

Revisiting the Issue of Anticipated and Unanticipated Monetary Policy Shocks

AUTHOR



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Overview

One of the key features of the new classical approach to macroeconomics that emerged in the 1970s is the distinction between the real effects of anticipated and unanticipated changes in nominal variables (e.g. money growth). Authors such as Lucas [1972], Phelps [1967, 1968] and Friedman [1968] argued that only unexpected monetary policy shocks or money surprises will affect output and employment. On the other hand, some economists (e.g. Cochrane [1997]; Romer & Romer [1994]; Taylor [1980]), particularly those of the Keynesian tradition, asserted that anticipated monetary policy shocks also have real effects on the economy.

The discussion on the real effects of anticipated and unanticipated monetary policy shocks is one of the enduring issues in the study of macroeconomics. The extensive literature on this topic attests to the relative importance given to it. Over time, developments in both theoretical and empirical fronts allowed for a richer analysis of the impact of anticipated and unanticipated policy shocks on the real sector of the economy.

The significant changes in the conduct of monetary policy likewise have important implications on the discussion on anticipated and unanticipated monetary policy. A number of central banks have adopted inflation targeting as their framework for monetary policy beginning in the 1990s. Inflation targeting entails that central banks announce inflation targets that they commit to achieve over a period of time. Hence, under this framework, economic agents are able to anticipate monetary policy actions. Consequently, this led to better managed expectations that resulted in substantial decline in both the level and variability of inflation.

This article revisits the discussion on the real effects of anticipated and unanticipated policy shocks. The objective is to provide a firm understanding of this issue that concerns central banks. This, in turn, will hopefully lead to a better perspective of the path that central banks are taking towards a more responsive and effective conduct of monetary policy.

The article is organized as follows: the next section provides a short survey of the literature on business cycle models and the discussion on anticipated and unanticipated monetary policy shocks; the third section gives a brief discussion of inflation targeting in the Philippines; the fourth section presents an empirical validation of the real effects of anticipated and unanticipated money shocks using the Philippines case; and the fifth section concludes.

Survey of related literature

This section provides a short survey of the literature on anticipated and unanticipated monetary policy shocks. It also looks into the policy prescription that emerges from monetary business cycle models that favors the use of rule-based monetary policy over discretionary monetary policy.

Monetary business cycle models and anticipated and unanticipated monetary policy shocks

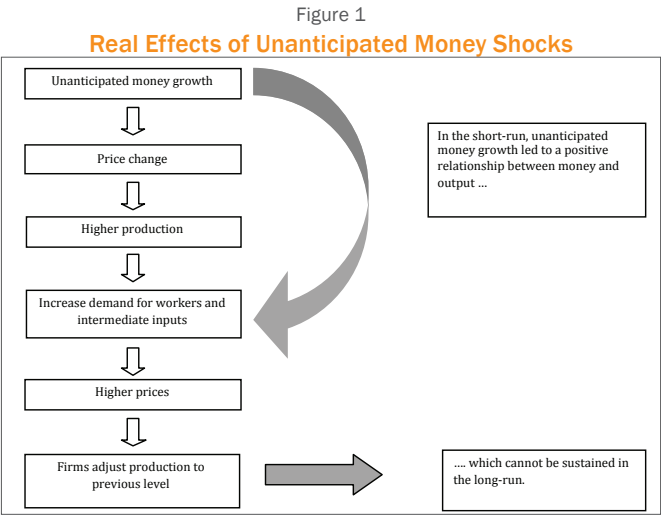
Classical economists believe in a dichotomy between nominal and real variables.¹ Changes in nominal variables (i.e. money supply) do not affect real variables like output and

¹ Real variables are economic variables that can be measured in physical units, such as quantities and relative prices (e.g. real GDP, capital stock, employment) while nominal variables are variables expressed in terms of money (e.g. inflation rate, price level).

employment in the long run. Thus, money is considered neutral because it only affects the price level and not the real variables of the economy. Keynesians, on the other hand, reject the notion of classical dichotomy between nominal and real variables. Their argument rests on the assumption of rigidities in the economy. According to them, prices and wages adjust sluggishly in the short-run so that changes in the money supply raises aggregate demand and affect other real macroeconomic variables.

