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MONETARY POLICY: INDICATORS AND IDENTIFICATION

Theses of the PhD Dissertation

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University of Szeged
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1 Introduction

Monetary policy involves policies that influence the movement of interest rates or money supply in order to achieve macroeconomic outcomes (Howells and Bain, 2003). The New Keynesian model supports the significant effect of monetary policy on output and prices at least in the short run. It establishes the theoretical framework for the worldwide application of monetary policy by central banks (Walsh, 2010).

The study of monetary policy copes with ongoing debates about the choice of the most proper measure and the development of a function that can approximate the behaviour of the central bank. While the first problem refers to as the indicator problem, the second problem is called identification problem.

It should also be noted that monetary policy indicator and monetary policy tools are different in nature although they can be used interchangeably in many occasions. While monetary policy tools are instruments that monetary authorities use to manage the stance of monetary policy whereas monetary policy indicators are

variables measuring changes in the stance of monetary policy.

While there is a vast literature about the indicator and identification problem for advanced economies, there is a few empirical evidence about these problems for emerging economies that follow inflation targeting. In fact, the existing literature remains some critical gaps that need a rigorous study.

Firstly, the vast literature for advanced economies jumps to a general consensus that interest rates are the best measure of monetary policy and Taylor rule is the simplest and the most appropriate function of monetary policy (e.g., Bernanke and Mihov, 1998; Howells and Bain, 2003; Acosta-Ormaechea and Coble, 2011; Phiromswad, 2015; Peters, 2016). However, differences in institutions between advanced and emerging economies raise doubt about the worldwide application of this consensus.

In the late 1980s and early 1990s, emerging economies experienced a period of recessions and high inflation. Such a declining economy is conditional on many factors of which the primary one is the weak

framework of monetary policy. The use of money supply and high emphasis on economic growth cause problems in the conduct of monetary policy. Therefore, many economies decided to follow the framework of inflation targeting whose primary principles are the emphasis on remaining price stability and using interest rates as the primary instrument. However, emerging economies rarely strictly follow the primary principles of inflation targeting. The low level of finance development, high level of economic uncertainty, or low level of central bank independence leads to the fact that monetary authorities in emerging economies use a pallet of instruments to achieve a range of objectives. Moreover, an underdeveloped financial system can interrupt the smooth transmission from a change in policy interest rates to economic activities, which restricts the effectiveness of the interest rate instrument. Since monetary policy instruments are different in nature, the application of multiple instruments is highly likely to increase the performance of monetary policy conduct in an uncertain environment. Despite of these advantages, the multiple-instrument framework causes difficulties in the study of monetary policy. It

suggests that no single indicator can fully capture changes in monetary policy. Interest rates can capture a proportion of information and the rest of information comes from other instruments such as changes in exchange rates or money reserves. Therefore, it is of importance to have a rigorous study about the relative significance of various monetary policy indicators as well as the relevance of a composite measure in emerging economies that follow inflation targeting.

Secondly, the basic Taylor rule is less likely to capture the process of making monetary policy decisions in emerging economies. The primary reason is that monetary authorities in emerging economies have more things under considerations than their counter partners in advanced economies. This means that to better understand the behaviour of monetary authorities in emerging economies, the Taylor rule should have more variables that indicate the difference in the institutions of these economies. To begin with, adding exchange rates is of importance. Since emerging economies are small and open, they have a high level of external exposure. Therefore, remaining a stable exchange rate has a

significant contribution to the protection and development of certain industries such as agriculture, commodities, or infant industries. A stable exchange rate can also maintain or increase the competitive advantage of emerging economies. Besides exchange rates, intervention in the exchange rate market should be under consideration. Finally, monetary authorities in emerging economies can show departures from the conventional model of monetary policy. For instance, the low level of central bank independence leads to the fact that monetary authorities in emerging economies cope with high political pressure in the implementation of monetary policy. In times of recessions, political pressure is heating and career-concerned monetary authorities are likely to put a high priority on output growth rather than price stability. This suggest that a linear monetary policy rule may not be a proper choice to study the behaviour of monetary authorities in emerging economies that follow inflation targeting. To put it differently, the behaviour of monetary authorities should be represented by a nonlinear or asymmetric rule.

