter to extend the data sample $\{y_t, T = 1, \dots \dots . T,\}$ indefinitely in both directions by taking $y_t = y_1$ for $T < 1$ and $y_t = y_T$ for $t > T$. This extension is motivated by the predictive properties of random walk assumption, and ideal weight is assigned to the extended sample further. In this context, it is asymptotically ideal in the sense that it approaches the ideal filter as the sample size approaches to infinity in both directions.

4.2. Narayan and Popp Unit Root Test with Structural Breaks

A recent contribution to this literature is by Narayan and Popp (2010) (hereafter, NP), who differ from Lumsdaine and Papell (1997) and Lee and Strazicich (2003) in their treatment of the selection of the break dates. That is, the break dates are selected by maximizing the significance of the break dummy coefficients. The NP test is also invariant to the magnitude of the break and can detect the break dates with better precision (Narayan and Popp, 2013). The null in the NP test is 'unit root with breaks' implying that there can be a unit root with breaks. This was ambiguous in the earlier break tests where the null only included unit root testing while the alternative implied 'no unit root with breaks'. The NP unit root test uses two models; Model 1, also called the "crash model" that allows for two endogenous breaks in the intercept and Model 2, which allows for two endogenous breaks in the intercept and trend. In this paper, we use the NP structural breaks unit root test since it has better size and power properties than the previous two break tests by Lumsdaine and Papell (1997)and Lee and Strazicich (2003).

NP test uses Innovational Outlier type test that allows for structural breaks both under the null hypothesis and the alternative hypothesis and is applicable for all type of model specifications (Narayan and Popp, 2013). Model 1 and Model 2 can be briefly defined as follows:

$$\begin{aligned} y_t^{M1} &= \rho y_{t-1} + \alpha_1 + \beta^* t + \theta_1 D(T'_B)_{1,t} + \theta_2 D(T'_B)_{2,t} + \delta_1 DU'_{1,t-1} \\ &+ \delta_2 DU'_{2,t-1} + \sum\nolimits_{j=1}^{k} \beta_j \Delta y_{t-j} + e_t \end{aligned} \tag{5}$$

$$\begin{aligned} y_t^{M2} &= \rho y_{t-1} + \alpha^* + \beta^* t + \kappa_1 D(T'_B)_{1,t} + \kappa_2 D(T'_B)_{2,t} + \delta_1^* DU'_{1,t-1} \\ &+ \delta_2^* DU'_{2,t-1} + \gamma_1^* DT'_{1,t-1} + \gamma_2^* DT'_{2,t-1} \sum\nolimits_{j=1}^{k} \beta_j \Delta y_{t-j} + e_t \end{aligned} \tag{6}$$

with $DU'_{1,t} = 1(t > T'_{B,i})$, $\qquad DT'_{1,t} = 1(t > T'_{B,i})(t - T'_{B,i}) \quad \forall i = 1,2$

In order to test the unit root null hypothesis of $\rho = 1$ against the alternative hypothesis of $\rho < 1$, Narayan and Popp (2010) use the t -statistics of $\hat{\rho}$, denoted $t_{\hat{\rho}}$, in equations (5) and (6).

4.3. Autoregressive Distributed Lag Model (ARDL)

We employed Autoregressive Distributed Lag (ARDL) approach to cointegration, developed by Pesaran and Shin (1999) and Pesaran *et al.* (2001) to estimate the Model 1 to 4[8]. It has advantages over the traditional cointegration techniques as it can be applied even a mix of I(0) and I(1). The testing of the ARDL approach consists of two steps. The

[8] We use a long-run cointegrating vector to analyze the model as cycles as in the literature, it is found that the business cycles are long-lasting and the shocks are persistent. This is mainly because the forces that restore equilibrium towards a steady-state or a natural rate are very slow-moving or and the steady-state equilibrium is not stable (Campbell and Mankiw, 1987).

first step to check the existence of a long-run cointegration relationship among variables. If cointegration is established, the second step is to estimate the long-run coefficients and short-run coefficients using error correction models (ECM). If the cointegration is rejected, the second step only converges to the estimation of short-run coefficients only. The ECM form of ARDL model 1 is given as follows:

$$\Delta Y_t = \alpha_0 + \beta_1 Y_{t-1} + \beta_2 MI_{t-1} + \beta_3 ERS_{t-1} + \beta_4 KAO_{t-1} + \sum_{I=1}^{P} \delta_1 \Delta Y_{t-i} + \sum_{I=1}^{P} \gamma_1 \Delta MI_{t-i} + \sum_{I=1}^{P} \varphi_1 \Delta ERS_{t-i} + \sum_{I=1}^{P} \theta_1 \Delta KAO_{t-i} + \varepsilon_t \quad (7)$$

The first part of the RHS β values are the long-run coefficients and the second part with the $\delta, \gamma, \varphi, and\ \theta$ are the short-run dynamics of the model. To obtain the long-run relationship we conducted F test of for the joint significance of the coefficient as $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ against $H_1 = \beta_1, \dots . \beta_4 \neq 0$. The non-rejection of the null hypothesis represents the existence of cointegration. Pesaran *et al.* (2001) proposed lower and upper critical values for the F-statistics assuming all variables are I(0) for lower bound and all are I(1) for upper bound. If the calculated F-statistic exceeds the upper critical value, then there is evidence of cointegration, whereas is fall below then the evidence of cointegration is rejected. However, if the calculated value falls between the lower and upper critical values, then the result is inconclusive. We obtained the critical values for the sample size from Narayan (2005). Once the cointegration is established, then long-run and short-run can be calculated using vector error correction framework. As ARDL assumes no serial correlation, an appropriate lag length (m) should be considered. We estimate the ARDL model based on the information criteria i.e. Akaike's information criterion (AIC).

5. Empirical Results

We report the descriptive statistics of the variables in Appendix II. Before estimating the models, we investigate the unit root properties of the variables by applying NP test. From the results we observed that the null of the unit root can be rejected for all variables except for the case of KAO and VIX and the break dates revolve around 2008 and 2009, indicating the structural change is occurred due to global financial crisis[9]. The evidence of the mixed

[9] As there are 10 tables associated with the NP test, we do not include them in the text. However, these results are available upon request.

order of the integration of the variables, that is, I(0) and I(1), enables us to employ the ARDL approach to cointegration for estimation. We incorporate the breaks dummies as exogenous variable in the empirical models as per the evidence from NP test.

5.1. Findings from ARDL Analysis

We estimate 12 models for each country in the sample, and the long-run cointegrating vector from the ARDL model for each country is reported from table 1-10. It can be seen that the F-statistics reported in the bottom part of the table are found to be statistically significant and thus establishes the cointegrating relationship between the variables in the model. The findings suggest that the trilemma variable, MI, that captures monetary policy independence is found to be negative in all equations in Brazil, Hungary, Indonesia, Russia and Thailand, indicating monetary policy independence helps to stabilize the macroeconomic instability. Among these economies, MI is found to be statistically significant in stabilizing output deviation and the credit cycle in the case of Brazil and Indonesia. These findings are in line with Prabheesh *et al.* (2021), especially related to Indonesia. Whereas in Russia's case, the MI is found to be significant in stabilizing the credit cycle. It is surprising to see that MI exhibits a positive sign and statistically significant in India's case in both the credit cycle and output deviation models.

[Insert Table 1-10 Here]

While analyzing the impact of exchange rate stability, it can be seen that ERS exhibits a negative sign in most country cases (table 1 to 10), indicating exchange rate stability can improve the macroeconomic stability among emerging economies. ERS is found to be statistically significant in stabilizing output, inflation, and credit cycle in India. Similarly, it stabilizes the credit cycles in Hungary and Russia. In contrast, ERS is found to stabilize inflation in the case of Malaysia and Turkey. All these findings suggest that greater exchange rate stability promotes better macroeconomic stability, by reducing uncertainty and thus stimulating capital flows and investment, in the emerging economies. These findings are in line with Dubas *et al.* (2005), De Grauwe and Schnabl (2004), and Aizenman *et al.* (2011b).

