Measures of Monetary Policy in Latin America

Trung Thanh Bui
Falcuty of Economics and Business Administration,
University of Szeged, Szeged, Hungary

Keywords: Monetary Policy, Instruments, Interest Rate, Money Supply, Latin America.

Abstract: Although the instrumentation of monetary policy is still constantly debated in the existing literature, there is a paucity of studies investigating this problem in emerging economies, especially after the recent global financial crisis. The objective of the paper is to investigate the role of interest rate and money supply as an overall measure of monetary policy in four major Latin America economies that follow the inflation targeting framework. Evidence from causality test and the analysis of impulse response function shows that both indicators have explanation for price movement. The price puzzle is clearly visible follows positive shocks to interest rate. These findings suggest that a composite index can be a better measure of monetary policy and other means should be conducted to improve the performance of the interest rate policy.

1 INTRODUCTION

The choice of an appropriate measure of monetary policy is of importance in the analysis of monetary policy (Bernanke–Mihov 1998). There are two main reasons (Romer–Romer 2004). Firstly, it alleviates the effect of the endogenous interaction between changes in monetary policy and changes in the state of the economy, thereby alleviating the problem of underestimating the effect of monetary policy on output and prices. Secondly, a representative monetary policy indicator also helps to reveal the true interaction between monetary policy and macroeconomic outcomes.

Most of studies on monetary policy in emerging economies have based on the prior that monetary policy is properly measured by a single indicator such as interest rate. See, for instance, Cermeño et al. (2012) for Mexico; Furlani et al. (2010), Sánchez-Fung (2011), Jawadi et al. (2014) for Brazil; or De Mello–Moccero (2011) for 4 Latin America countries. However, the practical conduct of monetary policy in emerging economies raises doubts on the effectiveness of interest rate as the sole measure of monetary policy, especially during the post-crisis period. Although Latin America countries have decided on interest rates as an official operational target since the adoption of inflation-targeting framework in the 1990s, they also depend on other instruments to affect reserve money such as reserve requirements, discount windows, and exchange rate interventions. Such a multiple instrument framework can stem from the insufficient knowledge about the structure of the economy or the distortion effect of objectives other than price stability. For instance, the Central Bank of Brazil simultaneously pursued several targets after crisis, including inflation-targeting, flexible exchange rate, and macroprudential regulations (Jawadi et al. 2014). Apart from price stability, Bank of Mexico also implicitly aimed at objectives such as output stability (Cermeño et al. 2012).

Furthermore, previous studies are limited to the pre-crisis period and, to the best knowledge of the author, there is no studies investigating the relative performance of interest rate and monetary aggregate as an overall measure of monetary policy in Latin America. Therefore, the performance of the two indicators remain ambiguous in the last decade. Since the choice of an appropriate monetary policy indicator is the first step to analyse further issues of monetary policy such as effectiveness, monetary policy rules, or transmission channels, it is of importance to have a rigorous study on the effectiveness of various instruments.

This paper sheds light on some crucial issues related to indicator problem of the monetary policy analysis in four emerging economies in Latin America, including Brazil, Chile, Colombia, and Mexico. What is the superior indicator in Latin

Bui, T.
Measures of Monetary Policy in Latin America.
DOI: 10.5220/0009343600270036
In *Proceedings of the 2nd International Conference on Finance, Economics, Management and IT Business (FEMIB 2020)*, pages 27-36
ISBN: 978-989-758-422-0

America? Is the usefulness of monetary policy indicators different after the global financial crisis? What is the role of monetary aggregates in the conduct of monetary policy? The investigation of these questions provides evidence about the role of various monetary policy indicators in emerging economies that follow inflation targeting framework. Furthermore, understanding the instrumentation over different time horizons contributes to the effective implementation of monetary policy.

To compares the significance of money supply and interest rate as an overall measure of monetary policy on two bases. First, the causality analysis is conducted to investigate the predictive power of changes in a monetary policy indicator on inflation. Such an analysis is of importance to examine the tightness between the indicator and inflation. Second, the analysis of the impulse response of inflation to a monetary policy indicator indicates the magnitude of the effect of monetary policy on inflation. The preferred indicator of monetary policy should show the dominance in fulfilling the objective of price stability.