1.1 Motivation and importance of the study

The thesis contributes to the literature in several aspects. Firstly, the thesis sheds light on the representative power of various indicator (money supply, interest rates, and monetary condition index) in measuring changes in monetary policy in inflation-targeting emerging economies. It should be noted that while the literature is vast for emerging economies, little is known on this issue for emerging economies, especially Asia, Latin America, and South Africa. It answers the question whether using only one indicator is enough to measure changes in monetary policy or it is necessary to construct a composite measure. Moreover, it fills the existing literature about monetary condition index (MCI) by examining its impact on the target variable of monetary policy in inflation-targeting emerging economies.

Secondly, the thesis helps understand the behaviour of monetary authorities in emerging economies that target price stability. It answers how they respond to economic variables. It also extends the Taylor rule by considering the potential influence of the "fear-of-floating", foreign exchange intervention, and potential

asymmetries in the rules where monetary policy responds differently to output and inflation gap.

Concerning exchange rates, although many studies (Minella et al., 2003; Mohanty and Klau, 2005; Paez-Farrell, 2007; Aizenman et al., 2011; Sánchez-Fung, 2011; Cermeño et al., 2012; Caporale et al., 2018) support their importance, there is a dearth of studies examining its asymmetric or post-crisis effect. Furthermore, to the best knowledge of the author, no study emphasizes on the problem of measurement sensitivity when analysing the effect of exchange rates on the setting of interest rates.

Turning to foreign exchange intervention, it is a popular instrument in emerging economies (Domaç and Mendoza, 2004; Chang, 2008; Sideris, 2008; Humala and Rodríguez, 2010; Villamizar-Villegas, 2016; Hansen and Morales, 2019; Krizek and Brcak, 2021). However, the literature about its impact on monetary policy is scant.

Furthermore, the Taylor rule can display the nonlinearity or asymmetries because of a nonlinear Phillips curve or an asymmetric preference. While this problem is extensively investigated for advanced economies (Bec et al., 2002; Schaling, 2004; Dolado et

al., 2005; Surico, 2007; Aguiar and Martins, 2008; Cukierman and Muscatelli, 2008; Caglayan et al., 2016; Tawadros, 2016), little is known about the effect of a nonlinear Phillips curve and asymmetric preferences on the reaction function of monetary policy in inflation-targeting emerging economies.

Thirdly, the thesis conducts a comparative analysis by focusing on a group of emerging economies. This can provide a comprehensive picture about the choice of monetary policy indicators as well as the function of monetary policy in inflation-targeting emerging economies. Moreover, the focus on emerging economies is of importance because these economies play an increasing role in the global economy.

Fourthly, it covers the post-crisis period during which the exchange rates and foreign exchange intervention may have important implication for monetary policy implementation. Therefore, the thesis provides an update analysis for previous studies.

1.2 Objectives of the study

The literature review suggests two important problems that require rigorous treatments before

conducting any analysis about the effectiveness or transmission of monetary policy in emerging economies. The first problem is the ambiguity about the representative power of money supply, interest rates, or monetary condition index as a measure of monetary policy in emerging economies. The second problem involves the approximation of the process of decision-making of monetary authorities. This requires serious consideration of the unique characteristics of emerging economies such as the "fear-of-floating", foreign exchange intervention, and the asymmetric preferences of policymakers. The thesis addresses the two problems in the context of inflation-targeting emerging economies.

With respect to the indicator problem, it tests the following emerging hypotheses:

- Hypothesis 1: Interest rates and money supply contain comparable information about changes in monetary policy.
- Hypothesis 2: Monetary condition index is a useful indicator of monetary policy in emerging economies.

With respect to the identification problem, it tests the following hypotheses:

- Hypothesis 3: Exchange rates have a significant influence on monetary policy in emerging economies.
- Hypothesis 4: Foreign reserves have a significant influence on monetary policy in emerging economies.
- Hypothesis 5: Monetary authorities in emerging economies asymmetrically responds to positive and negative inflation and output gap.