Similarly, the third policy choice, i.e., capital account openness (KAO), is found to affect the credit cycle in five countries out of ten positively. Among the five countries, KAO is found to be statistically significant in Hungary, India, and Poland, indicating that capital account openness leads to higher instability in the financial sector. Whereas in the case of Malaysia, KAO is found to stabilize the credit cycle. In China's case, KAO is found to have a positive and significant effect on output and inflation deviation, indicating the higher capital account openness leads to higher inflation and output instability in the economy. Similarly, in the case of Thailand, the KAO is found to have a stabilizing effect on output deviation. The findings on the impact of exchange rate stability and capital account openness are consistent with the use of these indicators by central banks in emerging economies in anticipating financial market instability or economic crisis. Abubakar *et al.* (2020) find that apart from the exchange rate, the international reserves and current account are commonly used as dominant indicators of external pressures or crisis in developing countries.

It is interesting to see that MPI is found to have a negative sign and statistically significant in stabilizing the credit cycle in most countries except China, Indonesia, Poland, and Russia. However, when the MPI is applied along with monetary policy (MI* MPI), the effect is negative and statistically significant in six cases, say India, Indonesia, Malaysia, Poland, Russia, and Turkey. This indicates that macroprudential policy with monetary policy helps stabilize the financial cycle in 6 out of 10 emerging economies. The interaction effect of MPI with MI on inflation deviation is quite obvious in Brazil and India, where MI becomes negative and statistically significant, indicating the presence of macroprudential policies enhances the impact of monetary policy independence (Table 1 and Table 4).

The interaction of macroprudential policies with capital account openness (KAO*MPI) impacts the financial cycle only in 2 out of 10 countries, i.e., in India and Malaysia. Table 4 and 6 show that KAO becomes negative and significant in output deviation and the credit cycle models. These findings clearly suggest that the adoption of macroprudential policies along with capital account openness helps to reduce the risk associated with capital account openness. The salient fact is that, while some countries may need to resort to capital flows management measures, a number of emerging market economies have recently used macroprudential instruments countercyclically to deal with swings in capital flows (Claessens, 2013; Medina and Roldós, 2014). Previous studies such as Unsal (2013) and Forbes *et al.* (2015) point out that macroprudential policies help to limit the intensity of aggregate credit booms or bust due to the capital flows volatility. Similar findings can be seen in Malaysia and Hungary where the interaction of macroprudential policies with KAO helps to stabilize output and inflation deviations (Tables 3 and 6). Whereas in the case of Thailand, the interactive term is found to be significant in reducing the output deviation. These findings support views by previous studies such as Samarina and Bezemer (2016) that argue that by controlling the capital flows, policymakers to restrain capital flows from aggravating the overheating pressures and consequent inflation, and to mitigate the risk that protracted periods of easy financing conditions will threaten the financial stability.

Our key findings from the analysis are as follows (1) MI is found to be negative in all equations in Brazil, Hungary, Indonesia, Russia and Thailand. Among these economies, MI is found to be statistically significant in stabilizing output deviation and the credit cycle in the case of Brazil and Indonesia, indicating monetary policy independence helps to stabilize the macroeconomic instability. Whereas in the case of Thailand, the MI reduces the output volatility. (2) ERS exhibits a negative sign in most country cases indicating exchange rate stability can improve the macroeconomic stability among emerging economies. (3) KAO, capital account openness, leads to financial instability in Hungary, India, and Poland. (4) The interaction effect of macroprudential policy with monetary policy helps stabilize the financial cycle in 6 out of 10 emerging economies. Macroprudential policies enhance the effectiveness of the monetary policy on inflation deviation in the case of Brazil and India. (5) The interaction effect of macroprudential policy with capital account openness helps stabilize credit cycle risk in India, and Malaysia. Whereas, in stabilizes the output volatility in the case of Malaysia, Hungary and Thailand. Our overall findings are in line with the argument by Gambacorta and Murcia (2019); Bruno and Shin, (2015); Rey (2015) that the macroprudential policies to "lend a hand" to monetary policy in containing credit booms.

5.2 Robustness test

In this section, we adopt an alternative method of estimation to confirm the empirical findings from a panel framework[10]. We carried out the panel ARDL method proposed by Pesaran and Smith (1995) and Pesaran et al. (1999). Before estimating the panel equation, we test for the presence of cointegration using the test proposed by Pedroni (1999, 2004), which includes seven different statistics; four of them belong to the within the dimension and three of them belong to the between dimension. The findings from the test are reported in Table (11). It can be observed that out of seven statistics, five reject the no cointegration in all four models where dependent variables are inflation deviation and credit cycle. Whereas in the case of output deviation models, most of the statistics unable to reject the null of cointegration. In this scenario, we proceed with estimating the long-run coefficients of the models of inflation and credit deviation. We do not estimate the models of output deviation as the cointegration is not established. The long-run estimates are reported in table (12). It is interesting to note that ERS is negative and significant in most models, which confirms the earlier findings that stabilizing the exchange rate helps to improve macroeconomic stability. Further, the interaction term (MI* MPI) is found to be significant and negative, indicating the macroprudential policies enhances the effectiveness of the monetary policy on inflation deviation and credit cycle. Overall findings from the panel estimation support the findings reported in the previous section.

6. Conclusion and Policy Implication

This paper attempts to examine the effectiveness of the trilemma policy choice in achieving macroeconomic stability, in the presence of macroprudential policies in ten emerging economies. Using the ARDL approach to co-integration, our findings suggest that adopting macroprudential policies with monetary policy helps maintain macroeconomic stability in 6 out of 10 emerging economies. Similarly, the presence of macroprudential policies also enhances the effectiveness of the monetary policy. However, the adoption of macroprudential policies with capital account openness is effective only in 3 cases. Our overall findings suggest that the emerging economies'

[10] We carried out the panel method as a robustness test as any alternative time-series technique requires more space in the text to incorporate additional ten tables.

policymakers can optimize the trilemma policy choice's effectiveness by giving more weightage to exchange rate stability and monetary policy along with macroprudential policies.

These results imply that managing policy trilemma in an open economy blighted with high uncertainty is indeed relevant with the implementation of a more flexible inflation targeting framework for emerging economies. It is also an integrated part of implementing a post-crisis central bank policy mix, whereby a central bank can utilize monetary policy and macroprudential policy instruments in a coordinated way, in line with a proper exchange rate and capital flow management measures.

It can be shown that, amidst the emerging economies' preference towards inflation targeting over the last decade, the integration of macroprudential policy with monetary policy improves monetary policy independence, which helps them stabilize macroeconomic stability. However, the strive for increased capital account openness largely culminated with macroeconomic instability in most of these economies. This is, among others, mainly due to high capital flow dynamics during the crisis period, which has significant implication on exchange rate volatility, especially for countries with shallow financial markets.

Even for inflation targeting economies, proper exchange rate management, in a particular case, is needed to smoothen excessive exchange rate volatility (instability). As reflected by our findings, the exchange rate stability is observed to improve the macroeconomic stability among these economies. Therefore, a policy convergence may have occurred between retaining monetary policy independence, and proper exchange rate management to smoothen exchange rate stability may produce an optimum outcome. Furthermore, amidst increasing capital account openness, the usage of macroprudential policy with monetary policy, along with capital flow management measures, significantly helps optimize the policy choice outcome.

How far the macroprudential policy instruments can be applied depending on the factors causing macro instability risks. During a period of high foreign capital inflows, for example, when price stability risk stems from strong domestic demand which is driven by rapid bank credit growth in the property sector, therefore adjusting the Loan-to-Value (LTV) ratio would be the most appropriate policy action. It is important also to reveal whether bank credit growth as an aggregate, by loan type and by economic sector, is excessive. Such assessments are critical in determining when and which macroprudential policy instruments should be applied to reinforce monetary policy and foreign capital flow management to achieve price (and exchange rate) stability as well as support financial system stability.

In pursuance of the monetary policy strategy based on the IT framework, interest rate policymaking is directed toward ensuring inflation projections remain within the target range. The issue, therefore, is how to address exchange rate fluctuations on the market that can edge inflation projections outside of the target range. Hence, foreign exchange intervention represents an option. If foreign capital flows are creating a misalignment between the exchange rate and its fundamental value and inflation has moved outside of the target range, an interest rate response combined with foreign exchange intervention would be more effective and, thus, reinforce monetary policy credibility.