The purported dichotomy between nominal and real variables raises the question on whether monetary policy has real effects. In 1972, Lucas' treatise on rational expectations and the neutrality of money paved the way for the development of micro-founded monetary business cycle models that analyze the relationship between money growth and economic growth.² Rational expectations imply that workers and firms utilize all available information in coming up with forecasts of the price and wage levels that would prevail in the economy.³ It is assumed that there are no systematic errors when predicting the future and that any deviations from perfect foresight are random. Lucas argued that, with rational expectations, anticipated monetary policy cannot change real GDP in a regular or predictable way. Similar to Phelps [1967, 1968] and Friedman [1968], Lucas implied that movements of output away from the natural level require a surprise. Monetary authorities can only affect output by creating a surprise and not through a predictable change in monetary policy.

In Lucas' model, market agents cannot immediately distinguish whether the price changes from unanticipated money growth are general or relative. If firms view the price changes as a relative-price change, they would expand their production in the belief that there has been an increase in demand for their product. This, in turn, would entail the hiring of additional workers. However, higher demand for workers put pressure on wages to increase which raises production costs. The increase in demand for intermediate inputs used for production will likewise result in an increase in their prices. In time, with rising wages and prices, market agents begin to realize that the price change is a general price change and production is adjusted to its former level. Thus, in the short-run, the unanticipated money change resulted in higher output growth, which cannot, however, be sustained in the long-run.



Under the case of anticipated money growth (e.g. monetary authorities adhere to a money growth rule), market agents expect the resulting general price change. Firms, having no money illusion, will not adjust their production levels. Thus, the increase in money supply leads to no real effects – money is neutral.

² Monetary business cycle models posit that money growth shocks trigger business fluctuations. While money shocks have been observed to cause output fluctuations (i.e. at least in the short-run), they cannot account for the propagation of these fluctuations. Moreover, as Nelson and Plosser [1982] pointed out, output fluctuations tend to be permanent rather than transitory. Shocks, other than those affecting aggregate demand, must therefore be contributing to the permanent changes in output. This resulted in the development of real business cycle (RBC) models. In RBC models, permanent output fluctuations are explained by shocks to production technology (Kydland and Prescott [1982]; Long, Jr. and Plosser [1983]).

³ John Muth [1961] was the one who originally proposed the concept of rational expectations.

Earlier empirical work in support of the claim that only unanticipated changes in monetary policy have real effects in the short-run include those of Barrow [1977, 1978]; Lederman [1978], Small [1978]; Grossman [1979]; Barrow & Rush [1980] and Cooley and Hansen [1997]. Unanticipated money growth is measured as a residual from a money growth equation. The residual is then used as a regressor in an aggregate demand or unemployment equation. Canlas [1986, 1997] applied the same tests using Philippine time-series data and found similar results. Unanticipated money growth has positive effects on output, but anticipated money growth is neutral. Moreover, he concluded that only a money surprise can reduce the unemployment rate. It is worth noting that most of the empirical work done to assess the impact of monetary policy shocks on output assumes an exogenous shock to monetary policy that is unanticipated by market agents.

Some empiricists, however, provide counter arguments to the notion that only unanticipated policy shocks matter. Monetary theorists have constructed models such as the overlapping contract models (e.g. Taylor [1979]), sticky price models (e.g. Rotemberg [1982, 1994]) and limited participation models (e.g. Grossman & Weiss [1983]; Rotemberg [1984]; Alvarez & Atkinson [1996]) to show that anticipated monetary shocks have real effects. Cash-in-advance models with adjustment costs such as those developed by Forest [1992] and Christiano & Eichenbaum [1992, 1995] generate conventional real effects of anticipated and unanticipated money shocks. Cochrane [1997] estimated the effects of money on output using vectorautoregression- or VAR-based measures with varying assumptions on the relative effects of anticipated and unanticipated money shocks. He observed that anticipated money and systematic monetary policy produce short and small output responses. Following Cochrane's empirical methodology, other authors (e.g. Hoover and Jordan [2001] and Gottschalk and Hopper [2001]) arrived at a similar conclusion that anticipated policy has real effects though more moderate compared to the impact of unanticipated policy.

