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Monetary Policy in Hybrid Regimes: The Case of Kazakhstan

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Monetary Policy in Hybrid Regimes: The Case of Kazakhstan[1]

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Abstract

This paper analyzes the monetary policy framework in Kazakhstan. The authorities have been successful in containing inflation in the context of a managed exchange rate regime. Over the past two years, the central bank has taken steps to enhance its ability to regulate liquidity in the financial system. However, the current policy interest rate does not properly signal the stance of policy, reflected in a weak transmission from the policy rate to money market interest rates. With the use of a stylized model, the paper studies the macro determinants of money market interest rates under the current framework, and illustrates both the benefits and challenges of active interest rate policy. The model shows that limited use of instruments to steer short-term interest rates weakens the framework's ability to counteract shocks. Finally, the paper explores the implications of varying degrees of exchange rate flexibility for interest rate policy and open market operations.

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I. INTRODUCTION

In the face of solid growth, the Kazakh authorities have been successful in containing inflation. Kazakhstan's economic recovery from the global crisis was rapid, with output growth of around 7½ percent in 2010–11. Real GDP growth slowed in 2012–13, mostly reflecting declines in oil and agricultural output, but was still solid at around 5–6 percent. At the same time, core inflation (excluding food, energy, and administered prices) averaged around 6 percent since 2010 or roughly half the rate of core inflation in the preceding three years. The February 2014 devaluation of the tenge reflected the central bank's concern about loss of competitiveness, amid depreciation of the Russian ruble. Temporary inflationary pressures are likely to emerge from the devaluation, although the authorities are determined to keep inflation within the objective range of 6–8 percent.

The National Bank of Kazakhstan (NBK) has taken measures to strengthen the regulation of liquidity in the banking system. The NBK has been conducting periodic auctions for the issuance of short-term notes. In parallel, the NBK in 2012 introduced important changes to its minimum reserve requirements (MRR). For example, in order to assess more accurately the size of tenge liquidity, the NBK excluded banks' cash on hand and correspondent accounts in foreign currency from the structure of reserve assets.[2] In addition, over the past two years, the NBK periodically provided short-term liquidity to banks through *automatic* repo operations to smooth seasonal fluctuations in demand for tenge liquidity. Moreover, to enhance the transmission mechanism of monetary policy, the NBK was planning to engage in more active open market operations (OMOs) for both the provision and withdrawals of liquidity, through changes to its standing facilitates and the introduction of a new policy interest rate.[3] However, following the recent devaluation, the NBK tightened the exchange rate band and refocused the exchange rate both as primary objective and as dominant instrument of monetary policy. The NBK remains committed to allowing greater exchange rate flexibility over time, including enhancing its overall monetary policy instruments.

There is no unique formula for running successful monetary policy, but garnering more direct influence over short-term interest rates is essential. Viable frameworks must help ensure price stability, while helping insulate the economy from external and domestic shocks. The ability to influence financial and monetary conditions, especially through the control of short-term interest rates, is a fundamental component of such frameworks. In this regard, strengthening monetary policy further in Kazakhstan will require introducing a policy rate that anchors key money market interest rates around it, and hence bolstering the signaling

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[2] To help reduce speculative components in the money market, and increase the flexibility and efficiency of liquidity regulation, the NBK also introduced higher MRR ratios on domestic short-term liabilities and nonresidence liabilities.

[3] See NBK's Monetary Policy Guidelines for 2013.

effects of monetary policy. In addition, it is important that the pursuit of multiple objectives (e.g., financial or exchange rate stability) does not conflict with the ultimate goal of policy (price stability) or send confusing signals to market participants.[4]

In this paper, we use a simple structural model of a small open economy to study the monetary and macroeconomic implications of the current framework. Notwithstanding the NBK's measures to enhance the regulation of liquidity, the current framework is characterized by a policy rate that is ineffective in anchoring key money market interest rates (in part because the policy rate only plays an indicative role). As a result, the stance of monetary policy is largely driven by the interaction of money demand developments and balance of payment (BoP) pressures. The model simulations suggest that limited control over short-term interest rates in this context can amplify the effects of shocks—mainly external—on the economy, and may ultimately result in periodic exchange rate adjustments. In addition, the current framework is asymmetric, in that the policy rate serves as a soft ceiling while the interest rate attached to a standing deposit facility serves as a hard floor. The asymmetry implies shocks have different macroeconomic effects depending on their sign.

We also use the simple model to study two alternative regimes in which the central bank has greater influence over the short-term interest rate, with the regimes varying in the degree of exchange rate management. The model simulations show that these would perform better than the current regime, e.g., by reducing output and inflation volatility. However, there are also challenges from greater control over short-term interest rates. First, the central bank must stand ready to withdraw or inject liquidity as necessary through a considerable increase in OMOs, regardless of the degree of exchange rate management. In addition, more direct influence over interest rates in the context of a managed exchange rate puts more pressures (both upward and downward) on foreign exchange (FX) reserves and potentially on the likelihood of devaluation. Greater exchange rate flexibility reduces these pressures but does not necessarily reduce the volume of OMOs. These alternative frameworks are therefore more demanding from an operation standpoint. Our modeling approach recognizes the hybrid nature of policy regimes in emerging market countries, in that control of monetary conditions coincide with varying degrees of exchange rate management. We draw on recent work on this topic, following Chamon et al. (2012) and Benes et al. (2013). Our results illustrate both the advantages and challenges of such hybrid regimes.