2 Methodology

2.1 Measuring monetary policy

Indicator and identification problem involves two primary aspects of monetary policy conduct. While indicator problem refers to the choice of a measure of monetary policy, identification problem refers to determining a function that can approximate the behaviour of the central bank. To put it differently, to solve the indicator problem, we need to identify a numeric

variable that can provide information about changes in the stance of monetary policy. Therefore, this thesis compares the performance of various indicators of monetary policy through the analysis of Granger causality, impulse response function, and forecast error variance decomposition (FEVD). Such an analysis indicates the strength of the linkage between indicators and the objective of monetary policy, which is in line with Atkeson et al. (2007).

To begin with, a scalar variable is an appropriate indicator of monetary policy if it causes changes in the objective of monetary policy. Granger causality test can be considered as a selection device to determine the causality between variables (Handa, 2009). In this thesis, since the sample consists countries that adopt inflation targeting, the Granger causality analysis between monetary policy indicators and inflation is of importance to capture the significance of these indicators as an overall measure of monetary policy.

Furthermore, a measure of monetary policy is more appropriate if it causes inflation to change according to the monetary theory and explains a greater proportion

of inflation variation. In this respect, the absence of the price puzzle (a phenomenon in which inflation shows an increase rather than a decrease after a contraction in monetary policy) provides critical evidence for the effectiveness of a variable as an indicator of monetary policy. In addition, FEVD can indicate whether a monetary policy indicator is a driver of changes in inflation.

2.2 Identifying the function of monetary policy

With respect to the identification problem, it is of importance to characterise and simplify the complexity in the reaction of monetary authorities to changes in economic activities. The interest rate rule developed by Taylor (1993) provides a simple framework to analyse the behaviour of monetary authorities. Accordingly, the Taylor rule assumes that a simple function of interest rates in term of inflation and output gap can capture the majority of information about monetary policy changes. However, monetary authorities in emerging economies show the fear of floating. Therefore, a proper augmented Taylor rule can provide a better approximation of the reaction function of monetary policy for emerging

economies (Yilmazkuday, 2008; Shrestha and Semmler, 2015; Peters, 2016; Caporale et al., 2018).

Following the existing literature, we make crucial modifications to the Taylor rule to shed light on the decision-making process of monetary authorities in emerging economies that follow inflation targeting. Firstly, following previous studies, we identify the role of exchange rates and foreign reserves by estimating their coefficients in the augmented Taylor rule. Secondly, the thesis investigates potential asymmetries in the Taylor rule that stem from either an asymmetric preference or a nonlinear Phillips curve. Following Dolado et al. (2005), we examine the effect of a nonlinear Phillips curve by interpreting the estimated interaction coefficient between expected inflation and output gap. On the other hand, we apply the methodology developed by Caglayan et al. (2016) to investigate the effect of an asymmetric preference on the interest rate setting. Accordingly, the preference to avoid inflation or recession can be investigated by observing the significance and sign of the conditional volatility of inflation and output.

3 Results

3.1 Measuring monetary policy by money supply and interest rates

The results of Granger causality test show that there is a bidirectional causality between interest rates and inflation in many countries. However, Granger causality from interest rates to inflation is statistically significant in many economies excepting Chile, Colombia, Romania, Korea, and Thailand. The reverse Granger causality is statistically significant in ten out of twelve countries. For M1, it has a bidirectional causality with inflation in most countries. While it does not Granger cause inflation in Thailand, the reverse Granger causality does not hold for Romania, Turkey, and the Philippines. For M2, it does not cause inflation in South Africa and Korea. On the contrary, inflation is useful to forecast changes in M2 in most countries excepting Poland, Turkey, and South Africa.

Moreover, the impulse response analysis shows that interest rates weakly affect inflation in emerging economies. Such a finding is in line with previous studies

(Acosta-Ormaechea and Coble, 2011) that monetary policy weakly transmits through the traditional interest rate channel. A low degree of monetization, underdeveloped financial markets, and capital controls are factors that can lower the effectiveness of the interest rate policy in emerging economies.