Recent literature on business cycle models categorize anticipated policy shocks as “news” about future policies and unanticipated shocks as “surprise” shocks (i.e. shocks that market agents did not expect). Most of the research work done in this area, however, considers the effect of news about future technological changes on labor, investment and consumption (e.g. Beaudry and Portier [2004], Beaudry, Collard, and Portier [2006], Jaimovich and Rebelo [2006], Fujiwara, Hirose and Shintani [2008] and Schmitt-Grohe and Uribe [2008]). The impact of news about future monetary policy actions and surprise policy shocks are analyzed in the papers such as those of Haldane and Read [2000], Hirose and Kurozumi [2011] and Milani and Treadwell [2011]. In their paper, Milani and Treadwell [2011] focused on news about future monetary policy shocks. They estimated a new Keynesian model that incorporates news about future policies to separate the anticipated and unanticipated components of policy shocks. They observed that unanticipated policy shocks or “surprise” shocks have a very small but immediate effect on the economy while the anticipated or news shock has a much larger and more persistent effect on the economy.

Rules versus Discretion

Some of the empirical work on monetary business cycle models has shown that unanticipated monetary policy shocks result in output and employment gains in the short-run. Monetary authorities, however, are restricted from using money surprises or unanticipated money growth counter-cyclically to address economic downturns or periods of high unemployment rate. This approach yields temporary output or employment gains but results in inflationary effects that are permanent. Hence, monetary business cycle models favor the use of a rule-based monetary policy (e.g. money growth rule) over a discretionary monetary policy.

The critique of Lucas [1976] on the use of reduced-form models in drawing policy conclusions provided the intellectual impetus for the use of rules in the conduct of monetary policy. Lucas argued that since the parameters of reduced-form models are not structural—not policy-invariant—they would be affected by changes in the policies implemented in the economy. It would then be difficult to tell whether the results generated from reduced-form models represent changes in the fundamental relationship of the variables being observed or if they capture the effects of policy changes in the other sectors of the economy. Lucas suggests

the modeling of “deep parameters” that govern individual behavior (e.g. preferences) of market agents to address this issue. According to Lucas [1976], policy changes affect the behavioral parameters of the model. The manner in which policy changes modify the behavioral parameters of the model depends on whether authorities implement policy through rules or discretion. Moreover, Lucas concludes that the resulting structural changes can be better understood and empirically validated if authorities followed rules rather than discretion in implementing policy changes. Kydland and Prescott [1977] echoed the same policy prescription as Lucas’ in their article. They pointed out the time inconsistency of optimal plans such that agents who optimize each period (i.e. select the best decision given the current situation) may deviate from previously set plans. Such behavior either leads to consistent but suboptimal planning or in economic instability.

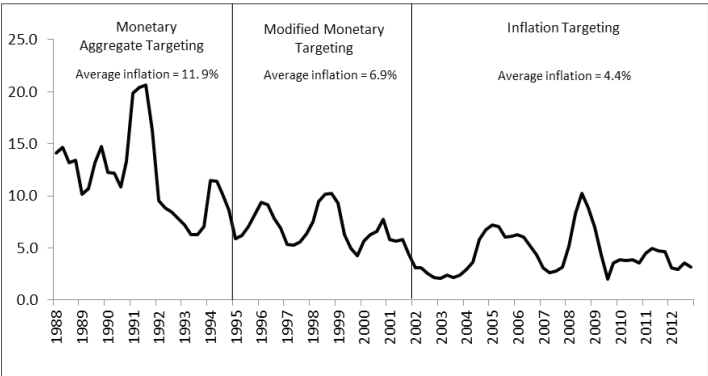
Inflation Targeting in the Philippines

Research on the conduct of monetary policy underscored the constraints that central banks face in achieving multiple targets (e.g. high output, low unemployment, stable exchange rate). The limited policy tools available to central banks are better suited to achieve price stability rather than pursue development goals like high output growth or employment.

In 2002, the BSP adopted inflation targeting as its framework for monetary policy. The Philippines joined a long list of inflation targeters like Australia, Canada, Finland, Sweden, New Zealand, the United Kingdom, Israel, Brazil, Chile and Thailand. Inflation targeting puts price stability as the main goal of monetary policy. This approach entails the announcement of an explicit inflation target that the central bank commits to achieve over a given period of time. The substantial decline in both the level and variability of inflation in recent years was traced to better managed inflation expectations of market agents.