The empirical findings are also quite relevant to China. We found that capital account openness (KAO) leads to higher output and inflation instability in the economy, and further monetary policy independence is not significant in any model. This may be due to the country's adherence to the fixed exchange rate. Our finding indicates the capital account openness may end up in higher macroeconomic instability in China due to the risk associated with volatile capital flows. Hence, optimum capital flow management is warranted to optimize the benefits of policy choices. These findings may also be applied to Malaysia. The increasing volatility of the capital flows, particularly capital inflows and combined with current account surplus, may lead to macroeconomic instability. In this context, using all of the policy options, i.e., monetary policy, exchange rate stabilization, capital flow control, and macroprudential policy, may help to attain macroeconomic stability, particularly the output.

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Table 1: Long-run coefficient estimates by the ARDL approach: **Brazil**

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1 (4, 0, 1, 0)	Model 2 (4, 1, 2, 0, 1, 0)	Model 3 (4, 1, 2, 0, 1, 0, 0)	Model 4 (4, 2, 3, 2, 1, 0, 0)	Model 1 (3, 3, 3, 2)	Model 2 (4, 2, 0, 5, 3, 2)	Model 3 (4, 1, 2, 0, 1, 0, 0)	Model 4 (4, 2, 3, 2, 1, 0, 0)	Model 1 (2, 0, 0, 3)	Model 2 (2, 0, 0, 1, 0, 0)	Model 3 (2, 0, 0, 0, 0, 0, 0)	Model 4 (2, 0, 0, 0, 0, 0, 0)
MI	-0.316 (-1.965)***	-0.649 (-3.919)*	-0.669 (-3.166)*	-0.677 (-3.162)*	-0.722 (2.466)**	-1.119 (-7.113)*	-0.618 (-3.176)*	-0.61 (-3.223)*	-0.092 (-0.734)	-0.143 (-1.244)	-0.041** (-1.752)	-0.211 (-0.894)
ERS	-0.561 (-1.677)	-0.433 (-2.414)**	-0.399 (-2.213)**	-0.543 (-2.154)**	0.332 (0.375)	-0.033 (-0.414)	-0.973 (-2.274)**	-0.906 (-2.141)**	0.158 (0.541)	-0.07 (-0.249)	0.148 (0.576)	0.159 (0.599)
KA0	0.016 (0.875)	0.007 (0.575)	0.008 (0.675)	0.033 (2.124)**	0.015 (0.453)	0.061 (6.662)*	0.008 (0.721)	0.041 (2.132)**	0.007 (0.465)	-0.111 (-1.449)	-0.002 (-0.096)	-0.001 (-0.052)
MPI		-0.143 (-3.467)*	-0.131 (-3.395)*	-0.105 (-3.967)*		-0.148 (-8.151)*	-0.097 (-3.447)*	-0.099 (-4.051)*		0.014 (0.850)	0.004 (0.187)	0.002 (0.093)
VIX		1.623 (5.037)*	1.634 (5.176)*	1.948 (7.143)*		1.814 (13.534)*	1.631 (5.497)*	1.939 (7.671)*		-0.095 (-0.328)	-0.006 (-0.022)	0.053 (0.186)
MI*MPI			0.098 (0.966)				0.071 (0.946)				-0.151 (-1.929)***	
KAO*MPI				0.01 (1.632)				0.01 (1.611)				0.01 (1.544)
Constant	1.312 (1.391)	-1.226 (-1.546)	-1.114 (-1.679)	-2.182 (-2.991)*	-0.833 (-0.573)	-3.55 (-5.742)*	-1.310 (-1.813)***	-2.492 (-3.153)*	-0.112 (-0.414)	0.455 (0.997)	0.012 (0.022)	-0.031 (-0.035)
F-stat	14.117*	18.356*	16.17*	16.259*	18.816*	41.408*	16.757*	17.584*	24.38*	19.538*	21.61*	20.837*
ECM	-0.073 (-8.512)*	-0.122 (-12.723)*	-0.111 (-12.315)*	-0.146 (-12.287)*	-0.097 (-10.456)*	-0.012 (-19.225)*	-0.149 (-12.153)*	-0.166 (-12.963)*	-0.311 (-10.521)*	-0.428 (-12.899)*	-0.511 (-14.073)*	-0.466 (-12.213)*

Table 2: Long-run coefficient estimates by the ARDL approach: China

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model 1	Model2	Model3	Model4
	(3, 0, 0, 0)	(3, 0, 0, 0, 0)	(4, 4, 4, 0, 2, 0, 0)	(3, 2, 1, 0, 0, 0, 0)	(2, 0, 0, 2)	(2, 0, 0, 2, 0, 0)	(2, 0, 0, 2, 0, 0, 0)	(2, 0, 2, 2, 2, 0, 1)	(6, 0, 0, 0)	(6, 0, 0, 0, 3, 3)	(1, 1, 0, 0, 1, 0, 0)	(1, 1, 0, 0, 1, 0, 0)
MI	-0.007 (-0.166)	-0.022 (-0.163)	-0.214 (-1.767)	-0.237 (-1.163)	-0.093 (-0.862)	-0.081 (-0.733)	-0.191 (-1.011)	-0.181 (-1.430)	-0.051 (-0.110)	-0.051 (-0.211)	-0.169 (-0.682)	-0.366 (-0.742)
ERS	0.231 (0.543)	0.196 (0.605)	0.404 (1.090)	0.622 (1.819)	0.978 (1.252)	0.912 (1.340)	0.907 (1.156)	0.900 (1.245)	-0.327 (-0.146)	-0.111 (-0.134)	-0.241 (-0.121)	-1.051 (-0.501)
$KA0$	0.024 (0.966)	0.023 (0.871)	0.024 (1.176)	0.008 (1.911)	0.167 (1.726)	0.138 (1.73)	0.177 (2.121)*	0.178 (2.667)*	0.144 (2.460)*	0.023 (1.66)*	0.287 (1.434)	0.132 (0.818)
MPI		0.0009 (0.432)	0.0004 (0.245)	0.002 (0.546)		0.004 (0.652)	0.003 (0.711)	0.014 (0.622)		-0.016 (0.911)	-0.007 (-0.262)	-0.004 (-0.022)
VIX		0.035 (0.261)	0.122 (1.038)	0.079 (0.452)		0.344 (0.873)	0.366 (0.866)	0.214 (0.664)		0.432 (0.828)	0.350 (0.232)	0.105 (0.085)
$MI * MPI$			0.008 (0.509)				0.031 (0.819)				-0.144 (-1.133)	
$KAO * MPI$				0.006 (0.130)				0.034 (0.948)				0.050 (0.762)
Constant	-0.211 (-0.914)	-0.354 (-0.717)	-0.814 (-1.982)***	-1.159 (-2.916)*	-1.393 (-1.461)	-1.966 (-1.856)***	-1.766 (-1.590)	-3.344 (-2.320)*	0.342 (0.313)	0.625 (0.514)	-1.054 (-0.322)	0.4212 (0.132)
F-stat	32.021*	22.513*	9.328*	23.318*	21.388*	15.342*	13.412*	15.265*	8.161*	6.196*	10.006*	9.833*
ECM	-0.241 (-13.042)*	-0.263 (-13.111)	-0.345 (-9.235)	-0.276 (13.314)	-0.466 (-10.731)*	-0.534 (-10.111)*	-0.492 (-10.901)*	-0.337 (-11.739)*	-1.118 (-6.673)*	-1.553 (-6.910)*	0.434 (-9.492)*	-1.022 (-9.362)*