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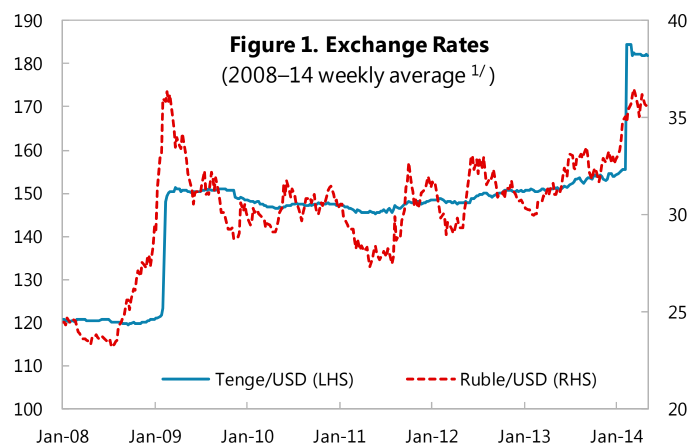
[4] There are two important additional elements of monetary policy that we abstract from here for the sake of simplicity. First, due to the lags with which policy influences real activity, policy frameworks must be forward looking, i.e., they must make policy decisions based on expectations of future variables, namely inflation. Second, policy frameworks should be supported by a clearly-articulated communication strategy that explains policy decisions and helps guide financial sector expectations.

The paper is organized as follows. Section II summarizes the current policy setup, including the role of the exchange rate in the management of system liquidity and the NBK's interest rate corridor and the role it plays in guiding key money market interest rates. Section III presents a model that describes how the current framework works, and analyzes the framework's implication for the de facto stance of policy, movements in inflation, output, FX reserves, and interest rates, in response to external and domestic shocks. Section IV makes use of the model to illustrate the benefits from alternative policy frameworks, particularly where the central bank engages in active OMOs. Section V discusses key policy implications and concludes.

II. The Current Policy Framework and Recent Developments

The de jure primary goal of NBK's monetary policy is price stability; however, de facto, a tightly managed exchange rate guides the management of system liquidity. The NBK's monetary policy guidelines are explicit about the primacy of the price-stability objective, with the view to promoting financial sector stability. In practice, however, the driving force behind the management of tenge liquidity, and in turn the conduct of monetary policy, is the tightly managed tenge/USD exchange rate and the frequency in which the NBK intervenes in the foreign exchange market. The NBK's tight exchange rate management, both as primary objective and as dominant instrument (via intervention) of monetary policy, complicates the management of system liquidity. The lack of effective interest rate instruments (see below) and high degree of financial dollarization further add to this challenge. Moreover, in recent months, the FX swap market has played an increasing role in the funding of short-term tenge liquidity among banks, which has contributed to volatility in the interbank repo market.

As a small open economy, Kazakhstan is exposed to external shocks, and periodically has resorted to one-step exchange rate devaluations. In early 2009, as a result of the sharp drop in global oil prices during the second half of 2008 (and following significant depreciation in the Russian Ruble and in currencies of other resource-exporting economies), the NBK devalued the tenge by 20 percent against the USD to a level of 150 tenge/USD. During 2009–13, the tenge/USD exchange rate was kept stable, despite volatility in other emerging market currencies. In September 2013, the NBK switched to the use of a multi-currency basket (with weights of 70, 20, and 10 percent for the USD, euro, and ruble, respectively) in smoothing "excessive" exchange rate fluctuations. However, in February 2014, the NBK unexpectedly devalued the tenge (by 18 percent), to a level of 185,



1/ May 2014: latest available data.

and reestablished a tight new corridor of +/- 3 tenge (roughly 1.5 percent) around the new devalued rate.

Under the current regime, the NBK's refinancing rate and deposit rate constitute an interest rate corridor, with the former serving as the ceiling and the latter as the floor. In principle, the official refinancing rate is the rate at which the NBK lends short term to the banking system, while the deposit rate is the rate that banks earn on their deposits at the NBK. In practice, the use of the refinancing window has been very limited, and the NBK's conduct of periodic *automatic* repo operations has resulted in rates which have been slightly higher than the refinancing rate. Moreover, while the deposit rate serves as a hard floor, because it is tied to a standing facility, the refinancing rate plays an indicative role and serves instead as a soft ceiling. For much of the period since the global crisis, especially during 2010–12, key money market interest rates hovered around the deposit rate, indicating a state of highly accommodative monetary policy. However, since late 2012, the benchmark seven-day interbank repo rate has mostly drifted higher and, more recently, exhibited increased volatility, reflecting tighter tenge liquidity conditions.