Figure 1 plots inflation from 1988 to 2012. Between 1988 and 1994, the year-on-year headline inflation rate in the Philippines averaged at 11.9 percent and declined to 6.9 percent during the period when the BSP adopted the modified monetary targeting framework in 1995-2001. This further declined to 4.4 percent after the BSP adopted inflation targeting. Moreover, the standard deviations of inflation between the pre-inflation targeting (i.e. 1988–2001) and the inflation targeting periods show that the volatility of inflation declined from 3.9 percent to 2.0 percent (Table 1). The decline in the inflation rate was traced to the ability of the BSP to rein in inflation to within target levels with the better anchoring of inflation expectations. Table 1 also shows the declining volatilities in GDP growth, unemployment rate and nominal exchange rate between the two sample periods.⁴

Figure 2
Domestic Inflation: 1988 – 2012



⁴ The significant decline in the variability of output and inflation has often been referred to as the “Great Moderation” (Stock & Watson [2003]). Several studies have documented this phenomenon (Cecchetti, Flores-Lagunes & Krause [2006]; Blanchard & Simon [2001]; McConnell & Perez-Quiros [2000]; Kim & Nelson[1999]).

Table 1
Volatility of Output, Inflation and Unemployment
 (Standard Deviations, Percentage Points)

	GDP Growth	Inflation	Unemployment Rate ¹	Nominal Exchange Rate
1990Q1- 2001Q4	2.4	3.9	1.6	8.9
2002Q1 – 2012Q4	1.9	2.0	0.9	5.0

¹ Starting in the April 2005 round of the LFS, the definition of unemployment was revised to include the availability criterion and to impose a cut-off period for the job search of the discouraged workers. The series used to derive the standard deviation of unemployment was adjusted to make the unemployment rates comparable across the survey periods from 1990 – 2012.

Woodford [2005] noted that inflation targeting safeguards central banks against the trap of discretionary policy making and helps private sector to more accurately anticipate future policy which increases the effectiveness of policy. Inflation targeting central banks often employ a policy rule (i.e. Taylor rule) to guide its interest rate setting process.⁵ Such adherence to a rule-based monetary policy limits the use of unanticipated money shocks to address economic downturns. Unanticipated shocks (if they are large enough) can unanchor inflation expectations which could lead to permanent changes in the long-run inflation trend. Medalla and Fermo [2013], in their analysis of the behavior of month-on-month inflation in the Philippines, observed that if inflation expectations are dislodged (e.g. due to a large random shock or administered wages), inflation would be persistently higher than the BSP’s target band.

If central banks find the need to depart from systematic monetary policy, the current literature on news (i.e. anticipated policy shocks) and surprises (i.e. unanticipated) underscore the crucial role of a central bank’s communication strategy to manage expectations and to generate larger economic gains. Greater central banks transparency is one of the requirements for the successful implementation of inflation targeting. Central banks promote transparency by communicating clearly to the public their policy actions and the rationale behind them. Hirose and Kurozumi [2011] notes that the increasing emphasis placed by central banks on good communication strategies to convey their policy decisions and actions reflects the rise of the academic views on central banking as management of expectations. These authors looked into the communication strategy of the US Federal Reserve based on the anticipated and unanticipated components of monetary policy disturbances. Based on their estimation results, the Fed used unanticipated monetary policy actions until the mid-1990s and thereafter tried to coordinate market expectations about future policy actions. Milani and Treadwell [2011] noted that communication by central banks (e.g. hinting at future deviations from systematic policy) is vital in achieving a larger economic impact. Transparency and good communication, in turn, help central banks build credibility. Market agents are more likely to anchor their inflation expectations on the inflation target if the central bank has high credibility.

Empirical Validation for the Philippines

Although inflation targeting restricts central banks from using unanticipated monetary shocks to address low output or employment, it would still be a useful exercise to look into the real effects of anticipated and unanticipated monetary policy shocks in the Philippines. This section presents the results of the simulations done to validate the impact of anticipated

⁵ There is a debate on the proper definition of inflation targeting (IT) – is it a monetary policy rule or a framework? From a policy standpoint, Bernanke et.al., [1999] characterized IT as a framework rather than a rule. Similarly, Gavin [2004] described IT as “management by objective” rather than a policy rule. Svensson [1999] offers a diverging view by defining IT as a monetary policy rule derived from an explicit optimization problem. Kuttner [2004] observed that the difficulty in defining IT is due to its origins in central banking practice and policy authorities’ search for a suitable nominal anchor

and unanticipated monetary policy shocks in the Philippines. Simulations are done using the BSP's Macroeconomic Model for the Philippines (MMPH).⁶