Table 3: Long-run coefficient estimates by the ARDL approach: Hungary

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1 (4, 3, 3, 3)	Model 2 (4, 3, 3, 0, 4, 4)	Model 3 (4, 4, 4, 0, 4, 0, 0)	Model 4 (4, 4, 4, 0, 2, 0, 3)	Model 1 (4, 0, 0, 0)	Model 2 (4, 3, 2, 0, 4, 4)	Model 3 (4, 3, 0, 0, 4, 3, 0)	Model 4 (4, 0, 2, 0, 3, 4, 4)	Model 1 (4, 1, 0, 0)	Model 2 (4, 0, 4, 0, 4, 2)	Model 3 (4, 1, 1, 0, 2, 0, 0)	Model 4 (4, 0, 0, 4, 2, 0, 4)
MI	-1.089 (-2.748)*	-1.062 (-2.221)**	-1.441 (-2.967)*	-0.816 (-2.428)**	0.451 1.371	-0.514 (-0.658)	-0.071 (-0.109)	0.321 (1.222)	(-0.456) (-2.288)**	-0.135 (-1.032)	-0.312 (-1.904)***	0.127 (0.911)
ERS	-5.387 (-3.966)*	-4.311 (-2.971)*	-5.311 (-3.148)*	-5.566 (-3.186)*	0.095 0.109	-3.119 (-1.853)	-0.432 (-0.466)	-1.876 (-1.876)	-0.443 (-1.167)	3.101 (1.697)***	-1.566 (-2.415)**	-0.770 (-1.75)***
KA0	0.005 (3.239)*	0.003 (1.817)***	0.004 (2.508)**	0.014 (3.66)*	-0.0004 -0.301	-0.0008 (-0.366)	0.001 (0.652)	-0.0006 (-0.466)	-0.0002 (-0.733)	0.0007 (0.954)	-0.0007 (-1.533)	-0.001 (-2.981)*
MPI		-0.061 (-1.943)***	-0.134 (-1.563)	-0.181 (-1.919)***		-0.107 (-0.923)	-0.142 (-1.211)	-0.152 (-1.492)		(-0.086) (-1.358)	-0.015 (-0.323)	-0.088 (-1.78)***
VIX		1.725 (2.814)*	0.974 (1.354)	0.162 (2.524)*		3.369 (1.919)***	4.677 (2.633)*	2.244 (1.988)***		1.406 (1.937)***	-0.426 (-0.996)	0.263 (0.647)
MI*MPI			-0.538 (-1.374)				-1.051 (-1.899)***				-0.245 (-1.026)	
KAO*MPI	3.012 (1.572)	0.221 (0.146)	1.881 (1.202)	0.021 (1.222)				-0.0370 (-4.932)*				-0.0076 (-1.966)**
Constant	27.663* -0.056	19.416* -0.055	16.231* 16.231	2.265 (1.749)	-0.441 -0.611	(-2.452) (-0.718)	-6.124 (-2.111)**	-2.461 -1.198	0.616 (1.816)***	-3.731 (-1.752)	1.744 (1.986)**	0.093 0.892
F-stat	(12.016)*	(12.358)*	(12.687)*	21.358*	16.176*	16.363*	14.560*	18.187*	16.562*	13.343*	12.589*	14.856*
ECM	-0.072 (-6.11)*	-0.067 (-7.63)*	-0.074 (-6.340)*	-0.050 (-13.638)*	-0.055 (-9.222)*	-0.054 (-11.212)*	-0.046 (-11.431)*	-0.048 (-12.641)	-0.052 (-9.351)*	-0.052 (10.161)*	-0.054 (-10.532)*	-0.050 (11.520)*

Table 4: Long-run coefficient estimates by the ARDL approach: India

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1 (3, 2, 4, 2)	Model 2 (2, 4, 4, 4, 4, 3)	Model 3 (2, 1, 1, 3, 2, 3, 3)	Model 4 (2, 2, 1, 2, 2, 1, 2)	Model 1 (3, 4, 0, 4)	Model 2 (3,4,2,1,4,0)	Model 3 (3, 3, 0, 3, 2, 1, 0)	Model 4 (3, 3, 0, 3, 2, 0, 0)	Model 1 (1, 4, 4, 1)	Model 2 (1, 0, 0, 2, 3, 0)	Model 3 (1, 2, 0, 0, 0, 1, 0)	Model 4 (2, 0, 0, 2, 0, 2, 2)
MI	0.661 (2.416)**	0.569 (3.713)**	-0.271 (-2.266)**	1.139 (3.231)*	0.561 (3.315)*	0.961 (5.291)*	0.962 (1.974)***	0.636 (3.11)*	0.781 (2.516)**	0.446 (-0.629)	-1.863 (-1.901)**	0.229 (0.809)
ERS	-0.312 (-1.181)	-0.253 (2.941)**	-0.153 (3.959)*	-0.972 (2.618)**	-0.376 (-1.988)**	-0.734 (-2.332)**	0.162 (-0.271)	-0.525 (-0.725)	-0.158 (-1.739)***	-0.925 (-1.822)***	-0.872 (-0.516)	-0.126 (-1.518)
KA0	0.015 0.412	0.082 (2.635)**	0.081 (3.551)*	-0.102 (2.231)**	0.171 (5.113)*	0.019 (3.251)*	0.171 (3.117)*	-0.232 (2.633)**	-0.082 (-1.751)	-0.235 (-1.591)	-0.033 (-0.211)	-0.055 (-0.531)
MPI		-0.087 (-2.165)***	-0.175 (-3.191)*	-0.166 (-1.891)***		-0.047 (-1.197)	-0.252 (-2.022)***	-0.232 (-1.792)***		-0.232 (-0.832)	0.012 (-0.058)	0.156 (1.227)
VIX		-1.441 (-3.2615*	-1.761 (-4.581)*	-1.521 (-2.249)**		1.221 (3.621)*	0.526 -0.646	1.133 (1.413)		4.016 (1.894)***	-1.252 (-0.482)	1.588 (1.277)
MI*MPI			-0.569 (-6.481)*				-0.352 (-2.632)**				-0.869 (-2.026)***	
KAO*MPI				-0.127 (-2.361)**				-0.048 (-1.9222)***				0.026 (0.425)
Constant	-0.128 (-0.031)	-2.568 (-2.829)**	-1.151 (-1.670)	-3.162 (-1.789)***	-6.942 (-6.116)*	-3.217 (-4.214)*	-8.329 (-3.184)*	-11.547 (-2.861)**	-3.531 (-1.173)	6.134 (-1.156)	2.869 (-0.842)	0.378 (0.148)
F-stat	7.821*	10.067*	11.669*	16.712*	11.822*	16.790*	6.517*	5.66*	10.326*	7.425*	5.667*	7.944*
ECM	-0.291 (-6.721)	-0.943 (-16.912)*	-0.656 (-25.110)*	-0.317 (-17.53)*	-0.522 (-8.477)*	-0.457 (-12.996)*	-0.247 (-8.713)*	-0.25 (-7.971)*	-0.322 (-7.823)*	-0.125 (-8.137)*	-0.121 (-7.544)*	-0.843 (13.863)*

Table 5: Long-run coefficient estimates by the ARDL approach: Indonesia

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1 (3, 3, 0, 4)	Model 2 (4, 3, 0, 4, 0, 0)	Model 3 (4, 4, 4, 4, 0, 3, 2)	Model (4) (4, 4, 4, 4, 0, 0, 2)	Model 1 (8, 2, 5, 8)	Model 2 (5, 1, 5, 3, 5, 0)	Model 3 (4, 0, 4, 4, 1, 4, 3)	Model 4 (4, 4, 3, 1, 0, 4, 3)	Model 1 1, 0, 0, 2, 0, 2)	Model2 (1, 0, 2, 0, 2,0)	Model 3 (1, 1, 0, 0, 0, 0, 0)	Model 4 (1, 0, 0, 0, 0, 0, 1)
MI	-0.216 (-2.994)*	-0.251 (-2.932)*	-0.231 (-1.946)*	-0.251 (-1.732)	-0.022 (-1.061)	-0.144 (-2.248) **	-0.083 (-2.122)**	-0.477 (-3.511)*	-0.148 (-0.238)	-0.134 (-0.333)	-0.700 (-1.193)	-0.203 (-0.303)
ERS	0.081 (0.633)	0.042 (0.721)	-0.212 (-0.891)	-0.162 (-0.652)	-0.008 (-0.242)	-0.021 (-0.163)	-0.221 (-1.031)	-0.022 (-0.061)	-0.647 (-0.612)	-0.665 (-0.744)	-0.551 (-0.592)	-0.199 (-0.203)
$KA0$	-0.043 (-1.521)	-0.053 (-1.866)***	-0.046 (-1.288)	-0.015 (-0.532)	-0.006 (-1.081)	-0.0137 (-0.733)	-0.005 (-0.238)	0.034 (1.791)	-0.122 (-0.962)	-0.128 (-1.099)	-0.155 (-1.286)	-0.134 (-1.341)
MPI		-0.022 (-0.167)	0.029 (0.749)	-0.003 (-0.169)		-0.001 (-0.267)	-0.044 (-1.667)	-0.068 (-1.431)		-0.037 (-0.344)	-0.016 (-0.154)	-0.093 (-0.443)
VIX		0.258 (2.131)**	-0.177 (-1.061)	-0.183 (-1.722)		-0.009 (-0.066)	0.133 (0.719)	0.079 (0.516)		-0.424 (-0.479)	-0.682 (-0.726)	-0.023 (-0.099)
$MI * MPI$			-0.341 (-2.937)*				-0.212 (-1.411)				0.000 (0.004)	
$KAO * MPI$				-0.166 (-1.623)				-0.166 (-1.81)				0.733 (1.002)
Constant	0.099 (1.227)	0.531 (2.461)**	0.461 (1.636)	0.424 (2.112)**	-0.015 (-0.669)	0.132 (0.765)	-0.026 (-0.139)	0.177 (0.481)	0.533 (0.760)	1.100 (0.709)	1.696 (1.149)	0.213 (0.104)
F-stat	11.217*	9.413*	6.776*	6.865*	20.447*	7.123*	7.012*	9.711*	19.760*	13.330*	12.093*	17.122*
ECM	-0.624 (-7.622)*	-0.628 (-8.761)*	-0.433 (-8.335)*	-0.514 (-8.216)*	-0.613 (10.860)*	-0.436 (-7.833)*	-0.436 (-8.426)	-0.419 (-9.622)*	-0.455 (-10.55)*	-0.402 (-10.034)	-0.694 (-10.515)*	-0.304 (-11.302)*