Turning to the key findings, the paper found that there is shifts in the causal effect of interest rate instrument in Latin America after crisis. In addition, evidence from impulse response function indicates that price puzzle is clearly visible after positive interest rate shocks. On the contrary, inflation response to monetary aggregates is more consistent with the prediction of monetary theories. The results of causality and impulse response analysis suggest that neither interest rates nor money supply sufficiently measures the stance of monetary policy in Latin America. Therefore, a composite measure can be a better measure of monetary policy. Other suggestions are related to the improvement of the compliance of the basic principle of inflation targeting such as increasing the independence of central banks or the performance of inflation forecast.

The rest of the paper is organized as follows. Section 2 provides theoretical background for the optimal choice of monetary policy indicators and empirical studies of instrument problems in emerging economies and Latin America in particular. Section 2 discusses how to investigate the relative significance of interest rate and money supply instrument. Section 4 presents and discusses empirical results. Section 5 is conclusions and policy implications.

2 LITERATURE REVIEW

2.1 Monetary Policy Indicator

The indicator problem of monetary policy refers to the controversy about the effectiveness of interest rate and money supply in signalling the stance of monetary policy. It arises because of incomplete knowledge about the structure of the economy as well as the existence of lagged effect of monetary policy on economic targets.

Poole (1970) analysed the optimality of interest rate and money supply based on a simple IS/LM framework. Two primary assumptions of the analysis are that monetary authorities have no errors in controlling interest rate or money supply and they must choose only one instrument to minimize the volatility of output. The conclusion is that money supply is preferred to deal with shocks from the real sector while interest rate is superior in dealing with shocks from monetary sector.

Following studies (Bhattacharya–Singh 2008, Singh–Subramanian 2008) reached a similar consensus. Likewise, Atkeson et al. (2007) argued that monetary policy instruments can be ranked in terms of tightness or transparency. They define tightness as the strength of the linkage between monetary policy instruments and target variables such as inflation or output growth and define transparency as the observability of instrument adjustments by the public. Based on these criteria, they rank interest rates as the best instrument because it has natural advantages over exchange rate instrument and money supply instrument in term of tightness and transparency. Exchange rate is less preferred instruments and money supply is at the bottom.

However, the consensus under Poole (1970) framework may fall if real/ monetary shocks are serially related or monetary authorities have imperfect knowledge about the economy (Howells–Bain 2003). The serial correlation is likely to happen because monetary authorities concern about smoothing the path of interest rate/money supply. The violation also happens when there is lag in the system or changes in the slope of IS and LM curve. Moreover, Poole (1970) derives the consensus from an ad hoc macroeconomic models, whereby the derivation of aggregate demand and aggregate supply does not base on consistent assumptions about the behaviour of consumers and firms.

In the context of emerging economies, Poole (1970) analysis has three primary limitations. First, monetary authorities in emerging economies cannot control monetary policy instruments as well as

counterparts in advanced economies. The low performance is caused by the underdevelopment of the financial system or the low expertise of policymakers. Therefore, errors in controlling instruments can be large and the conclusion about the superiority of interest rate and money supply is not clear-cut as the simple analysis of Poole (1970). Second, output stabilization may not be the exclusive objective of monetary policy, especially for central banks that follows inflation targeting framework. The focus can be the deviation of inflation from the target or any weighted combination of output stabilization and price stability. Therefore, the robustness of Poole (1970) consensus is open to question for cases that central banks have preference to other macroeconomic outcome beyond output stabilization. Final, monetary authorities in emerging economies can choose both instruments rather than one. One reason is that they are unsure about the source of uncertainty. It is difficult to conclude whether changes in the economy is from the real sector or the monetary sector. It is highly likely that both monetary shocks and real shocks have an effect on the economy. Furthermore, in practice, the money supply and interest rate are not necessarily competing but they can be complementary. For instance, reserve instrument can support interest rate instrument when the level of financial friction is high (Sensarma–Bhattacharyya 2016). Recently, central banks in emerging economies have an additional task of securing financial stability; therefore, they opt to use reserve requirement instrument (Glocker–Towbin 2012).