The quarterly BSP MMPH is a semi-structural macro model that resembles standard new Keynesian open economy models (Svensson [2000] and Gali & Monacelli [2005]). The MMPH is based on the key relationships underlying the monetary policy transmission mechanism. It consists of four core behavioral equations: i) an aggregate demand equation (output gap equation); ii) inflation equation (expectations-augmented Phillips curve); iii) an exchange rate equation (uncovered interest rate parity); and a forecast-based monetary policy rule (i.e. Taylor rule). The model likewise has a foreign sector block which represents the external factors that may affect the domestic economy. Appendix 1 lists the key equations of the MMPH and Appendix 2 gives some of the parameter values of the model. For a more detailed discussion of the MMPH, please see the article of Bautista, Glindro and Cacnio [2013].

In the MMPH, monetary policy shocks being implemented can be specified as either anticipated or unanticipated. However, by default, the MMPH assumes that all shocks are unanticipated. This is to generate short-run real effects in the economy. The simulations assume a -1.0 percent monetary policy shock (i.e. anticipated and unanticipated) sustained over a period of four quarters.⁷

Figure 3 presents the impulse responses of the output gap, inflation rate, policy rate and nominal exchange rate to a -1.0 percent monetary policy shock. In the short-run, unanticipated money shocks led to higher output gap and lower paths of inflation and policy rate compared to the anticipated case. Nominal exchange rate likewise adjusts more slowly under the unanticipated case. The real effects of unanticipated money shocks, however, cannot be sustained in the long-run. Output starts to decline to its previous level with inflation on a higher path. These findings are in keeping with the conclusion found in the literature that real gains from using unanticipated shocks are only in the short-run but the resulting inflationary effects persist in the long-run.

Simulation results likewise showed that anticipated policy shocks can generate real effects in the immediate horizon. Output gap is higher during the period of declining policy rates (i.e. first four quarters). This could be reflective of the ability of the BSP to effectively communicate to the public its policy actions and the forward-looking behavior of market agents. Future research can further look into this finding and validate the real effects of anticipated policy shocks under inflation targeting.

Conclusion

The distinction between the real effects of anticipated and unanticipated changes in nominal variables is one of the continuing issues in the study of macroeconomics. Some economists argue that only unexpected monetary policy shocks or money surprises will affect output and employment while others, particularly those of the Keynesian tradition, asserted that anticipated monetary policy shocks also have real effects on the economy. This issue is of relative importance to central banks since it has significant consequences for the conduct of monetary policy.

The adoption of inflation targeting by many central banks starting in the early 1990s bore important implications for the discussion on anticipated and unanticipated monetary policy shocks (e.g. money shocks are better anticipated, the use of rule-based monetary policy under IT). Inflation targeting safeguards central banks against the trap of discretionary policy making and helps private sector to more accurately anticipate future policy which increases the effectiveness of policy. Such adherence to a rule-based monetary policy limits the use of unanticipated money shocks to address economic downturns. Unanticipated shocks (if

⁶ The MMPH has been calibrated for the IT period. While it may be useful to consider the pre-IT period, doing so entails a re-calibration of the model to account for possible structural changes that occurred between the pre-IT period and the IT period (e.g. changes in the way expectations are formed). Nonetheless, this limitation does not invalidate the results generated in the simulation exercises.

⁷ In generating the simulation results, a -1.0 percent monetary policy shocks sustained over a period of 2, 3 and 4 quarters were considered. The three scenarios exhibited the same trend but some difference in the magnitude. For ease of presentation and clarity, a monetary policy shock sustained over 4 quarters was used.