Table 6: Long-run coefficient estimates by the ARDL approach: Malaysia

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1 (4, 0, 0, 1)	Model 2 (2, 0, 2, 1, 1, 0)	Model 3 (2, 4, 4, 3, 2, 3, 0)	Model 4 (2, 0, 0, 0, 0, 1, 2)	Model 1 (2, 0, 2, 0)	Model 2 (2, 0, 2, 0, 0, 0)	Model 3 (4, 3, 4, 4, 4, 4, 4)	Model 4 (4, 1, 0, 3, 0, 3, 4)	Model 1 (2, 0, 0, 1)	Model 2 (2, 0, 0, 1, 0, 0)	Model 3 (2, 0, 0, 1, 0, 0, 0)	Model 4 (1, 0, 1, 1, 0, 2, 1)
MI	-0.012 (-0.766)	-0.097 (-1.244)	-0.063 (-0.461)	-0.044 (-1.412)	-0.045 (-0.694)	-0.05 (-0.758)	-0.318 (-5.476)*	-0.102 (-2.132)**	0.136 (0.676)	0.157 (0.763)	0.131 (0.631)	0.347 (1.393)
ERS	0.121 (0.899)	-0.505 (-1.055)	0.261 (0.541)	0.166 (0.823)	-0.577 (-1.768)	-0.604 (-1.812)***	-0.117 (-0.831)	0.152 (1.964)***	-0.242 (-0.449)	-0.191 (-0.349)	-0.081 (-0.147)	-1.743 (-1.959)***
KA0	-0.007 (-0.466)	-0.056 (-2.352)**	-0.041 (-2.321)**	-0.005 (-0.402)	-0.01 (-0.987)	-0.007 (-0.576)	-0.066 (-5.272)*	-0.019 (-2.115)**	0.069 (1.441)	0.058 (1.125)	0.067 (1.273)	0.059 (0.936)
MPI		-0.0266 (-1.535)	-0.041 (-2.271)**	-0.021 (-1.980)***		0.01 (0.696)	-0.036 (-4.057)*	-0.013 (-1.87)***		-0.018 (-0.382)	-0.026 (-0.551)	-0.02 (-0.346)
VIX		0.342 (1.106)	0.852 (2.361)**	0.588 (2.101)**		0.258 (1.067)	0.678 (4.273)*	0.148 (1.251)		1.882 (2.227)**	2.141 (2.414)**	2.192 (1.813)***
MI*MPI			-0.211 (2.001)***				-0.591 (3.902)*				-0.434 (-1.465)	
KAO*MPI				-0.048 (-2.018)**				-0.042 (-2.942)*				-0.144 (-1.873)***
Constant	-0.173 (-1.044)	0.264 (0.521)	-0.891 (-1.541)	-0.599 (-1.825)***	0.857 (2.927)*	0.568 (1.42)	-1.402 (-4.492)*	-0.588 (-3.224)*	-0.253 (-0.537)	1.97 (1.789)***	2.146 (1.908)***	3.36 (2.153)**
F-stat	6.221*	28.234*	37.141*	32.511*	57.987*	40.833*	12.293*	7.179*	11.544*	10.345*	9.699*	8.454*
ECM	-0.333 (-5.001)*	-0.342 (-15.031)*	-0.422 (-20.91)*	-0.461 (-17.121)*	-0.356 (-17.949)*	-0.354 (-18.338)*	-0.773 (-14.025)*	-0.546 (-8.865)*	-0.49 (-7.997)*	-0.376 (-9.21)*	-0.345 (-9.673)*	-0.138 (-9.105)*

Table 7: Long-run coefficient estimates by the ARDL approach: Poland

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1 (3, 3, 1, 0)	Model 2 (2, 3, 1, 0, 2, 1)	Model 3 (3, 3, 1, 0, 1, 1, 0)	Model 4 (2, 0, 2, 1, 0, 1, 2)	Model 1 (3, 1, 1, 1)	Model 2 (3, 3, 0, 3, 0, 0)	Model 3 (3, 3, 0, 3, 0, 0, 0)	Model 4 (3, 3, 0, 4, 0, 2, 0)	Model 1 (1, 0, 0, 2)	Model 2 (2, 0, 3, 2, 0, 0)	Model 3 (2, 0, 3, 2, 0, 0, 0)	Model 4 (2, 0, 0, 2, 0, 0, 1)
MI	0.025 (0.653)	0.029 (0.706)	0.04 (1.244)	-0.02 (-0.859)	-0.051 (-1.332)	-0.026 (-0.189)	-0.011 (-0.602)	-0.026 (-0.934)	0.114 (0.791)	0.010 (0.132)	0.012 (0.101)	-0.016 (-0.164)
ERS	0.025 (0.329)	0.006 (0.063)	0.024 (0.401)	0.184 (1.113)	-0.071 (-0.301)	0.122 (1.627)	0.106 (1.429)	0.037 (0.788)	-0.115 (0.202)	-0.644 (-1.394)	-0.663 (-1.532)	-0.202 (0.715)
KA0	0.002 (2.405)**	0.003 (3.197)*	0.002 (3.46)*	0.001 (0.428)	0.001 (1.603)	0.002 (0.069)	0.002 (0.907)	0.002 (1.786)***	-0.009 (-0.832)	-0.010 (-1.333)	-0.009 (-1.245)	-0.012 (-1.612)
MPI		-0.035 (-1.444)	-0.023 (-1.601)	-0.013 (-1.029)		0.006 (0.806)	0.004 (0.660)	0.007 (0.652)		0.033 (0.735)	0.043 (1.302)	0.032 (0.756)
VIX		0.084 (1.5)	0.127 (2.705)**	0.106 (1.57)		0.081 (2.533)**	0.141 (2.906)*	0.121 (2.481)**		-0.633 (-1.852)***	-0.918 (-2.212)**	-0.653 (-1.823)***
MI*MPI			-0.035 (-2.425)**				0.010 (0.981)				-0.125 (-1.547)	
KAO*MPI				-0.001 (-0.831)				-0.001 (-2.334)**				-0.008 (-2.211)**
Constant	-0.223 (-2.337)**	-0.388 (-2.97)*	-0.434 (-3.776)*	-0.151 (-0.926)	-0.082 (-1.109)	-0.182 (-2.502)**	-0.303 (-2.521)**	-0.396 (-2.230)**	0.609 (0.652)	2.026 (1.966)***	2.261 (2.123)**	1.731 (1.784)***
F-stat	16.047*	51.439*	15.577*	38.133*	50.921*	15.221*	13.612*	12.711*	23.900*	18.924*	17.061*	17.118*
ECM	-0.679 (-9.555)*	-0.571 (-21.13)*	-0.738 (-12.687)*	-0.56 (-19.761)*	-0.713 (-16.483)*	-0.821 (-11.600)*	-0.844 (-11.502)*	-0.748 (-11.532)*	-1.358 (-11.153)*	-1.932 (-12.518)*	-1.866 (-13.121)*	-1.861 (-13.102)*