Furthermore, several studies show that the use of interest rate instrument does not always follow Poole (1970) criteria. Higher output volatility when targeting interest rates allows individuals and firms more room to optimize the utility. In some cases, interest rate can be employed because of political pressure coped by monetary authorities (Cover–VanHoose 2000). Particularly, monetary authorities can lose credibility because of political pressure if there is high degree of error in the control of reserve instrument. This implies that interest rate instrument can be employed even though it is suboptimal.

Small open economies also face more challenges when deciding whether money supply or interest rate is optimal. With interest rate parity assumption, Gardner (1983) argued that monetary authorities in small open economies encounter the trade-off between money supply instrument and exchange rate instrument when exchange rates are not fixed. When the parity holds, it is equivalent in controlling interest rate and exchange rate, thereby these instruments are equivalent. In other words, monetary authorities have two instruments at their disposal, exchange rate/ interest rate and money supply. However, there is no general conclusion about the optimal choice based on an ad hoc loss function that minimize sum of squares of deviation of money supply and exchange rate from their targets. The optimal choice of instruments depends on the knowledge of the money demand and money supply as well as the relative weight put on the control of exchange rate. If monetary authorities have perfect knowledge about money demand, interest rate instrument is superior to reserve instrument. If they know money supply perfectly, reserve instrument is superior. However, when exchange rate movement is of great concern, interest rate instrument can be preferred even though monetary authorities completely know the process of money supply. Under New Keynesian framework, Singh–Subramanian (2008) examined the superiority of money supply instrument and interest rate instrument under different types of shocks. Based on welfare yardstick, they found that targeting money supply is preferred to deal with demand (fiscal) shock whereas interest rate is best to respond to supply (productivity) shock or monetary (velocity) shock.

2.2 Empirical Choice of Monetary Policy Indicator in Emerging Economies

Empirical studies use both quantity-based indicators such as monetary aggregates and price-based indicators such as short-term interest rates to measure monetary policy. Follow the seminal Sims (1972) work, many studies use VAR-based innovations to the growth rate of monetary aggregates as surprised changes in monetary policy. In the 1990s, however, many countries shifted to inflation-targeting monetary policy (Howells–Bain 2003, Peters 2016). The measure of monetary policy also changed, with the focus moving onto price-based indicators.

While there is no agreement on the optimal choice of monetary policy instrument, the prior that interest rates are an appropriate measure of monetary policy is popular for studies of emerging economies or Latin America. Among many others, Furlani et al. (2010), Sánchez-Fung (2011), De Mello–Moccero (2011), Cermeño et al. (2012), Jawadi et al. (2014), (Aragón–de Medeiros 2015) are studies that employ interest rate as measure of monetary policy for investing the performance of Taylor rule in Latin America. However, the paucity of studies on indicator problem results in the ambiguity of the relative effectiveness

of monetary aggregates and interest rates in measuring monetary policy.

3 METHODOLOGY AND DATA

3.1 Methodology

This paper compares the performance of different indicators of monetary policy on two bases. First, the monetary policy indicator should be causally related to the objective of price stability. Second, the preferred indicator of monetary policy should show the dominance in fulfilling the objective of price stability.

3.1.1 Causality Analysis

An indicator is effective when its adjustments result in changes in targeted variables. Therefore, we can determine the usefulness of a monetary policy indicator by investigating its causal effect on target variables. According to Sun–Ma (2004), if the causality runs from instruments to prices/output, the instruments are effective for price/output stability. By contrast, if the causality runs from target variables to the instrument, the instrument is considered as endogenous. Since four Latin America countries in the sample follow inflation-targeting framework, the focus of the analysis is on how a monetary policy indicator leads to inflation.

Granger (1969) causality test is a pioneering method for examining the causality between variables. Its VAR representation is:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \ldots + \beta_p Y_{t-p} + \varepsilon_t \quad (1)$$

Where Y_t is a vector of k endogenous variables and ε_t is white noise. Since this paper investigates the causality between monetary policy indicators and inflation, Y_t consists of inflation and a monetary policy indicator.