Furthermore, a positive shock of interest rates have positive effect on inflation in most countries, which has been termed as price puzzle (Sims, 1992). For Poland and Thailand, interest rates negatively affect inflation in few months, which is consistent with findings for advanced economies and most theoretical models. The presence of price puzzle in most emerging economies has several possible implications. Firstly, interest rates are weak in representing the stance of monetary policy in emerging economies. To put it differently, a rise in interest rates cannot fully measure the restrictiveness of monetary policy in emerging economies. Other variables such as monetary aggregates can play a role in measuring the stance of monetary policy. Furthermore, the segmentation of credit markets can also reduce the representation of interest rates as an indicator of monetary

policy. In summary, for emerging economies, the stance of monetary policy may require information from other indicators such as monetary aggregates.

Secondly, the small-scaled nature of the VAR model may lead to the exclusion of important information for inflation forecast (Sims, 1992; Bernanke and Mihov, 1998). Therefore, a remedy to solve the price puzzle is to add variables such as commodity or oil prices (Sims, 1992; Bernanke and Mihov, 1998). However, the robustness tests do not support the speculation that the price puzzle is conditional on misspecification errors.

Thirdly, the price puzzle can result from the influence of monetary policy on the supply side of the economy (Barth and Ramey, 2001). Changes in interest rates can affect borrowing costs and thus lead to changes in prices. If the effect of monetary policy on production costs dominates the effect on aggregate demand, prices are likely to increase rather than decrease following a monetary policy contraction. Fourthly, information asymmetry can also lead to price puzzle. Monetary authorities have more information about price movement than the private sector. When monetary authorities expect

an increase in the price level, they will increase interest ratess. However, imperfect information may cause monetary policy responses to be insufficient or too late to control inflation. As a result, raising interest rates will increase rather than decrease inflation (Walsh, 2010). Furthermore, high inflation expectation can lead to weak response of inflation to a monetary policy restriction and lengthen disinflation period (Mackiewicz-Łyziak, 2016).

Turning to M1 and M2, inflation positively reacts to positive shocks of M1 and M2 in most emerging economies. Such a positive effect shows a quick reduction and becomes neutral in the medium term. The finding is in line with the traditional conceptualization. However, it should be noted that the results are quite different for Romania and Korea, whereby M1 has a negative effect on inflation. M2 has a quite similar pattern of impulse response function. Lastly, the effect of monetary aggregates on inflation is statistically insignificant in most emerging economies. This finding suggests that changes in money supply can contain information about changes in monetary policy, but this role seems to be weak.

However, this finding does not mean that quantitative easing policy, characterized by large changes in the volume of money supply, has no effect on the course of the economy. Since quantitative easing is used in typical situations, especially when interest rates are near zero. Therefore, event-study is more appropriate to investigate the effectiveness of quantitative easing. Furthermore, such studies are out of scope of the thesis.

Turning to FEVD results, they show that interest rates explain a greater part of the variation of inflation than the money supply does in few countries (Brazil or Hungary). In many countries, M1 and M2 explain more about the variation of inflation than interest rates. In Brazil, Colombia, Korea, Philippines, and Poland, interest rates and M2 have similar explanatory power on inflation variation. Overall, money supply has a stronger power in explaining inflation variation than interest rates.

In summary, the response of inflation to both monetary aggregates and interest rates suggests some implications. One, misspecification causes difficulties in distinguishing the endogenous and exogenous component

of monetary policy changes. However, the robustness tests show that this is less likely to happen. Two, neither interest rates nor money supply can fully capture the stance of monetary policy. The results of causality, impulse response function, and FEVD are supportive of the speculation that monetary policy is not fully captured by using a single indicator.

3.2 Measuring monetary policy by MCI

We further investigate the significance of MCI as an indicator of monetary policy in inflation-targeting emerging economies by observing the response of inflation to exogenous shocks of MCI. The empirical results show that inflation negatively respond to MCI shocks in most emerging economies. To begin with, inflation shows an immediate reduction following a monetary policy contraction (a positive MCI shock) in Chile and Colombia. In other emerging economies, the negative response of inflation is visible in the very short run, from the one-month ahead. In Philippines, inflation shows a negative response to MCI shocks but such a response is not statistically significant.

The finding has some implications. The absence of the price puzzle when using MCI as a measure of monetary policy in most emerging economies provides supportive evidence for the argument that a composite measure can better reflect the stance of monetary policy than any single indicator does in inflation-targeting emerging economies.