Table 8: Long-run coefficient estimates by the ARDL approach: Russia

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model1	Model 2	Model 3	Model 4
	(4, 2, 2, 2)	(4, 2, 2, 1, 1, 0)	(4, 2, 0, 1, 1, 0, 3)	(4, 2, 2, 1, 1, 0, 0)	(2, 0, 0, 1)	(2, 0, 0, 1, 0, 0)	(2, 0, 0, 1, 0, 0, 0)	(2, 0, 0, 1, 0, 0, 2)	(2, 0, 0, 2)	(2, 0, 0, 2, 2, 0)	(2, 0, 0, 2, 2, 0, 0)	(2, 0, 0, 2, 0, 0, 1)
MI	-0.051 (-2.201)*	-0.081 (-3.226)*	-0.104 (-3.801)*	-0.083 (-2.912)*	-0.003 (-0.102)	-0.012 (-0.422)	-0.030 (-0.687)	-0.034 (-0.756)	-0.312 (-0.758)	-0.341 (-0.745)	-0.274 (-0.601)	-0.301 (-0.692)
ERS	-0.054 (-1.421)	-0.071 (-1.955)***	0.012 (0.615)	-0.070 (-1.966)***	-0.094 (-1.002)	-0.139 (-1.052)	-0.088 (-0.856)	-0.177 (-1.573)	0.531 (0.614)	0.932 (1.046)	0.833 (0.907)	1.123 (1.240)
$KA0$	-1.022 (-0.026)	-8.33 (-0.761)	-4.30 (-0.409)	-8.018 (-0.713)	0.0004 (1.503)	0.0001 (1.329)***	0.000 (1.884)***	0.0006 (1.36)	-0.0004 (-0.066)	-0.0002 (-0.066)	-7.045 (-0.010)	0.0006 (0.120)
MPI		-0.001 (-0.970)	8.710 (0.026)	-0.001 (-0.966)		-0.012 (-1.412)	-0.024 (-1.478)	-0.027 (-1.575)		-0.071 (-0.921)	-0.052 (-0.908)	-0.123 (-1.554)
VIX		-0.019 (-0.611)	-0.032 (-1.112)	-0.016 (-0.591)		-0.161 (-1.249)	-0.228 (-1.511)	-0.231 (-1.435692)		-0.655 (-0.501)	-0.470 (-0.630)	-0.632 (-0.504)
$MI * MPI$			-0.042 (-2.600)**				0.0346 (1.218)				-0.133 (-0.410)	
$KAO * MPI$				6.101 (0.051)				0.0001 (0.134)				0.004 (0.636)
Constant	0.082 (1.282)	0.151 (2.402)**	0.099 (1.972)***	0.150 (2.041)**	-0.041 (-0.212)	0.1441 (0.670)	0.192 (0.851)	0.315 (1.178)	-0.211 (-0.172)	-0.024 (-0.015)	-0.132 (-0.070)	-0.353 (-0.180)
F-stat	29.114*	23.629*	21.101	20.331*	13.662*	10.222*	9.259	8.774*	10.502*	7.607*	6.515*	6.820*
ECM	-0.250	-0.225	-0.222	-0.201	-0.802	-0.766	-0.767	-0.722	-0.402	-0.552	-0.515	-0.730

	(-12.914)*	(-13.706)*	(-14.011)*	(-13.410)*	(-8.290)*	(-7.707)*	(-9.178)*	(-7.202)*	(-7.504)*	(-7.721)*	(-7.731)*	(7.820)

Table 9: Long-run coefficient estimates by the ARDL approach: **Turkey**

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1 (3, 3, 3, 0)	Model 2 (3, 3, 1, 4, 4, 1)	Model 3 (2, 2, 0, 2, 2, 2, 2)	Model 4 (3, 3, 3, 4, 3, 3, 4)	Model 1 (4, 2, 2, 2)	Model 2 (3, 2, 2, 2, 0, 0)	Model 3 (2, 1, 2, 2, 2, 2, 2)	Model 4 (2, 1, 2, 2, 2, 2, 0)	Model 1 (1, 1, 0, 2)	Model 2 (1, 1, 0, 2, 1, 0)	Model 3 (1, 1, 0, 2, 1, 0, 1)	Model 4 (1, 1, 0, 2, 1, 0, 2)
MI	0.610 (0.916)	0.287 (0.756)	0.334 (1.067)	0.561 (0.872)	0.611 (1.654)	0.053 (0.461)	0.739 (1.422)	0.912 (1.587)	0.651 (1.466)	0.650 (1.481)	0.815 (1.702)	0.868 (1.705)
ERS	-0.776 (-0.818)	-0.459 (-1.182)	-0.522 (-1.260)	-0.632 (-0.876)	-0.410 (-1.601)	-0.673 (-0.478)	-0.122 (-0.221)	-0.150 (-0.521)	-1.404 (-1.944)***	-1.721 (-2.368)**	-1.732 (-2.401)**	-1.722 (-2.168)**
KA0	-0.022 (-0.503)	-0.042 (-0.621)	-0.023 (-4.050)*	-0.106 (-1.089)	-0.001 (-0.079)	-0.092 (-0.576)	-0.021 (-3.619)*	-0.097 (-1.727)***	-0.046 (-1.512)	-0.046 (-1.201)	-0.034 (-1.239)	-0.031 (-0.863)
MPI		-0.178 (-0.901)	-0.271 (-3.512)*	-0.138 (-0.640)		-0.098 (-0.372)	-0.212 (-3.131)*	-0.390 (-1.544)		-0.076 (-1.099)	-0.060 (-0.910)	-0.089 (-0.803)
VIX		6.091 (1.122)	2.371 (2.846)*	2.803 (0.823)		0.790 (0.192)	2.322 (2.179)**	2.809 (1.150)		-0.894 (-1.189)	-1.224 (-1.740)***	-0.683 (-0.749)
MI*MPI			-0.804 (-2.650)**				-0.712 (-2.303)**				-0.768 (-2.279)**	
KAO*MPI				0.124 (1.008)				0.004 (0.342)				0.009 (0.244)
Constant	-0.701 (-0.264)	-14.606 (-1.030)	2.950 (2.594)**	-19.704 (-1.151)	-0.146 (-0.105)	6.762 (0.550)	3.180 (2.728)*	6.530 (1.491)	3.966 (1.693)	4.455 (1.999)***	4.647 (2.280)**	3.590 (1.242)
F-stat	5.240*	6.516*	9.734*	6.591*	9.453*	3.949	7.566*	3.048	16.824*	10.021*	20.674*	11.496*
ECM	-0.056	-0.101	-0.317	-0.107	-0.130	-0.036	-0.335	-0.166	-0.480	-0.522	-0.595	-0.356

	(-5.512)*	(-7.017)*	(-10.201)*	(-10.243)*	(-7.412)*	(-5.801)*	(-9.121)*	(-5.641)*	(-11.902)*	(-12.963)*	(-14.440)*	(-10.800)*

Table 10: Long-run coefficient estimates by the ARDL approach: **Thailand**

The table reports the long-run coefficients estimated by Auto Regressive Distributed Lag (ARDL) procedure developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term. F-stat is the test for cointegration, where the null hypothesis of no cointegration is tested against an alternative of cointegration. I(0) and I(1) are the critical values for the lower and upper bounds, respectively, of the F statistic with constant and trend (Narayan, 2005).