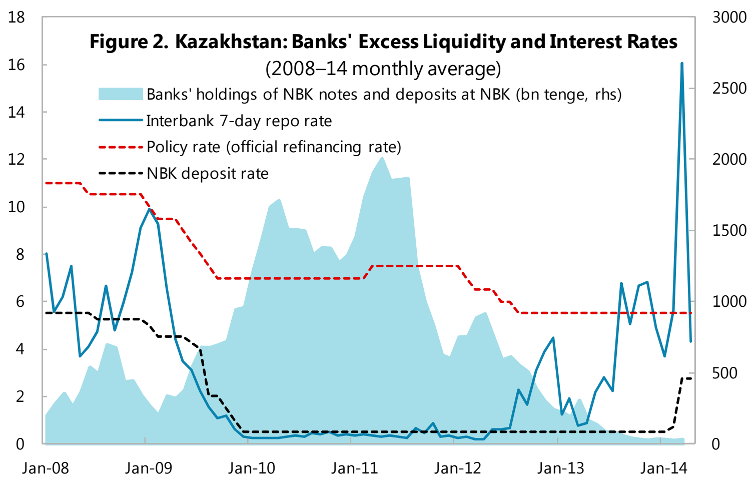


Figure 2. Kazakhstan: Banks' Excess Liquidity and Interest Rates (2008–14 monthly average)

The policy rate, stipulated as the official refinancing rate, does not properly signal the stance of policy. In 2010–11 and early 2012, while the rise in system liquidity signaled a largely accommodative monetary policy, key money market interest rates appeared to be guided more by the NBK deposit rate rather than by the policy rate. More recently, while the policy rate remained unchanged at 5½ percent, the benchmark seven-day interbank repo rate has drifted higher irrespectively. In particular, in late 2013 and early 2014, in part due to sustained speculations of tenge devaluation and tightening of tenge liquidity conditions, the benchmark interbank rate rose significantly, temporarily exceeding the refinancing rate by a large margin. The recent volatility in the money market illustrates the limited relevance of the

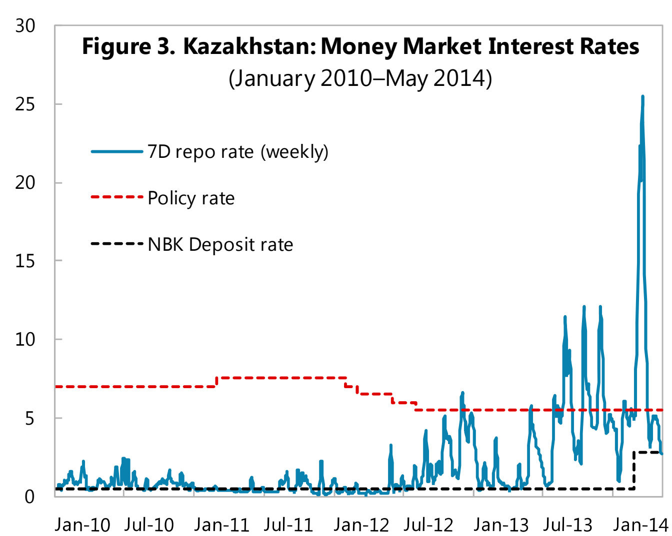


Figure 3. Kazakhstan: Money Market Interest Rates (January 2010–May 2014)

refinancing rate as a policy interest rate and the difficulty for the NBK in anchoring money market interest rates in the presence of liquidity shocks. With limited open market operations, and in the absence of a flexible exchange rate, the bouts in speculation of tenge devaluation were accompanied by falling central bank international reserves.[5]