Furthermore, the stabilizing effect of MCI on inflation is in line with Berument (2007). However, it should be noted that the spread constructed by Berument (2007) implies that that interest rates and exchange rates are equally important. In this thesis, the weight of exchange rates is smaller in size. Therefore, exchange rates may show a reduction in its importance during the post-crisis period.

3.3 Identifying the function of monetary policy

The empirical results provided evidence for the matter of exchange rates in the reaction function of monetary policy in emerging economies that are inflation targeting adopters. Particularly, the fear of floating emerges in most emerging economies and it is more pronounced during the post-crisis period. Furthermore,

there is strong evidence for the fear of appreciation, especially against the main currencies of international transactions such as the US dollar or the euro. Finally, the measurement sensitivity analysis suggests that the fear of floating or appreciation strongly emerges with the monthly movement of the exchange rates.

The thesis used the GMM model to examine how foreign exchange interventions affect the setting of interest rates in emerging economies that follow inflation targeting. The analysis started with the linear response of monetary policy to foreign reserves. Then, it proceeded by investigating the asymmetric effect of foreign exchange interventions. The thesis found that foreign exchange interventions differently affect the setting of interest rates in inflation-targeting emerging economies. The impact is negative in Mexico, Philippines, and Thailand; positive in Colombia, Poland, Turkey, Korea, and South Africa; and insignificant in other countries. Furthermore, sales and purchase interventions asymmetrically affect the movement of interest rates. Purchase intervention effect is pronounced in Colombia, Hungary, Philippines, Thailand,

and South Africa whereas sales intervention effect is pronounced in other countries.

Finally, we searched for asymmetries in the reaction function of monetary policy in twelve emerging economies targeting price stability. Unlike previous studies, we simultaneously investigated the effect of two drivers: nonlinear Phillips curve and asymmetric preference. The empirical results suggested that both have important implications for the setting of interest rates in emerging economies. In general, monetary policy response to inflation is stronger in recessions than in expansions. Furthermore, recession avoidance is strong and consistent in emerging economies whereas inflation avoidance varies between economies.

In detail, monetary authorities in emerging economies show a greater aversion to deflation pressure caused by a reduction in the output gap. Secondly, the asymmetric preference evidence is mixed. In Brazil, Colombia, Hungary, Philippines, and South Africa, monetary authorities aggressively reduce inflation when it is above the target. On the other hand, in Chile, Romania, Korea, and Thailand, policymakers are reluctant to keep

low inflation because it can destabilize the economy. With respect to output preference, recession avoidance is strong in most emerging economies. In Poland, expansion avoidance preference is dominant.

Both output and inflation preference are consistent with the counter-procyclical properties of monetary policy. On one hand, recession avoidance is in line with the high concern of emerging economies about economic growth, which can reduce the gap between them and advanced economies. On the other hand, the existence of inflation avoidance and strong reaction to inflation caused by negative output gaps imply that monetary authorities are reluctant to maintain a low inflation rate and prefer to have a moderate and stable inflation rate. To put it differently, monetary authorities may care about the pace of economic growth. Therefore, if the economy grows rapidly (slowly), inflation can be too high (low), monetary policy should be tightening (easing) to reduce (increase) economic growth and inflation.

4 Conclusions and implications

4.1 Conclusions

The empirical results show critical findings. Firstly, the hypothesis 1 cannot be rejected. This means that money supply contains a significant information about changes in monetary policy in emerging economies that follow inflation targeting. Although interest rates contain significant information about the stance of monetary policy, its role seems to be weaker than that in advanced economies. The price puzzle still happens after a contraction shock caused by interest rates. The misspecification and weak representation of interest rates are primary justifications for this phenomenon. A range of robustness tests indicate the second factor is likely to be the main driver.

Secondly, monetary condition index, which is a weighted average of changes in interest rates and exchange rates relative to a benchmark level, makes a critical contribution to the conduct of monetary policy in emerging economies that follow inflation targeting. The empirical results show that inflation negatively responds

to a contraction shock of MCI. Such an impulse response function is of expected and consistent with monetary theories. Therefore, monetary condition index can be considered as a useful indicator of monetary policy.