The standard VAR copes with the stationarity and cointegration condition. However, if variables are integrated or cointegrated, it leads to the violation of the standard distribution of the Wald test in VAR model (Toda–Yamamoto 1995). To overcome this issue, Toda–Yamamoto (1995) suggested adding the maximum integration order d into the selected lag of the standard VAR p, then estimating the VAR system with the surplus lag $p+d$, and finally conducting Granger test up to standard lag p. The additional lag d ensures that the Wald test of VAR coefficients is asymptotic. The surplus lag VAR is:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \ldots + \beta_{p+d} Y_{t-p-d} + \varepsilon_t \quad (2)$$

This paper employs Toda–Yamamoto (1995) method to test the causal effect of monetary policy indicators on inflation in Latin America. One reason for such a choice is that variables under investigation are unlikely to be stationary at the same level for four Latin America. Another reason is to ensure the comparability of the results when simultaneously considering several countries.

3.1.2 Relationship Analysis

The literature suggests that interest rate and money supply can provide numeric information about the direction and size of changes in the monetary policy. To examine the impact of these measures on inflation, we use a VAR model of four endogenous variables as follows:

$$Y_t = [DLCPI\ DLY\ DLNEER\ DLM1/DLM2/R] \quad (3)$$

Monetary policy indicators in equation (3) include three variables: M1, and M2 and policy rate. Therefore, equation (3) is regressed three times, each time with one monetary indicator. Because of stationary condition, variables that enter the VAR model are first difference of their logarithm, excepting for interest rate. In particular, DLCPI, DLY, DLNEER, DLM1, DLM2 are the first difference of the logarithm of consumer price index, industrial production index, nominal effective exchange rate, M1, and M2 respectively. R is the policy rate.

The strength of the linkage between monetary policy indicators and inflation is analysed through impulse response function (IRF). IRFs indicate the direction and the magnitude of the effect of exogenous changes in monetary policy indicators on inflation.

It should be noted that the VAR model is recursive with the ordering specified in Equation (3). The given ordering implies that inflation, output, and exchange rate have a contemporaneous effect on a monetary policy indicator while current changes in the monetary policy indicator causes other variables to changes in the future. Such a recursive causal ordering requires minimum assumptions about the structure in the VAR model.

3.2 Data

The paper examines the performance of various monetary policy indicators in four Latin America countries: Brazil, Chile, Colombia, and Mexico. The study period starts at January 2002 for Brazil and January 2000 for other countries. The sample ends at June 2018 for all countries. We split the sample into two subsamples to examine the influence of crisis on the performance of monetary policy instruments. The selected break point is June 2008.

Monetary policy indictors include both monetary aggregates and interest rates. Monetary policy aggregates are narrow money supply (M1), broad money supply M2 (M2). Interest rate measure of monetary policy (R) is Selic rate for Brazil, monetary policy rate for Chile, central bank policy rate for Colombia, and 91 days TIIE rate for Mexico. The data is collected from website of corresponding central banks.

It should be noted that four Latin America countries adopted inflation targeting framework in the late 1990s. Currently, Brazil has the target inflation of 4.5% and 2% tolerance while other countries aim for the target of 3% with 1% tolerance. The performance of inflation stabilization is not quite good in the region. Inflation rate are volatile, especially at the begin of inflation targeting and after the global financial crisis. Compared to other countries, Brazil experienced a lengthy period of stable inflation. These facts raise doubts about the effectiveness of interest rate instrument in stabilizing inflation in these countries.

4 EMPIRICAL RESULTS

4.1 Causality

This section discusses the causal relationship between monetary policy indicators and inflation in Latin America. The analysis is of importance because it shows whether changes in a monetary policy indicator lead to changes in inflation. Moreover, it fills the weakness of correlation analysis in previous studies. We present the results of Toda–Yamamoto (1995) test since it accounts for the nonstationarity of variables. As shown in Table 1, variables are not integrated at the same level across countries. The majority is stationary at first difference (superscript a). Some variables are stationary at level (superscript b).