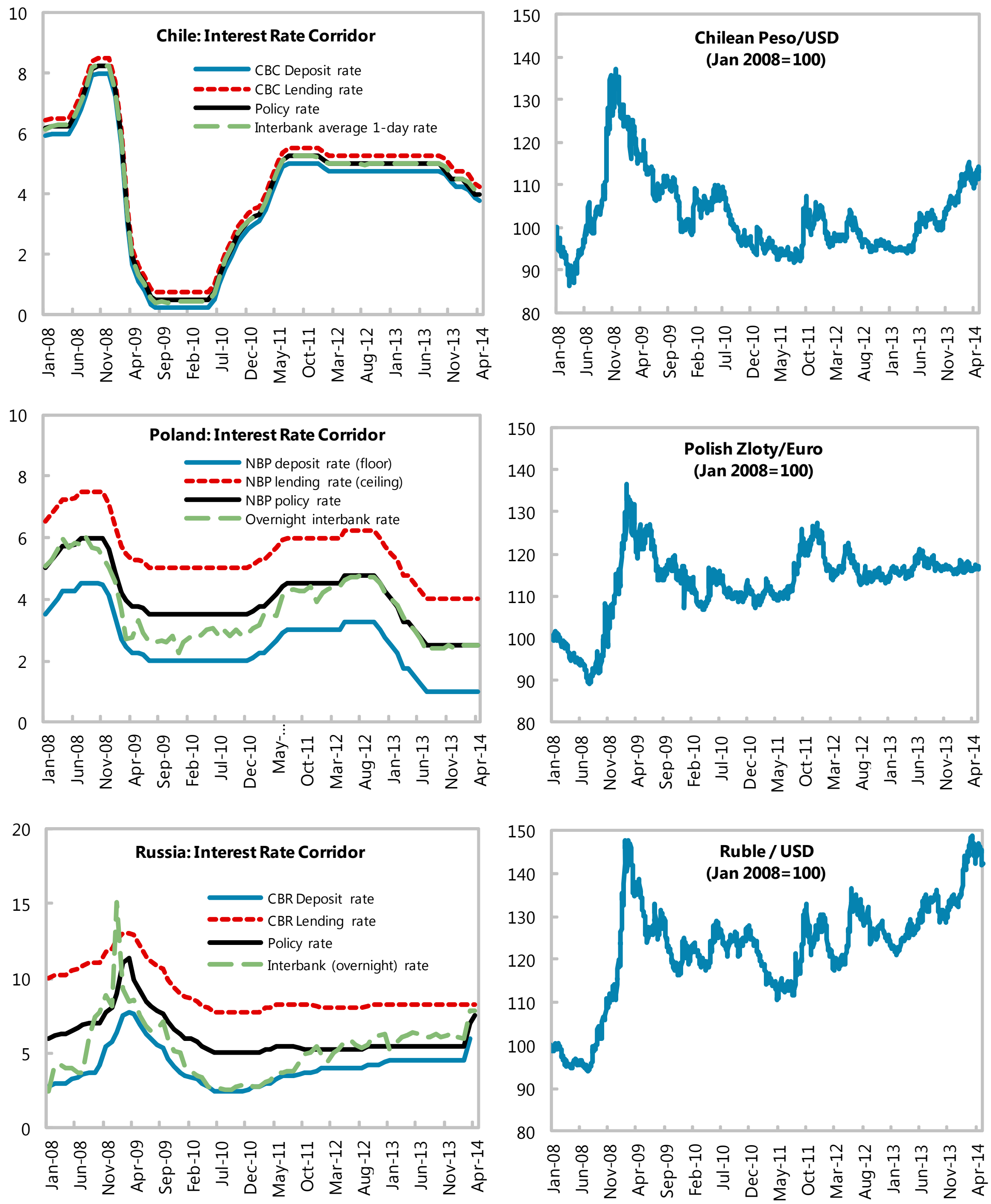
The NBK's operational framework stands to benefit from moving toward standard practice in advanced and other emerging market economies. In these countries, active open market operations by the central bank help ensure that key interbank rates are anchored around the policy rate, and where the latter fluctuates between the two standing facility rates (see Figure 4 with examples from Chile, Poland, and Russia). In some cases, where the central bank has the ability to fully influence the short-term interest rate, the benchmark interbank rate essentially becomes the policy rate that signals changes in policy (e.g., the U.S. Fed Funds Rate and, to a very close degree, Chile's overnight interbank rate). However, even in the absence of "perfect" anchoring, active OMOs enable the central bank to closely align its policy rate with the benchmark interbank rate.

A notable difference between Kazakhstan and most emerging market countries that actively control the short-term interest rate is the extent of exchange rate management. Figure 4 displays the exchange rate in Chile, Poland and Russia relative to their relevant reserve currency (USD in the case of Chile and Russia, and euro in the case of Poland). All three countries show considerable exchange rate flexibility, in notable contrast with the stability of the tenge/USD exchange rate. These differences seem to confirm the impossible trinity, in that considerable exchange rate management and an independent monetary policy, i.e., with interest rate control, are incompatible if capital is mobile. It remains an open question whether countries with imperfect capital mobility can do both. The model-based simulations we present below suggest such outcomes are possible; although they also highlight the operational challenges, e.g., in terms of open market operations and FX reserve interventions, as well as the possibility of periodic exchange rate adjustments.

The next two sections are devoted to a model-based illustration of the benefits of adopting active OMOs and gaining more direct influence over the short-term market interest rate. In the current framework, for the purpose of simplification and illustration, we assume that the central bank does not engage in OMOs when interest rates are within the corridor. If the interest rate hits the floor, the central bank withdraws sufficient liquidity so that the interest rate does not fall below the floor. If, on the other hand, the interest rate hits the upper band of the corridor, the central injects liquidity but not sufficiently, which allows the short-term interest rate to go above the ceiling. In the alternative framework, the central bank engages in active OMOs, which ensures control over the short-term interest rate.

[5] NBK's international reserve exclude FX reserves that arise from oil export receipts, which are held in the government's national oil fund. While reserves in the oil fund are managed by the NBK, these cannot be used for direct FX intervention by the central bank.

Figure 4. Interest Rate Corridor and Exchange Rate in Selected EM Countries



Sources: Bloomberg and IMF country reports.

III. A Model-Based Analysis of the Current Policy Regime

In this section, we employ a simple model to illustrate the macroeconomic implications of the current policy framework. The stylized, quarterly small open-economy model is not meant to provide a quantitative analysis of the Kazakhstan's economy, e.g., on the sources of inflation, but is instead meant to provide economic intuition on the implications of the current regime (and the alternative regimes we will consider in the next section) for the domestic economy. The analysis here draws on recent work by Chamon et al. (2012) and Benes et al. (2013).