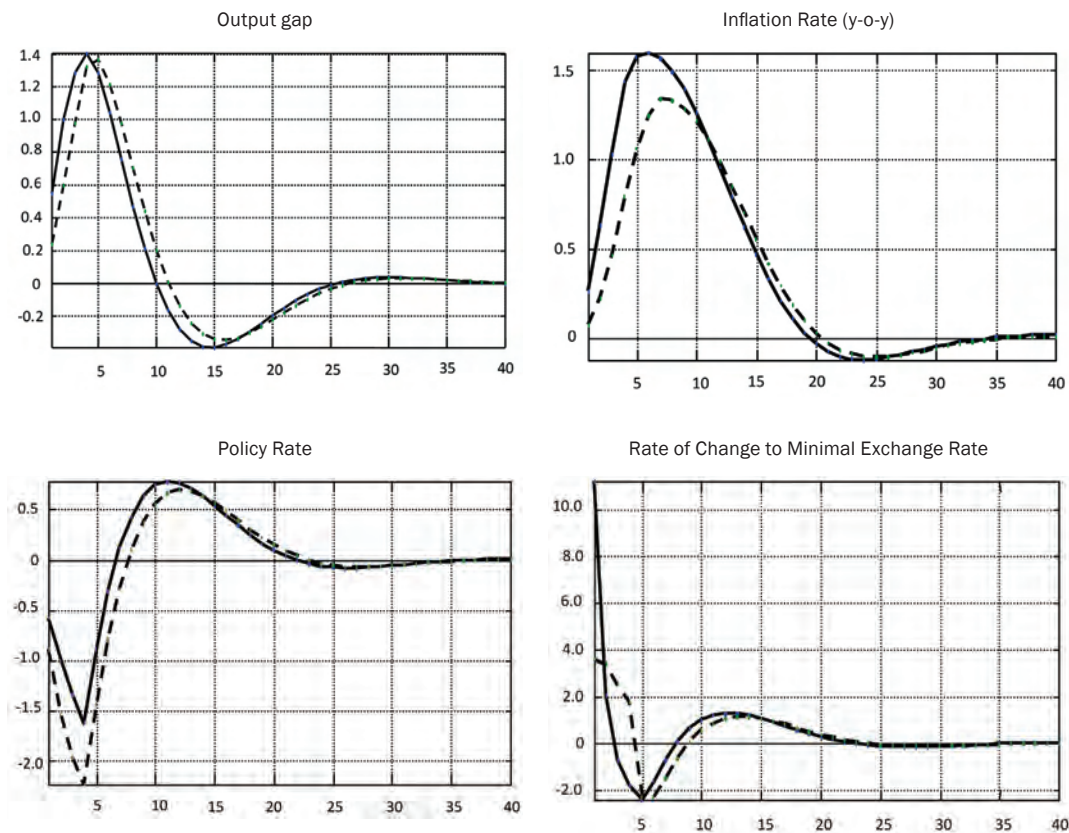
they are large enough) can unanchor inflation expectations that could lead to permanent changes in the long-run inflation trend.

An important aspect of central banking that is highlighted in the recent research work on anticipated and unanticipated policy shocks is the crucial role of a central bank's communication strategy. The effectiveness of a central bank in conveying its policy actions to the public (i.e. open and transparent communication) largely affects its ability to manage expectations and to generate larger economic gains.

Using the BSP's MMPH, the impact of a -1.0 percent monetary policy shock (i.e. anticipated and unanticipated) sustained over a period of four quarters is explored. Unanticipated money shocks led to higher output gap and lower paths of inflation and policy rate compared to the anticipated case in the short-run. Nominal exchange rate likewise adjusts more slowly under the unanticipated case. These findings are consistent with the observation found in the literature that unanticipated money shocks result to real gains in the short-run. However, the real effects of unanticipated money shocks cannot be sustained in the long-run. Output starts to decline to its previous level and inflation is on a higher path. These findings are in keeping with the conclusion found in the literature that real gains from using unanticipated shocks are felt only in the short-run but the resulting inflationary effects persist in the long-run.

The results of the simulation also showed that anticipated policy shocks can generate real effects in the immediate period. Output gap is higher during the quarters of declining policy rates (i.e. first four quarters). This finding could be reflective of the ability of the BSP to effectively communicate to the public its policy decisions and the forward-looking behavior of market agents. Future research can consider looking further into this observation and validate the real effects of anticipated policy shocks under inflation targeting.

Figure 3
Impulse Response to a -100 bps Policy Rate Shock
(percentage point deviation from baseline)



Basic Structure of the MMPH

Output gap equation (Aggregate demand)

$$Y_g = \alpha_1 * Y_{g,t+1} + \alpha_2 * Y_{g,t-1} - \alpha_3 * (R_g + cc) + \alpha_4 * RMTg + \alpha_5 * Z_g + \alpha_6 * YFg + \alpha_7 * URg + RES_YG$$

where:

Y_g	Output gap
$Y_{g,t+1}$	Lead output gap
$Y_{g,t-1}$	Lagged output gap
R_g	Real policy rate gap (real reverse repurchase rate gap)
cc	Credit condition
$RMTg$	Remittance gap (in domestic currency)
Z_g	Real exchange rate gap