Table 1: ADF test for the stationarity of variables.

Variable	Brazil	Chile	Colombia	Mexico
LY	-7.49$^{*(b)}$	-12.11$^{*(b)}$	-11.82$^{*(b)}$	-8.56$^{*(b)}$
LCPI	-5.24$^{*(b)}$	-8.15$^{*(b)}$	-8.02$^{*(b)}$	-8.75$^{*(b)}$
LM1	-3.25$^{**(a)}$	-8.63$^{*(b)}$	-13.99$^{*(b)}$	-16.69$^{*(b)}$
LM2	-3.57$^{*(b)}$	-8.11$^{*(b)}$	-17.09$^{*(b)}$	-16.25$^{*(b)}$
R	-4.97$^{*(b)}$	-3.05$^{**(a)}$	-4.96$^{*(a)}$	-4.68$^{*(a)}$
LNEER	-7.92$^{*(b)}$	-3.11$^{**(a)}$	-9.16$^{*(b)}$	-9.21$^{*(b)}$

Source: Author's calculation

Notes: *, **, *** denote significance at 1%, 5%, 10%. $^{(a)}$: unit root test at level. $^{(b)}$: unit root test at first difference. Lag is selected by SBIC criterion.

Table 2: The causal effect of monetary policy indicators on price.

Before crisis	Brazil	Chile	Colombia	Mexico
R → LCPI	22.06**	3.26	20.67**	32.94*
LM1→ LCPI	38.31*	26.48**	50.43*	83.15*
LM2 → LCPI	130.76*	26.89*	85.72*	10.88
After crisis				
R → LCPI	11.06*	47.6***	12.85	57.5***
LM1→ LCPI	0.17	27.69**	43.86***	71.16***
LM2 → LCPI	6.04	1.48	33.15***	47.49***

Source: Author's estimation.

Notes: *, **, *** denote significance at 1%, 5%, 10%.

As shown in Table 2, there is a shift in the significance of the causality between monetary policy indicators and price after crisis. The occurrence of the global financial crisis leads to changes in the significance of the interest rate instrument in two countries, Chile and Colombia. While Colombia copes with the loss in the causal effect of policy rate on price, the reverse happens with Chile, whereby the causality becomes statistically significant. For other countries, changes in policy rate cause price to change. Turning to monetary aggregates, the causal effect of M1 on price is significant for Latin America economies (except for Brazil during the post-crisis period). Its significance does not alter during the post-crisis period in most countries. M2 has a significant causal effect on price in all countries excepting for Mexico before crisis. This causality is statistically significant for Colombia and Mexico after crisis.

In summary, the recent global financial crisis has a trivial effect on the causality between monetary policy indicators and monetary policy objectives. Overall, changes in both interest rate and money supply lead to changes in prices in four Latin America countries.

4.2 Impulse Response Analysis

We proceed by separately investigating the dynamic effect of monetary aggregates and interest rates on inflation (see Figure 1). Since policy rate and logarithm of other variables have different order of integration, we estimate recursive VAR as specified in equation (3) by using interest rate and first difference of other variables. Such a transform does not affect the interpretation of the empirical results. As shown in Figure 1, there are two panels corresponding to the pre-crisis and post-crisis period. Each panel indicates the response of inflation to interest rate, M1, and M2.

The results show that interest rate shocks have positive effect on inflation, indicating the presence of price puzzle, a phenomenon labelled by Sims (1992). This means that a restrictive monetary policy constructed by raising interest rate does not lead to a fall but a rise in inflation, which is counterintuitive. For Brazil, the price puzzle is pronounced and observable after the crisis while being muted before crisis. This pattern can be a result of deconstructing credibility of the Central Bank of Brazil (CBB). According to Aragón–de Medeiros (2015), CBB became less and less responsive to current and expected inflation and eventually violated the Taylor principle since the mid-2010. Cortes–Paiva (2017) also pointed out that CBB follows excessively loose monetary policy during the first administration of Rousseff president, from 2011 to 2014. Other reason might be the reluctance of CBB in fighting inflation (Moura–de Carvalho 2010).