Dependent Variable	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Regressor	Model 1 (2, 0, 0, 0)	Model 2 (2, 0, 0, 0, 0, 2)	Model 3 (2, 0, 0, 0, 0, 2, 0)	Model 4 (2, 0, 0, 0, 0, 2, 0)	Model 1 (2, 0, 0, 1)	Model 2 (4, 4, 1, 3, 2, 0)	Model 3 (2, 0, 2, 1, 1, 1, 3)	Model 4 (2, 3, 2, 1, 4, 0, 2)	Model 1 (2, 1, 0, 0)	Model 2 (2, 0, 0, 0, 0, 1)	Model 3 (2, 0, 0, 0, 0, 0, 0)	Model 4 (2, 0, 0, 0, 0, 0, 0)
MI	-0.019 (-2.562)*	-0.067 (-2.202)*	-0.051 (-2.125)**	-0.053 (-2.005)*	-0.007 (-0.356)	-0.016 (-0.170)	-0.025 (-1.175)	-0.034 (-2.142)*	-0.345 (-1.309)	-0.065 (-0.339)	-0.056 (-0.209)	-0.074 (-0.403)
ERS	0.098 (0.829)	0.128 (0.970)	0.126 (1.012)	0.165 (1.268)	0.070 (1.322)	-0.010 (-0.118)	-0.019 (-0.306)	-0.073 (-1.355)	-0.034 (-0.084)	-0.202 (-0.469)	-0.334 (-0.707)	-0.033 (-0.055)
KA0	-0.004 (-0.509)	-0.006 (-0.646)	-0.004 (-0.488)	-0.006 (-0.732)	-0.007 (-1.977)***	-0.003 (-1.936)***	-0.008 (-1.995)***	-0.007 (-1.967)***	-0.030 (-1.066)	-0.035 (-1.081)	-0.069 (-1.244)	-0.033 (-0.903)
MPI		-0.003 (-0.476)	-0.004 (-0.544)	-0.030 (-0.389)		-0.002 (-0.112)	-0.001 (-0.299)	-0.002 (-0.909)		-0.065 (-0.344)	-0.048 (-1.158)	-0.089 (-0.805)
VIX		-0.105 (-0.622)	-0.100 (-0.570)	-0.125 (-0.703)		0.026 (0.250)	0.005 (0.133)	-0.006 (-0.209)		-0.141 (-0.292)	-0.599 (-1.152)	-0.307 (-0.602)
MI*MPI			0.054 (0.966)				-0.029 (-0.609)				0.138 (0.636)	
KAO*MPI				0.028 (1.553)				-0.008 (-2.105)*				0.072 (1.490)
Constant	-0.041 (-0.373)	0.069 (0.259)	0.048 (0.208)	0.036 (0.148)	-0.076 (-1.450)	-0.047 (-0.208)	-0.048 (-0.490)	-0.075 (-1.099)	0.239 (0.610)	0.466 (0.550)	1.135 (1.669)	0.529 (0.619)
F-stat	8.466*	9.970*	8.043*	8.876*	10.059*	11.046*	11.350*	11.667*	14.259*	15.430*	15.840*	15.355*
ECM	-0.410	-0.415	-0.411	-0.415	-0.899	-0.453	-0.901	-0.908	-0.912	-0.910*	-0.904	-0.928

	(-15.406)*	(-15.488)*	(-15.630)*	(-15.824)*	(-7.320)*	(-9.163)*	(-12.610)*	(-10.299)*	(10.104)*	(-10.750)	(-11.732)	(-11.509)

Table 11: Panel cointegration test

The table presents the results of panel cointegration test based on Pedroni (1999, 2004)). The null hypothesis of no integration is tested against an alternative of integration. We assume deterministic intercept and no trend in the model and lag length is selected based on SIC criteria. Where, *, ** and *** denotes rejection of no cointegration at 1%, 5% and 10% level respectively.

Dependent	*Credit cycle*				*Output deviation*				*Inflation deviation*			
Test Statistic	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Within dimension test statistics												
Panel v	5.983*	3.938*	3.201*	2.897*	5.479*	3.566*	2.838*	2.521*	-1.578	-2.396	-2.777	-2.960
Panel rho	1.604	1.678	2.435	2.696	0.640	1.710	2.509	2.665	-6.281*	-2.963*	-1.745*	-1.337
Panel PP	9.789*	8.413*	7.319*	9.630*	2.749	3.482	4.485	4.629	-20.155*	-19.963*	-20.854*	-20.950*
Panel ADF	-0.283	2.256	2.967	3.197	0.126	2.414	3.857	3.454	-12.482*	-12.340*	-10.768*	-8.701*
Between dimension test statistics												
Group rho	8.653*	4.197	4.711	5.057	1.913	3.841	4.190	4.511	-5.117*	-1.592***	-0.324	0.026
Group PP	13.803*	9.187*	9.600*	10.292*	2.602	4.360	4.743	5.272	-25.982*	-24.212*	-24.208*	-22.698*
Group ADF	-14.457*	-8.413*	-6.209*	-7.170*	-5.191*	-5.917*	-2.967*	-3.973*	-17.009*	-13.246*	-14.045*	-11.501*

Table 11: Long-run coefficient estimates by the panel ARDL approach

The table presents the results of panel cointegration test proposed by Pesaran and Smith (1995) and Pesaran et al. (1999). Asterisks *, ** and *** denote statistical significance at the 1%, 5 % and 10% levels, respectively and values in parenthesis indicate t statistics. Credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. MI*MPI and KAO*MPI capture the interactive effect of macroprudential policy with monetary policy independence and capital account openness. Similarly, ECM indicates the error correction term.

Dependent Variable	*Credit cycle*				*Inflation deviation*			
Regressor	Model 1	Model2	Model3	Model 4	Model 1	Model2	Model3	Model 4
MI	-0.002 (-0.393)	-0.001 (-0.199)	-0.001 (-0.192)	-0.00063 (-0.12)	-0.083 (-0.592)	-0.085 (-0.621)	-0.041 (-0.3)	-0.057 (-0.427)
ERS	-0.020 (-1.606)	-0.022 (-1.755)***	-0.021 (-1.69)***	-0.021 (-1.761)***	-0.202 (-0.626)	-0.499 (-1.505)	-0.563 (-1.689)***	-0.590 (-1.837)***
KAO	0.000 (1.456)	0.000 (1.262)	0.000 (1.191)	0.0001 (0.994)	0.000 (0.085)	-0.001 (0.368)	-0.001 (0.203)	-0.002 (0.721)
MPI		0.000 (0.236)	0.000 (0.463)	0.000 (0.061)		-0.007 (-1.068)	-0.008 (-1.279)	-0.006 (-0.998)
VIX		0.024 (2.2)**	0.024 (2.264)**	0.024 (2.177)**		-0.347 (-1.272)	-0.419 (-1.521)	-0.333 (-1.263)
MI*MPI			-0.003 (-2.965)*				-0.215 (-2.358)**	
KAO*MPI				0.000 (0.753)				0.005 (1.076)
Constant	-0.017 (-2.686)*	-0.041 (-3.434)*	-0.041 (-3.443)*	-0.038 (-3.306)*	0.205 (3.269)*	0.866 (6.118)*	0.964 (5.916)*	0.939 (6.475)*
ECM	-0.768 (-3.826)*	-0.767 (-3.827)*	-0.759 (-3.823)*	-0.754 (-3.752)*	-0.898 (-7.295)*	-0.907 (-7.203)*	-0.906 (-7.22)*	-0.915 (-7.429)*

Appendix I

Data Coverage of the study

Sl. No	Country	Data Coverage
1	Brazil	2001Q4-2018Q4
2	China	1998Q1-2018Q4
3	Hungary	1995Q1-2018Q4
4	India	2006Q1-2018Q4
5	Indonesia	2001Q4-2018Q4
6	Malaysia	2005Q1-2018Q4
7	Poland	2005Q1-2018Q4
8	Russia	2000Q4-2018Q4
9	Turkey	2006Q1-2018Q4
10	Thailand	2000Q4-2018Q4

Appendix II
Descriptive Statistics

This table reports the descriptive statistics for the selected emerging economies. Output deviation, credit cycle and inflation deviation are derived using Christiano-Fitzgerald Filter. Here, MI, ERS, VIX and KAO stand for monetary policy independence index, exchange rate stability index, volatility index and capital account openness index respectively. Where, * , ** and ** represents 1% , 5% and 10% significance level respectively.