Expectations-augmented Phillips Curve (Aggregate supply)

$$dP = \beta_1 * (dPM - dZt) + (1 - \beta_1) * [\beta_2 * dP_{t-1} + (1 - \beta_2) * dR] + \beta_3 * Y_g + \beta_4 * Z_g + \beta_5 * LRPCOMGAP + RES_{DP} + PP_{DP2} - \beta_6 * PP_DP2_{t-1}$$

where:

dP	Quarter-on-quarter inflation
dPM	Quarter-on-quarter import price inflation
dZt	Rate of change in the real exchange rate trend
$dPt-1$	Lagged inflation
dPe	Inflation expectations
Y_g	Output gap
Z_g	Real exchange rate gap
$LRPCOMGAP$	Real international commodity price gap
PP_DP2	Short-lived supply shock
RES_DP	Cost-push shock

Monetary policy rule (Taylor rule)

$$RS = \gamma_1 * RS_{t-1} + (1 - \gamma_1) * \{(RR_t + PIETARGET_{t+1}) + \gamma_2 * (dP_{t+3} - PIETARGET_{t+3}) + \gamma_3 * Y_g\} + RES_RS$$

where:

In real terms, $RR = RS - dP_{t+1}$

RS	Nominal reverse repurchase rate (policy rate)
RR	Real policy rate
RR_t	Trend real policy rate
$PIETARGET$	Inflation target
dP	Quarter-on-quarter inflation
Y_g	Output gap
RES_RS	Monetary policy shock

Exchange rate equation (Uncovered interest rate parity)

$$RS - RS_US = 4 * (S^e - S) + PREM - \omega_4 * RMTFg + \omega_5 * dFXRES + RES_UIP$$

where:

<i>RS</i>	Nominal reverse repurchase rate (policy rate)
<i>RS_US</i>	Nominal US Federal Funds rate
<i>S^e</i>	Expected nominal exchange rate
<i>S</i>	Nominal exchange rate
<i>PREM</i>	Risk premium
<i>RMTFg</i>	Remittance gap in US\$
<i>dFXRES</i>	Quarter-on-quarter change in foreign exchange reserves
<i>RES_UIP</i>	Shock on exchange rate

Foreign block

$$\begin{aligned}
 YFg &= \alpha_{f1} * YFg_{t-1} + \alpha_{f2} * YFg_{t+1} - \alpha_{f3} * RRFg_{t-1} + RES_YFG \\
 dPF &= \beta_{f1} * dPF_{t-1} + (1 - \beta_{f1}) * dPF_{t+1} + \beta_{f2} * YFg_{t-1} + RES_DPF \\
 RS_US &= \gamma_{f1} * RS_US_{t-1} + (1 - 0.65) * \{ (RRF_t + PIETARGET_US_{t+1}) + \gamma_{f2} \\
 &\quad * (d4PF_{t+3} - PIETARGET_US_{t+3}) + \gamma_{f3} * YFg \} + RES_RS_US \\
 RRF &= RS_US - dPF_{t+1}
 \end{aligned}$$

where:

<i>YFg</i>	US output gap
<i>dPF</i>	US inflation rate
<i>PIETARGET_US</i>	US inflation target
<i>RS_US</i>	US Federal funds rate
<i>RRF</i>	US real Federal funds rate
<i>RRF_t</i>	US real trend Federal funds rate
<i>RRFg</i>	US real interest rate gap
<i>RES_YFG</i>	Shock to US output gap
<i>RES_DPF</i>	Shock to US inflation
<i>RES_RS_US</i>	US monetary policy shock

Appendix 2
Summary of Parameter Values

Parameter	Value
alpha1	0.60
alpha2	0.15
alpha3	0.10
alpha4	0.06
alpha5	0.03
alpha6	0.20
alpha7	1.00
alpha8	0.004
beta1	0.03
beta2	0.40
beta3	0.10
beta4	0.0001
beta5	0.03
beta6	0.90
gamma1	0.85
gamma2	1.75
gamma3	0.50
omega4	0.20
omega5	0.40
alpha_f1	0.55
alpha_f2	0.30
alpha_f3	0.20
beta_f1	0.40
beta_f2	0.04
gamma_f1	0.65
gamma_f2	1.95
gamma_f3	0.20

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