The model presented here is not intended for forecasting purposes. The model consists of a set of equations that determine the joint behavior of output, inflation, exchange rate, interest rate, monetary aggregates, open market operations, and reserve accumulation. The model does not include forward looking behavior, the absence of which simplifies the solution of the model but comes at the expense of missing an important channel through which monetary policy affects the economy—the expectations channel. This type of tradeoff–abstracting from features that may be relevant but that would complicate the analysis—is always present in any economic modeling.[6] The focus in this paper is not on forecasting but rather on understanding the macroeconomic implications of alternative policy regimes. Hence, the need to replicate the properties of data is secondary to providing a simple understanding of the mechanisms of interest. In addition, the focus is on one or two relevant shocks, and not the whole spectrum of possible macroeconomic disturbances.

We do not formally model the periodic devaluations of the tenge. This is a shortcoming of our approach, in that it does not take into account the use of devaluations as part of the macro adjustment tools.[7] However, by showing the implications of shocks for interest rates and reserves under current and alternative exchange rate management frameworks, our results help assess the viability of the various regimes. We leave a formal treatment of periodic devaluations for future work.

Based on the structure of the Kazakhstan's economy, we focus mainly on external shocks. The economy is considered relatively small and open, and revenues stemming from natural resources are the primary source of external funding. As international commodity prices are subject to large fluctuations, the economy as a whole is exposed to sudden and large changes in the balance of payments. In the model, these shocks can also be loosely interpreted as changes in the external environment, e.g., changes in the risk appetite of foreign investors, or as changes in the private sector expectations of a future devaluation. We

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[6] As George Box, a famous statistician, once said, "all models are wrong, some are useful." All models are wrong in that they are a gross simplification, and will inherently miss many important aspects of the real world. However, if they help identify an important aspect of reality, which may not have been properly assessed in their absence, then the modeling effort has been useful.

[7] This could be analyzed in the model, along the lines of Krugman (1979).

study both positive and negative shocks to the BoP, to emphasize the asymmetric nature of the current regime. For the sake of completeness, we also study domestic price shocks, the results of which are summarized in Appendix II.

The description of the model begins with the equation that describes the BoP.[8]

$$\Delta IR_t^* = \omega(R_t - R_t^*) - \varphi y_t + \delta s_t + x_t$$

The BoP will tend to be in surplus (relative to its long run value) when domestic interest rates are above foreign interests ($R_t > R_t^*$), when output is below trend ($y_t < 0$), when the real exchange rate is depreciated ($s_t > 0$), or when there is a positive shock to the BoP (x_t).[9] As discussed above, the latter variable can also capture a decrease in the country's risk premium or equivalently an increase in capital inflows (in a reduced form way). A BoP surplus is reflected in an increase in FX reserves in percent of steady state GDP (ΔIR_t^*). The coefficient ω captures the sensitivity of capital flows to the difference between domestic and foreign interest rate. A high ω implies strong capital mobility. The parameter φ denotes the marginal propensity to import, while δ captures the price elasticity of import demand.

The second equation describes the central bank balance sheet:

$$\Delta M_t = \theta \Delta B_t + (1 - \theta)\Delta IR_t^*$$

Changes in reserve money (in percent of GDP) are the weighted sum of changes in net domestic assets and net foreign assets. The coefficient θ measures the steady-state share of NDA in reserve money.[10]

The third equation is a standard money demand:

$$m_t = M_t - P_t = y_t - \vartheta R_t$$

Demand for real money balances depends positively on income and decreases with the nominal interest rate (in percentage points). The term ϑ denotes the semi-elasticity of money demand.

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[8] Variables in the model are presented as percent deviations from a long-run trend, which for the most part we leave unspecified.

[9] This shock can also reflect higher export prices (e.g., because of higher global oil prices).

[10] The above equation results from the log-linearization—around the steady state—of the equation that describes the central bank balance sheet: $\Delta\overline{M}_t = \Delta\overline{B}_t + \overline{S}_t\Delta\overline{IR}_t^*$, where an overbar ($\overline{\ }$) denotes levels, and $\overline{S}_t$ is the nominal exchange rate (in level). Under the assumption that there is no accumulation of reserves at steady state ($\Delta\overline{IR}^* = 0$), the nominal exchange rate drops from the log-linear version. More generally, this simplification reflects the fact that changes in the local currency value of reserves are not monetized. Instead, they lead to changes in the net worth of the central bank or in transfers to the government, which we abstract from here.

The fourth equation is a dynamic IS equation[11]

$$\mathrm{y_t} = -\gamma\left(R_t - \pi_t\ \right) + \mathrm{y_{t-1}} + \alpha\Delta s_t + \mu\Delta x_t,$$

where $\pi_t = P_t - P_{t-1}$. Temporary deviations of output from trend, which we will refer to as aggregate demand pressures, depend on real interest rates (the interest rate channel), the rate of real depreciation (the exchange rate channel), and changes in external revenue. The coefficient γ measures the strength of the real interest rate channel. The coefficient α reflects the sum of two different mechanisms pushing in opposite directions. First, a real depreciation lowers the relative price of domestically produced goods and results in an increase in aggregate demand (the exchange rate channel). Second, in the presence of currency mismatches in domestic balance sheets, e.g., as a result of financial dollarization, a real depreciation can raise the real burden of debt and hence reduce aggregate demand. The coefficient α may be positive or negative, depending on the relative strength of the two mechanisms. Finally, positive developments in the BoP also have a positive impact on aggregate demand, the strength of which is given by μ. The presence of lagged output ($\mathrm{y_{t-1}}$) captures the persistence of aggregate demand pressures.