Brazil (2001Q4-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	0.216	2.373	-0.633	0.796	1.155	3.776	15.118*
Credit Cycle	0.216	2.570	-0.700	0.823	1.185	3.910	16.397*
Inflation Deviation	0.001	2.521	-1.672	0.662	0.437	5.481	17.600*
MI	0.586	1.000	0.000	0.371	-0.385	1.468	7.469**
ERS	0.203	0.879	0.028	0.164	1.868	6.954	75.253*
VIX	1.278	1.767	1.042	0.151	0.945	3.745	10.496*
KAO	49.321	69.374	32.737	7.313	0.540	3.725	4.312
China (1998Q1-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	0.054	4.572	-1.203	0.648	4.653	33.021	3128.327*
Credit Cycle	0.060	5.217	-1.225	0.734	4.732	33.866	3300.673*
Inflation Deviation	0.477	3.633	-1.779	1.115	0.224	2.825	0.733
MI	0.456	0.999	0.000	0.378	0.202	1.429	8.327*
ERS	0.921	1.000	0.619	0.091	-1.209	3.792	20.510*
VIX	1.294	1.767	1.042	0.144	0.541	3.246	3.901
KAO	3.329	6.940	0.900	1.002	0.428	4.289	7.591**
Hungary (1995Q1-2018Q4)							

Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	0.137	6.871	-1.897	1.580	1.973	8.492	167.731*
Credit Cycle	0.090	4.881	-1.501	1.144	1.856	7.991	141.918*
Inflation Deviation	0.088	3.481	-1.279	0.800	1.993	9.043	192.216*
MI	0.533	1.000	0.000	0.379	-0.159	1.374	10.059*
ERS	0.550	0.924	0.184	0.151	-0.093	2.803	0.271
VIX	1.283	1.767	1.042	0.142	0.576	3.291	5.181***
KAO	314.116	701.176	96.053	96.514	0.206	1.349	10.612*
India (2006Q1-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	0.295	6.325	-1.308	1.480	3.004	12.384	227.628*
Credit Cycle	0.251	5.432	-1.119	1.260	2.980	12.297	223.625*
Inflation Deviation	0.001	3.587	-2.745	1.339	0.158	2.925	0.193
MI	0.601	1.000	0.000	0.334	-0.576	1.847	4.873***
ERS	0.640	0.957	0.371	0.152	0.182	2.361	0.989
VIX	1.270	1.767	1.042	0.153	1.116	4.295	12.210*
KAO	45.008	53.071	32.264	5.852	-0.637	2.323	3.818
Indonesia (2001Q4-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	0.089	5.150	-1.142	0.769	4.905	32.614	2473.692*
Credit Cycle	0.076	4.395	-0.974	0.657	4.867	32.409	2439.198*
Inflation Deviation	0.021	6.340	-2.214	1.247	2.191	12.343	270.688*
MI	0.559	0.999	0.000	0.377	-0.275	1.467	6.738**
ERS	0.647	0.967	0.197	0.152	-0.056	3.093	0.054
VIX	1.271	1.767	1.042	0.150	0.945	3.745	10.496*
KAO	1.545	5.330	-3.870	1.351	-0.955	6.507	40.547*
Malaysia (2005Q1-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera

Output Deviation	0.094	4.434	-0.950	0.734	4.558	27.285	1345.829*
Credit Cycle	0.096	4.530	-0.945	0.749	4.564	27.327	1350.325*
Inflation Deviation	-0.008	2.848	-2.345	0.735	0.364	8.271	56.635*
MI	0.438	0.999	0.000	0.367	0.294	1.558	4.850***
ERS	0.711	0.963	0.397	0.140	-0.273	2.508	1.082
VIX	1.256	1.767	1.042	0.154	1.178	4.382	14.939*3.560
KAO	3.506	8.370	-1.820	2.275	0.064	2.809	0.105
Poland (2005Q1-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	-0.003	0.306	-0.516	0.151	-0.636	4.219	6.219**
Credit Cycle	-0.001	0.284	-0.479	0.158	-0.449	3.142	1.556
Inflation Deviation	-0.005	1.089	-1.546	0.538	-0.480	3.176	1.908
MI	0.506	0.999	0.006	0.369	0.041	1.377	5.280***
ERS	0.628	0.955	0.297	0.141	0.234	2.964	0.442
VIX	1.256	1.767	1.042	0.154	1.178	4.382	14.939*
KAO	119.713	157.812	84.786	20.195	-0.101	1.800	2.961
Russia (2000Q4-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	-0.001	0.254	-0.369	0.139	-0.635	2.470	5.139***
Credit Cycle	-0.005	3.396	-0.528	0.236	-0.181	2.060	2.746
Inflation Deviation	-0.016	4.076	-4.466	1.492	-0.201	3.612	1.454
MI	0.582	0.998	0.000	0.353	-0.382	1.597	6.911**
ERS	0.503	0.920	0.088	0.247	0.074	1.858	3.587
VIX	1.257	1.767	1.013	0.156	0.871	3.618	9.258*
KAO	111.558	170.023	81.202	20.197	0.611	2.837	4.126
Turkey (2006Q1-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	0.096	2.083	-0.469	0.482	2.939	12.140	216.556*

Credit Cycle	0.101	2.155	-0.455	0.506	2.971	12.238	221.214*
Inflation Deviation	0.001	3.221	-2.745	1.238	0.086	2.870	0.085
MI	0.423	0.999	0.000	0.391	0.439	1.533	5.357***
ERS	0.540	0.915	0.178	0.158	0.146	2.741	0.280
VIX	1.270	1.767	1.042	0.153	1.116	4.295	12.210*
KAO	78.172	96.330	64.336	7.693	0.331	2.505	1.253
Thailand (1993Q3-2018Q4)							
Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
Output Deviation	0.054	5.154	-1.086	0.610	6.395	53.440	10831.620*
Credit Cycle	0.046	4.353	-0.949	0.519	6.237	51.711	10113.620*
Inflation Deviation	0.006	2.674	-2.304	0.820	0.538	4.546	14.200*
MI	0.397	0.999	0.000	0.381	0.432	1.532	11.611*
ERS	0.697	0.981	0.115	0.171	-0.807	3.755	12.712*
VIX	1.270	1.767	1.042	0.143	0.662	3.261	7.300**
KAO	2.833	9.020	-7.990	2.206	-1.090	8.719	149.880*

Appendix III
The comparison of monetary policy regime, exchange rate system, and capital account regime among the Emerging countries

Country	Monetary policy regime	Objectives (goals)	Exchange rate system	Capital account regime
Brazil	*Inflation targeting*	Keeping inflation around the target[11]	*Free floating exchange rate system*	*Open capital account regime*
China	*Multiple targeting*	Maintain the stability of the value of the currency and thereby promote economic growth[12]	*Managed-float exchange rate system*	*Open capital account regime*
Hungary	*Inflation targeting*	Achieve and maintain price stability, preserve financial stability and support the Government's economic policy[13]	*Free floating exchange rate system*	*Open capital account regime*
India	*Inflation targeting*	Maintain price stability while keeping in mind the objective of growth.[14]	*Managed-float exchange rate system*	*Open capital account regime*
Indonesia	*Inflation targeting*	Achieve and maintain the stability of Rupiah value[15]	*Free floating exchange rate system*	*Open capital account regime*
Malaysia	*Exchange rate targeting*	Maintain price stability, supporting economic growth[16]	*Managed-float exchange rate system*	*Open capital account regime*
Poland	*Inflation targeting*	Maintain price stability for constructing solid foundations for long-term economic growth[17]	*Free floating exchange rate system*	*Open capital account regime*
Russia	*Inflation targeting*	Maintain price stability, that is, sustainably low inflation[18]	*Free floating exchange rate system*	*Open capital account regime*
Thailand	*Inflation targeting*	Ensuring economic stability, which is defined as low and stable inflation[19]	*Managed-float exchange rate system*	*Open capital account regime*
Turkey	*Inflation targeting*	Achieve and maintain price stability[20]	*Free floating exchange rate system*	*Open capital account regime*

11 https://www.bcb.gov.br/en/monetarypolicy
12 http://www.pbc.gov.cn/english/130727/130867/index.html
13 https://www.mnb.hu/en/monetary-policy/monetary-policy-instruments
14 https://www.rbi.org.in/home.aspx
15 https://www.bi.go.id/id/moneter/tujuan-kebijakan/Contents/Default.aspx
16 https://www.bnm.gov.my/index.php?ch=en_about&pg=en_intro&lang=en
17 https://www.nbp.pl/homen.aspx?f=/en/onbp/informacje/polityka_pieniezna.html
18 https://www.cbr.ru/eng/dkp/
19 https://www.bot.or.th/English/MonetaryPolicy/MonetPolicyKnowledge/Pages/PriceStability.aspx
20 https://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN/Main+Menu/Core+Functions/