Similar results emerge for Chile, Colombia and Mexico. It should be noted that the number of instruments in Colombia have increased over time, which is important for the attainment of multiple targets such as price stability, economic growth, financial stability, exchange rate stability, and adequacy of international reserve. As a result, interest rate is weak in representing monetary policy in Colombia. For Mexico, Bank of Mexico has more indirect influence on market interest rate before crisis. At the beginning of inflation targeting, it uses two instruments, Corto and minimum interest rate, to signal the stance of monetary policy. As noted by Garcia-Iglesias et al. (2013), overnight interbank is an official operational target in Mexico after 2004 and it only replaced Corto instrument after January 2008. Corto refers to the system of target balances that commercial banks must reserve at the central bank. The central bank can announce a negative balance target to signal a restrictive stance, which motivates banks to chase for funds and increase market interest rates. The existence of two instrument also indicates that changes in interest rates show a part of changes in the stance of monetary policy. After crisis, however, the price puzzle is not persistent, reflecting improvement in the performance of the interest rate instrument.

The existing literature also suggests some explanation for the existence of the price puzzle. First, a disadvantage of a VAR model is its small scale; therefore, it is likely that the VAR model fails to capture important information that monetary authorities use to forecast the movement of inflation in the future (Sims 1992). The existing literature (Sims 1992, Bernanke–Mihov 1998) suggests that the inclusion of additional variables such as commodity prices or asset prices can eliminate the problem of price puzzle. However, this remedy is not always effective, especially for the case of Latin America under investigation (see Section 4.3).

Second, price puzzle can emerge because of factors other than model misspecifications. First, price puzzle can be a result of the effect of monetary policy on the supply side of the economy. Interest rates can be considered as capital cost of productive production; thereby raising it leads to a rise in the cost of borrowing and this cost will pass on consumers. This implies a rise in the price level after an increase in interest rate. If this effect dominates the effect of demand reduction on prices, prices are higher rather lower. Such a mechanism is also termed as cost channel (Barth–Ramey 2001). Other reason is the influence of information asymmetry. It is likely that monetary authorities may have more information about price movement than the private sector and they will increase interest rates when expecting a rise in the price level. However, the absence of complete or perfect information leads to the fact that their responses are insufficient to or too late to curb inflation. Therefore, inflation increases rather than fall after a rise in interest rates (Walsh 2010). Furthermore, Latin America countries do not strictly follow inflation targeting**.** This means that their increase in interest rate is not larger than the increase in inflation. According to Moura–de Carvalho (2010), while Brazil and Mexico are more responsive to inflation expectation; Chile is less responsive; and Colombia is almost irresponsive. For Chile and