The fifth equation is the Phillips curve:

$$\pi_t \ = \tau\,\mathrm{y_t} + \sigma\Delta s_t + \pi_{t-1} + \epsilon_{\pi,t}$$

Inflation depends on domestic real marginal costs, which themselves depend on the level of output, with sensitivity τ. Inflation also depends on changes in the real exchange rate, with with exposure σ: ceteris paribus, a real depreciation results in an increase in inflation. σ captures the degree of openness in consumption, e.g., the importance of imported or traded goods. The presence of lagged inflation (π_{t-1}) with coefficient 1 implies that the long run Phillips curve is vertical.[12] Finally, inflation is subject to exogenous shocks $\epsilon_{\pi,t}$, which capture movements in inflation that result from cost push shocks, e.g., sudden increases in real wages, increases in commodity prices or changes in administered prices.

[11] For simplicity, the IS equation is assumed to be backward looking.

[12] Most macro models employed in both emerging markets and advanced economies typically include a Phillips curve. The use of a Phillips curve does not imply that aggregate demand (the output gap) is the sole or main determinant of inflation, since cost push shocks can be (and usually are empirically) the main source of inflation volatility. The importance of the Phillips curve is that it helps the central bank understand how monetary policy decisions will ultimately affect inflation.

The sixth equation is the real exchange rate equation:

$$s_t - s_{t-1} = \Delta S_t - \pi_t$$

There are eight endogenous variables ($\Delta IR_t^*, M_t, \Delta B_t, R_t, \pi_t, s_t, S_t, \mathrm{y}_\mathrm{t}$) and six equations so far. The model is complete with the description of policy. We begin by describing and analyzing a highly stylized regime meant to capture the broad features of the current framework before studying alternative regimes.

A stylized version of the current policy regime

The current regime may be characterized by two broad features:

The first feature is the management of the exchange rate.[13] We model this feature by assuming that the authorities buy and sell foreign exchange to maintain a relatively stable exchange rate. Specifically:

$$\Delta IR_t^* = -\beta \Delta S_t$$

According to this rule, the central bank accumulates FX reserves when the nominal tenge exchange rate appreciates and sells reserves when the exchange rate depreciates. The degree of exchange rate management is captured by the value of β: the higher the value of β the stronger the management. At the limit, an infinitely high value of β would be equivalent to an exchange rate peg. It must be stressed that this rule cannot perfectly capture the range of policies that influence the value of the exchange rate in practice, including fiscal policy. However, the rule and its calibration ensure that nominal exchange rate fluctuations in the model are broadly consistent with: (i) the central bank's (secondary) objective of maintaining a relatively stable FX market, and (ii) the observed stability of the exchange rate since 2009. A few comments are worth making:

- First, the rule does not imply that the central bank targets an exchange rate level, as it assumes that the central bank does not correct for any potential misalignment between the exchange rate level and some (unspecified) target level. Indeed, we recognize that interventions in the FX market may not be meant to counter a particular trend in the exchange rate, but rather to smooth sharp fluctuations in the supply and demand for foreign currency (including those impacting the central bank's management of the NFRK).

[13] Since 2011, the de jure exchange rate arrangement for Kazakhstan has been classified as a "managed float." The de facto exchange rate arrangement is classified as crawl-like, because the tenge has been consistently tracking a trend against the U.S. dollar within a 2 percent margin. The exchange rates at numerous exchange bureaus are very close to the auction rate, and the spread between buying and selling rates is very small (see IMF Country Report No. 12/164).

- Second, the model focuses on deviations from steady state (long run equilibrium) and does not take a stand on whether the equilibrium exchange rate should appreciate (or depreciate) over time.

- Third, while the rule does imply that the central bank may find itself on either the buying or the selling side of the market for some time, if the economy is hit by one shock at a time, this need not be the case once the model is hit with multiple shocks. The latter is more realistic, but we abstract from such analysis for the sake of clarity.

- Fourth, the rule does not allow for periodic devaluations.

The second feature of the regime is the existence of an interest rate corridor. In particular, the authorities set a floor on short-term rates($\underline{\mathrm{R}}_t$), while the current "policy rate" is considered a soft ceiling ($\overline{\mathrm{R}}_t$).[14] These characteristics lead to three different possible scenarios:

- If interest rates are within the corridor, the central bank does not engage in OMOs ($\Delta B_t = 0$), and the interest rate will fluctuate depending on the unsterilized accumulation (or de-accumulation) of FX reserves and variations in money demand.[15] Again, this is a crude simplification that does not perfectly reflect the actual state of affairs. There may indeed be open market operations that take place when the interbank rate is within the corridor; the general point, however, is that these may not stabilize the market interest rate.