Thirdly, exchange rates play a critical role in the process of decision making of monetary policy in inflation-targeting emerging economies. To begin with, monthly changes in exchange rates matter more in the Taylor rule than yearly changes, which suggests a close look of monetary authorities on the evolution of the exchange rate market in the last month. Moreover, interest rates show an asymmetric response to changes in the exchange rates. During the post-crisis period, the effect of exchange rates is more pronounced, which is consistent with changes in the exchange rate policy in many countries such as Hungary or Poland. Furthermore, there is strong evidence for the fear of appreciation.

Fourthly, the exchange rate intervention matters and a Taylor rule augmented by changes in foreign reserves can better approximate the behaviour of monetary authorities in inflation-targeting emerging economies. However, it should be noted that the direction

of interest rate changes is different among countries. Interest rates show a negative response in Mexico, Philippines, and Thailand; positive response in Colombia, Poland, Turkey, Korea, and South Africa. Insignificant response is visible for other countries. Furthermore, the effect of sales and purchase interventions are asymmetric.

Finally, monetary authorities show a departure from the symmetric reaction to output and inflation, suggesting that their behaviour should be captured by an asymmetric Taylor rule. The empirical results show that there is a great aversion to deflation pressure caused by a contraction in output. Such a finding is in line with the fact that the Phillips curve is concave in most of emerging economies. Furthermore, there is evidence for the nonlinearity caused by the asymmetric preference of monetary authorities to changes in output and inflation. While inflation avoidance is pronounced in Brazil, Colombia, Hungary, Philippines, and South Africa, deflation avoidance is pronounced in other emerging economies. With respect to output preference, recession avoidance is supportive in most emerging economies.

4.2 Recommendations

The empirical results suggest critical implications for the implementation of monetary policy. Firstly, regarding the hypothesis 1, the existence of price puzzle and other empirical results such as Granger causality, impulse response function, and forecast error variance decomposition suggest that interest rates capture a proportion of the information about monetary policy changes and money supply contains significant information about the latter. The price puzzle problem provides important implications about the interest rate policy. One, interest rates contain part of information about the stance of monetary policy and a composite measure of monetary policy can be a better measure of monetary policy. Two, the interest rate policy has limited impact on inflation. There are several reasons for the low effectiveness of the interest rate policy. The use of multiple instruments reduces the role of interest rates in driving the evolution of inflation in emerging economies that follow inflation targeting. In other words, a significant part of information about changes in monetary policy comes from other instruments beyond interest rates

such as money reserves or exchange rates. Other reason may come from the effect of monetary policy on the supply side of the economy. According to Barth and Ramey (2001), an increase in interest rates can lead to a rise in borrowing costs, which can affect the production cost as well as the spending of the consumers. If the contraction effect on production is greater than that on aggregate demand, there will be an increase in the price and inflation. Hence, the presence of the cost channel is a driver of price puzzle. Furthermore, another reason is the existence of asymmetry information. An increase in inflation following a rise in interest rates can occur because monetary authorities do not have sufficient information and they cannot make policy decisions in time.

Therefore, to increase the effectiveness of the interest rate policy, it requires several reforms. To begin with, it is of importance to restrict the use of other instruments beyond interest rates and increasing the focus on the price stability. However, in practice, the government has a significant impact on the conduct of monetary policy in inflation-targeting emerging

economies. Political pressures are typically high during times of recessions, which can foster career-concerned monetary authorities to focus more on economic growth rather than price stability. Economic growth, competitiveness, the protection of infant industries, and many other factors stimulate monetary authorities to maintain a stable exchange rate and accumulate the stock of foreign reserves. Therefore, increasing the effectiveness of the interest rate policy is conditional on a higher level of the central bank independence, which allows the central bank a higher degree of freedom in determining the tools and objective of monetary policy. Such a reform can be coped with the political conflict between the government and monetary authorities. Furthermore, a high central bank independence should accompany with the high accountability, transparency, and efficient public communication (Christoffersen et al., 2001). Therefore, an improvement in the central bank independence requires a lengthy period.