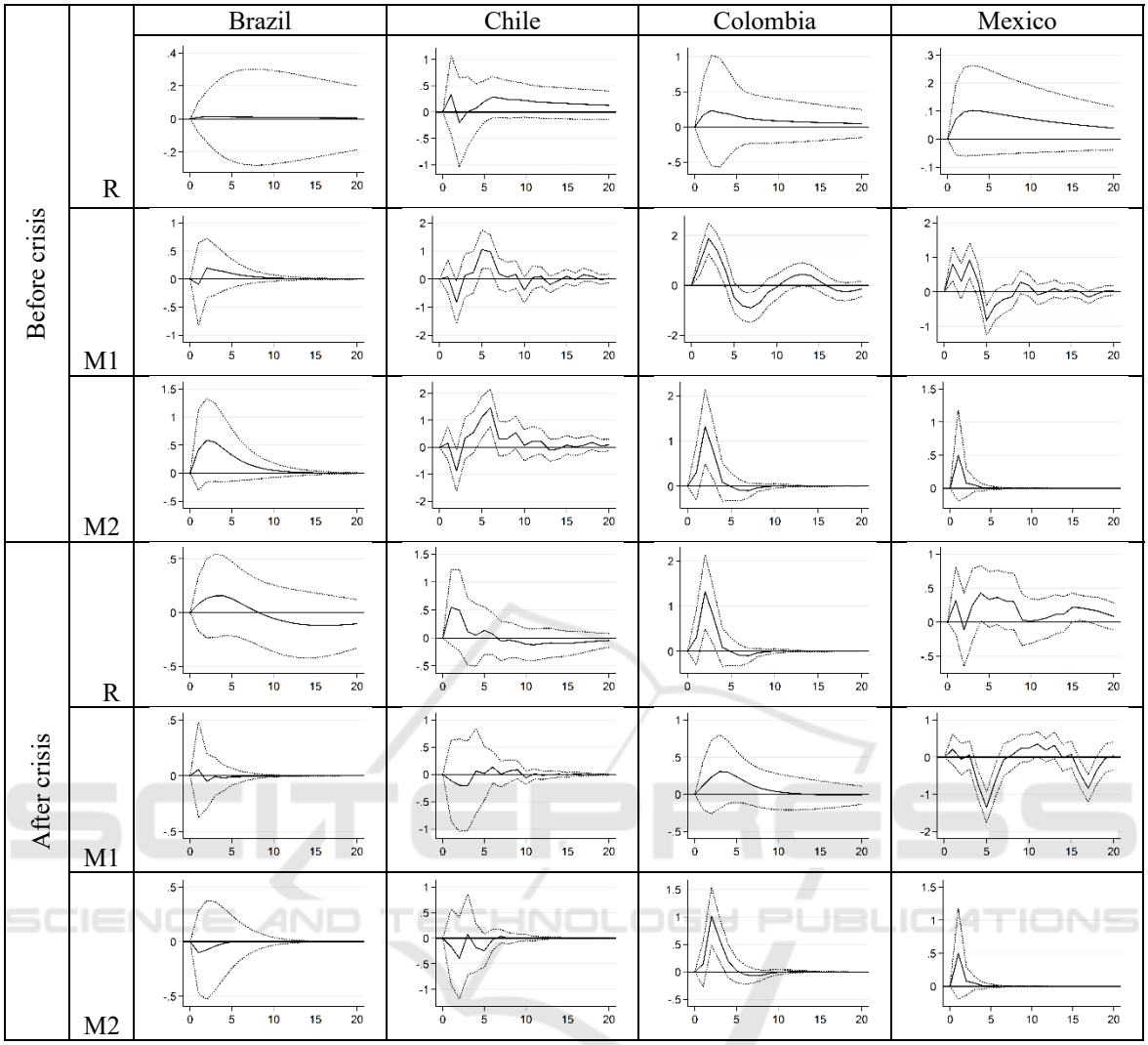

Figure 1: Inflation response to monetary policy indicators.

Colombia, the response of interest rate to inflation is less than one-for-one. The weak inflation response can also be a result of the high inflation expectation of economic agents, which prolongs the process of disinflation (Mackiewicz-Łyziak 2016).

Turning to monetary aggregates, Figure 1 shows that inflation positively reacts to shocks to money supply. This implies that a rise in money supply causes inflationary pressure on the economy. Such a response is of expected sign and is according to the monetary theory. However, the negative response of inflation to money supply shocks is found in Brazil and Chile, which is counterintuitive.

Overall, the empirical results show the ineffectiveness of monetary policy for price stability in Latin America when measuring monetary policy by a single indicator, either interest rates or monetary aggregates. The existing literature suggests two justifications for the insignificant effect of monetary policy on prices. Firstly, the incorrect identification leads to a dirty measure of exogenous shocks in the system, which is less likely to happen in the paper. Secondly, it is the choice of an inappropriate indicators of monetary policy. The analysis of causality and IRF provides evidence that the latter may be an applicable explanation.