- If interest rates reach the interest rate floor ($\underline{R}_t$), then the floor rate becomes the relevant interest rate in the economy ($R_t = \underline{R}_t$). OMOs are automatically implemented to ensure the interest rate stays at that rate, and their value is given by the difference between the demand for nominal money balances and the equilibrium accumulation of FX reserves:

$$\Delta B_t = \frac{1}{\theta}\Delta \mathrm{M}_t - \frac{1-\theta}{\theta}\Delta \mathrm{IR}_t^*.$$

- If interest rates reach the upper end of the corridor ($\bar{R}_t$), the central bank injects liquidity via the purchase of domestic assets:

$$\Delta B_t = \varsigma(R_t - \bar{R}_t)$$

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[14] For simplification, we abstract from the fact that recent periodic liquidity injections, through central bank repo operations, have been transacted at interest rates slightly higher than the official refinancing rate.

[15] We do not distinguish between open market operations and other transactions that affect the size of the central bank's net domestic assets (e.g., the issuance of central bank notes), including standing facilities, and define them all as OMOs. This is a simplification that does not alter the results of the model.

Note that ς is relatively small, which implies interest rates higher than the ceiling ($R_t > \bar{R}_t$) are possible. This is the way in which $\bar{R}_t$ is considered a soft ceiling.

Note that, as in the current framework in Kazakhstan, there is an inherent asymmetry between shocks that push interest rates up versus shocks that push interest rates down. We will explore the implications of this asymmetry in our simulations.

We assume that $\bar{R}_t$ and $\underline{R}_t$ vary with changes in economic conditions.

$$\begin{cases} \bar{R}_t = \rho_R \bar{R}_{t-1} + (1-\rho_R)(\bar{\sigma}_\pi \pi_t \; - \bar{\sigma}_{\Delta RR^*}\, \Delta IR_t^* + \bar{R} \;\;) \\ \underline{R}_t = \rho_R \underline{R}_{t-1} + (1-\rho_R)(\bar{\sigma}_\pi \pi_t \; - \bar{\sigma}_{\Delta RR^*} \; + \underline{R} \;\;) \end{cases}, \quad \bar{R} \;\; > 0 > \underline{R} \;\; .$$

This appears consistent with the current framework in Kazakhstan, in which the corridor has adjusted over time in response to economic developments. In this specification, the corridor rates could be adjusted down when the central bank is accumulating FX reserves or when inflation is declining.

Analysis of a positive shock to the balance of payment ($x_1 > 0$)[16]

We now study the macroeconomic effects of an increase in $\mathbf{x_1}$. The dynamics of x_t are given by the following stochastic process:

$$\Delta x_t = \rho_X \Delta x_{t-1} - \varepsilon x_{t-2} + \epsilon_{x,t}$$

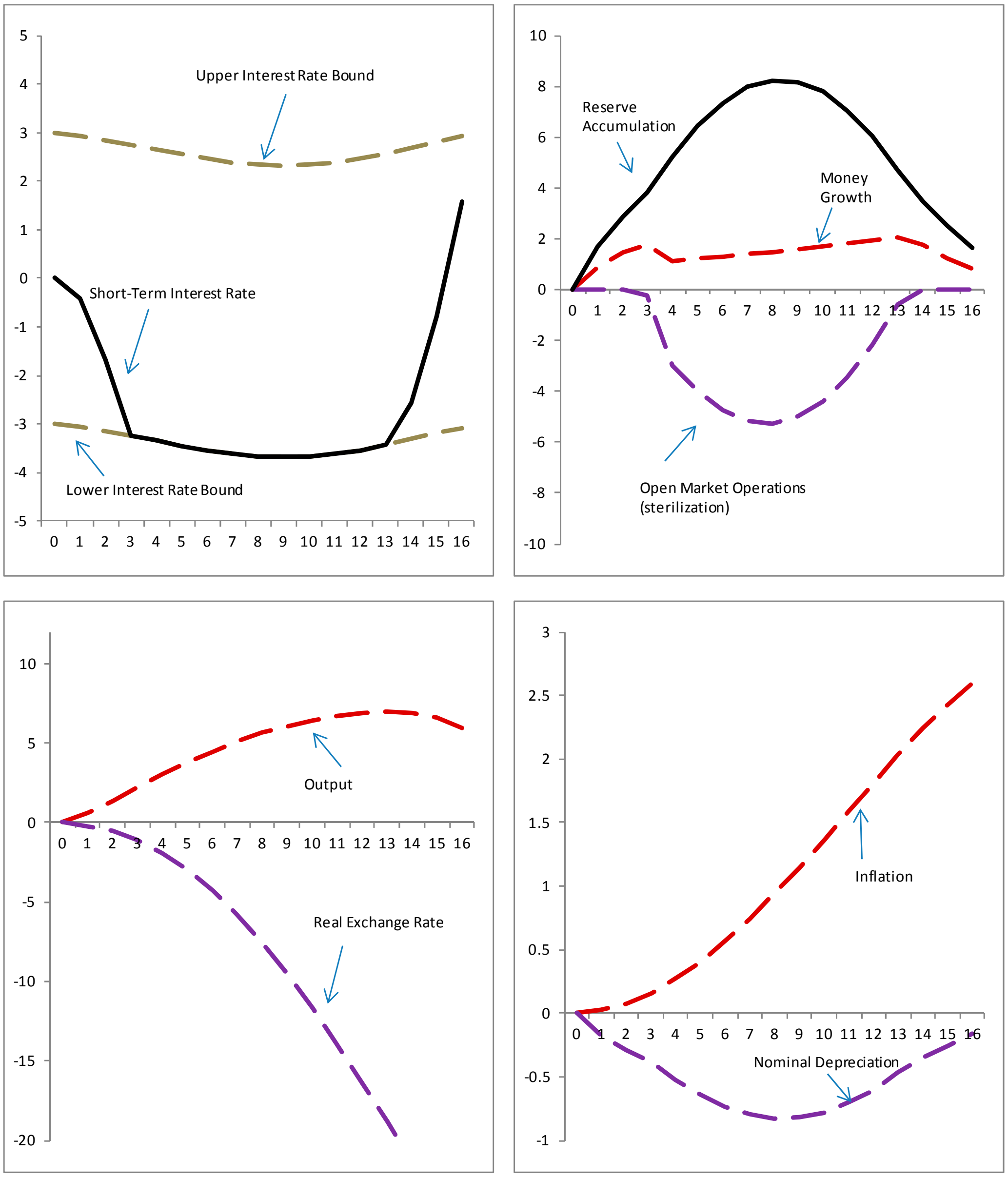
This process ensures that the increase in x_t is both persistent and amplified over time—with amplification given by ρ_X, while a small but positive value of ε ensures the system remains stationary.