Moreover, accelerating the speed of finance development can contribute to increase the effectiveness of the interest rate channel. For instance, a greater stock

of financial instruments provides more rooms for monetary authorities to cope with the uncertainty in emerging economies because financial instruments vary in nature and they can be effective in different situations. Therefore, whenever monetary authorities alter policy interest rates, it is highly likely that other types of interest rate changes, which then affect investing and consuming. Furthermore, finance development that is characterized by increased indirect finance (Duggal, 1995) can contribute to reduce the problem of information asymmetry through the third-party verification (Sheng et al., 2021). This allows investors to reduce risks and actively react to changes in the interest rate policy.

Turning to the hypothesis 2, monetary condition index is a useful indicator of monetary policy because there is an absence of the price puzzle following a contraction of monetary policy (a positive shock of interest rates). However, it should be cautious for both policymakers and market participants when using the monetary condition index as an operational target because there are difficulties in monitoring changes in the index components and their weights. It should be noted that the

weight of interest rates and exchange rates remains constant in the thesis. Such a time-invariant characteristic is a limitation of the thesis and need further studies that relax this constrain. In comparison with interest rates, monetary condition index has a lower level of observability by the public. For this reason, monetary condition index shows a disadvantage to interest rates.

Regarding the hypothesis 3, the empirical results provide some crucial implications. The empirical evidence suggests that a Taylor rule augmented by the product of the exchange rates and crisis dummy or the square of exchange rates can better capture the behaviour of monetary authorities in inflation-targeting emerging economies. Furthermore, the empirical results indicate the measurement sensitivity, whereby the role of exchange rates is more pronounced with respect to monthly changes of the bilateral exchange rates (domestic currency in term of the euro for European countries or US dollar for other countries). Such a finding implies the presence of the fear of floating, which may stem from the small and open nature of emerging economies, their concern about the competitive advantage in the global market, and the care

about the development of infant industries. Given the status of the development of emerging economies, there are many obstacles to eliminate or mitigate the fear of floating.

The fear of appreciation is also consistent with the accumulation of foreign reserves in emerging economies. Furthermore, the statistical significance of the monthly coefficient of exchange rate changes implies a high frequency in changing monetary policy, especially during the period of global turbulence.

To reduce the exchange rate effect, it needs combined actions in many areas. It needs to reduce the dependence on low-valued products (agriculture or commodities) and increase the production of high-value products (high technology). It also requires the maturity of new and infant industries, which consumes a great amount of time. Changes in the competitive advantage of the country is of importance for emerging economies that follow inflation targeting.

Regarding the hypothesis 4, the empirical results show that foreign reserves matter for the conduct of monetary policy in emerging economies that follow

inflation targeting. Market participants should consider the effect of the intervention when analysing the stance of monetary policy because changes in foreign reserves are useful in predicting the future course of monetary policy. However, it should be noted that the significance of foreign reserves can cause misleading information about the priority of monetary policy, which can cause a reduction in the credibility of the central bank. To avoid these problems, monetary authorities should increase the transparency in the conduct of foreign exchange interventions and foster finance development.

Regarding the empirical results for the hypothesis 5, the asymmetries of the Taylor rule implies that the Phillips curve is nonlinear and monetary authorities show an asymmetric preference. Such asymmetries cause difficulties for both market participants and policymakers in analysing the behaviour of the central bank in emerging economies that follow inflation targeting. For this reason, clear and understandable communication is of importance to improve the observability and performance of the conduct of monetary policy. Furthermore, accounting for

these nonlinearities can improve the forecast of the interest rate movement.

4.3 Limitations

It should be noted that the thesis focuses on the period from January 2000 to June 2018. Data availability is the main reason that prevents the inclusion of the data of recent years. The period after 2019 is characterized by the introduction and spread of Coronavirus disease over the world, which can refer to as the post-covid era. Therefore, it is not clear about the impact of the covid pandemic on the conduct of monetary policy in inflation-targeting emerging economies. Consequently, both monetary authorities and market participants should be cautious when applying the findings in the thesis. Furthermore, the ignorance is a limitation of the thesis and needs further studies in the future. It is recommended that future studies should investigate the effect of the covid pandemic on the conduct of monetary policy in inflation-targeting emerging economies.