4.3 Robustness Tests

The literature (see, for instance, Sims 1992, Bernanke–Mihov 1998) suggests that the presence of price puzzle can be a result of the failure to incorporate useful information for the forecast of inflation. Therefore, we conduct a robustness test of

the model (3) by augmenting shocks to commodity or oil prices. Since Latin America countries are small-open economies, the evolution of commodity or oil prices have impacts on domestic prices. However, these countries are not likely to affect the price of the world commodity or oil; therefore, shocks to these variables are considered as exogenous. This means that their shocks have contemporaneous effect on domestic economic activities and changes in a monetary policy indicator, but not the reserve. The results (not shown, available upon request), demonstrate that there is little difference in the impulse response. The price puzzle is still present, reflecting the positive effect of interest rate on inflation. The effect of monetary supply on inflation is positive, which is consistent with the prediction of the monetary theory.

Another robustness test involves changing the measure of inflation. Following Acosta-Ormaechea–Coble (2011), we replace inflation measure in the baseline model (equation 3) by the differential between domestic inflation and the US inflation. This approach is believed to isolate domestic inflation from the effect of external factors, thereby removing the presence of price puzzle. In this paper, we choose US inflation because Latin America countries use US dollar as an anchor currency. Other reason is that US is a large economy that can affect the price of Latin America economies, its small neighbours. We estimate how changes in a monetary policy indicator affect the inflation gap with and without considering the influence of commodity or oil prices. The results show that these changes do not solve the problem of price puzzle and provide no general consensus about the superiority of either policy rate or monetary aggregates.

In summary, the paper provides evidence in support of the argument that the price puzzle is a result of low representative power of interest rate other than model misspecification. To put it differently, neither interest rate nor monetary aggregate can summarize enough information about changes in monetary policy.

5 CONCLUSIONS

What should be the primary indicator of monetary policy: interest rate or some monetary aggregates? It is a controversial issue in the analysis of monetary policy and is limitedly investigated in emerging economies. This paper sheds light on the usefulness of interest rate and monetary aggregates as an overall measure of monetary policy in four emerging economies in Latin America. The results of causal analysis and impulse response function demonstrate that both policy rate and monetary aggregates explain the movement of inflation. Moreover, monetary aggregates dominate interest rate. There is strong evidence suggesting the presence of price puzzle following a positive shock to interest rate instrument.

The presence of price puzzle in Latin America provides some crucial implications for the implementation of the interest rate policy. As argued by Torres (2003), interest rates must change with larger amount when monetary authorities react to both inflation and output gap than when they focus exclusively on inflation. This implies that monetary authorities have two possible options. First, they should be more responsive to inflationary pressure. Interest rate should be raised with larger magnitude to create a contractionary effect on aggregate demand and thus reducing prices. However, this approach comes with the cost of greater variation in interest rates, eventually increasing the volatility of expected inflation (De Mello–Moccero 2009). Secondly, monetary authorities should focus more on inflation if they want to lower the degree of interest rate volatility. This requires an increase in the dependence for monetary authorities and substantial changes in institutional setting for some countries in the region. For instance, Bank of Brazil has low level of independence and accountability (Barbosa-Filho 2008); therefore, institutions should specify the role of the central bank in choosing the target and instruments as well as the penalty when the target is not fulfilled. High level of independence is also crucial for the maintenance of credibility, which takes time for successful construction.

Furthermore, monetary authorities should increase the effectiveness of forecasting inflation to improve the performance of the interest rate policy for price stability. When monetary authorities are forward-looking, changes in interest rate depends on the expectation and the forecast of inflation. If monetary authorities systematically underestimate the expected level of inflation, interest rates show smaller response to changes in inflation. This results in a reduction in the role of the interest rate as a nominal anchor. Several tools are available for effective management of inflation expectation of the public: (1) obtaining greater insight into determinants of inflation or the structure of the Phillips curve and (2) using forward guidance to improve the transparency of monetary policy (Mackiewicz-Łyziak 2016).

Finally, the evidence that both monetary aggregates and policy contains information about

changes in monetary policy suggests that a composite measure is better than single indicator in capturing the stance of monetary policy. Although the construction of the composite measure is outside the scope of this paper, this topic is deserved for deeper investigation.

It should also be noted that the paper is subjected to some drawbacks. First, the sample is small, which concludes only four emerging economies. Further studies should add more countries to enrich the information of the research sample. Second, the parameters can be time-varying, which is out of the scope of the paper. However, this issue should put more emphasis in future studies.

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