Another shortcoming is the possibility of structural breaks in the last two decades. Over the last two

decades, there are changes in institutions in emerging economies that follow inflation targeting. Firstly, the adoption of inflation targeting leads to radical changes in the framework of monetary policy. Price stability becomes the key target whereas interest rates become the primary instrument. Secondly, the Great recession also puts pressures on the implementation of monetary policy in many countries. For instance, the introduction of quantitative easing may affect the effectiveness of the interest rate channel. Finally, the outbreak of Coronavirus disease in 2019 and its spread lead to sudden changes in the global economy like mobility disruptions or market demand. Obviously, the thesis accounted for these possible breaks to a limited degree. It extended the baseline study by adding a time dummy into the baseline as well as ARDL models, which can control for the effect of the structural break. However, it remains ambiguous about the possible effect of structural breaks on the indicator and identification problem of monetary policy analysis. Therefore, it is of importance to have a more rigorous study about these problems.

Another drawback is the ignorance of the time-varying characteristic of variables of interest. To begin with, the most common speculation is that the role of interest rates was increasing whereas that of money supply or exchange rates was declining after the adoption of inflation targeting in emerging economies. Finance development made a great contribution to this trend. The introduction and development of stock market, the banking restructuring and market liberalization are factors that lead to changes in the effectiveness of the interest rate policy. Second, exchange rates may show a variation in its importance over time. In some occasions, policymakers should closely monitor the movement of exchange rates, especially in times of financial turmoil. In most of the time, exchange rates can freely move in a specific range. Finally, the asymmetries may change over time. This stems from many factors such as the arrival of a new policy committee, economic crises, or government changes. Therefore, it is of importance to have a rigorous study about time-varying characteristic in both indicator and identification problem.

Furthermore, some disparities appear with the estimate of the asymmetry of foreign exchange intervention effect by ARDL and baseline models. This implies that it is unable to extract purchase and sales intervention from foreign reserves because they are a narrative measure of foreign exchange intervention (Blanchard and Adler, 2015). Therefore, future studies should use a better measure of foreign exchange intervention. A recommendation is event studies, which involve the definition of which events refer to the purchase or sales of foreign reserves. However, such a method requires a huge amount of information and a high degree of transparency in the implementation of monetary policy in emerging economies.

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6 Publication list

6.1 Peer reviewed journal

Bui Thanh Trung: The role of the exchange rate in the conduct of monetary policy in emerging economies. Hungarian Statistical Review 5 : 2. (2022)

Bui Thanh Trung: Measuring monetary policy in emerging economy the role of monetary condition index. Ekonomický Časopis/Journal of Economics 70 : 6. (2022)

Bui Trung Thanh, Kiss Gábor Dávid: Asymmetry in the Reaction Function of Monetary Policy in Emerging Economies. Pénzügyi Szemle/Public Finance Quarterly 65 : 2 pp. 210-224. , 15 p. (2020).

Bui Trung Thanh, Gábor Kiss Dávid: Measuring monetary policy by money supply and interest rate: evidence from emerging economies. Review Of Economic Perspectives/ Národohospodársky Obzor: The Journal Of Masaryk University 21 : 3 pp. 347-367. , 21 p. (2021).

6.2 Conference proceedings

Bui Thanh Trung, Gabor David Kiss: The performance of the Taylor rule in emerging economies. In: FEB Zagreb 10th International Odyssey Conference on Economics and Business Faculty of Economics & Business University of Zagreb, (2019) pp. 373-384. , 12 p.

Bui Thanh Trung: The Role of Exchange Rate in The Conduct of Monetary Policy: The Case of Emerging Economies. In: International Conference on Business and Finance 2019. Ho Chi Minh City, Vietnam : UEH Publishing House, (2019) pp. 235-252. , 18 p.

Bui Thanh Trung: Measures of Monetary Policy in Latin America In: 2nd International Conference on Finance, Economics, Management and IT Business Setúbal, Portugal : SCITEPRESS, (2020) pp. 27-36. , 10 p.

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Bui Thanh Trung: Measuring monetary policy in emerging economies: the role of monetary condition index
In: Udvari, Beáta (eds.) Proceedings of the European Union's Contention in the Reshaping Global Economy Szeged, Hungary : University of Szeged, Doctoral School of Economics (2020) pp. 80-93. , 14 p.

6.3 Papers under review

Bui Thanh Trung: Foreign exchange interventions and monetary policy: evidence from emerging economies. Review of Economic Perspectives (revision)