The simulation results are presented in Figure 5. An increase in x_1 causes (ceteris paribus) an incipient nominal (and real) appreciation to clear the balance of payment. This incipient appreciation triggers an intervention in the FX market by the central bank. Given the absence of sizeable OMOs (inside the interest rate corridor) the accumulation of FX reserves results in an injection of liquidity. The latter causes a decrease in short-term interest rates, which stimulates the economy, leading to both an increase in output and a rise in inflation. As the initial spike in x_t amplifies over time, the short-term interest rate continues to decline until it reaches the interest rate floor $\underline{R}_t$. Once this happens (in period 3 of the simulation), the central bank begins to sterilize any additional accumulation of FX reserves to ensure the interest rate does not fall below $\underline{R}_t$. This can be inferred from the path of ΔB_t: it

[16] For model calibration and choice of parameters see Appendix I.

stays at zero for two quarters before becoming largely negative after that. Note that, while interest rates stabilize at the floor rate, and do not fall below that rate, the stance of policy stays accommodative. This stance further fuels the expansion in output and inflation. In the context of a broadly stable nominal exchange rate, the sustained increase in inflation is associated with a persistent real exchange rate appreciation.

Figure 5. Impulse Response, Positive Shock to x, Current Framework



Source: IMF staff model simulations.

The original positive BoP shock eventually winds down. Before that however, the decline in interest rates, the expansion in output, and the real exchange rate appreciation start to create offsetting pressures in the balance of payments. These pressures reduce the pace of FX reserves accumulation and therefore reduce the need for OMOs. In addition, the rise in output and prices increase the demand for nominal money balances. Eventually, the combination of higher money demand and reduced FX reserve accumulation push the interest rate above the floor (in current simulation, this occurs in quarter 13).[17] Once the BoP pressures go from positive to negative, the central bank must switch from buying to selling FX reserves (not shown in this simulation). Interest rates will continue to increase; depending on the degree of overheating in the economy rates may even hit the ceiling. A truly binding ceiling is problematic because it limits the economy's ability to stabilize its BoP, a soft ceiling does not have this feature. Letting the exchange rate float on the other hand (not shown) reduces the need to raise interest rate and can also help reestablish external balance, though with different effects on the real economy.

The above simulation shares some of the features that have been observed in Kazakhstan since the global financial crisis. After a period of high interest rates, improvements in the balance of payments (triggered in part by an exchange rate adjustment) resulted in a declining short-term interest rate, which eventually hit the floor. The decline in interest rates is associated with FX reserves accumulation. In addition, it is around the time when interest rates hit the floor that deposits by commercial banks at the NBK start to increase, consistent with the path for OMOs shown in Figure 5. The more recent spike in interest rates, and the associated decline in deposits and accumulation of FX reserves, is also consistent with the predictions of the model, although it also likely reflects a negative BoP shock as argued below. One area where the above simulations do not seem to match recent history is the dynamics of inflation. Inflation does not show an increase during this period, instead it has stayed broadly constant. One possible reason why this has been the case is that the financial system has not fully recovered from the aftermaths of the global crisis, so that excess liquidity has not translated into aggregate demand pressures and high inflation. From this perspective, the accommodative stance (low interest rates) could be considered appropriate in order to facilitate banking sector resolution and support a resumption of credit expansion.

Analysis of a negative shock to the balance of payment ($x_1 < 0$)

We now study the effect of a negative shock to the BoP. For simplicity we maintain the same stochastic process, and simply change the sign of the shock. In a perfectly symmetric

[17] The actual period in which the floor rate becomes (and stops being) binding is specific to the structure and the calibration of the stylized model, and therefore does not have any specific quantitative empirical relevance. It is simply meant to illustrate that a positive shock to the balance of payment can self correct in terms of its impact on the monetary policy stance.

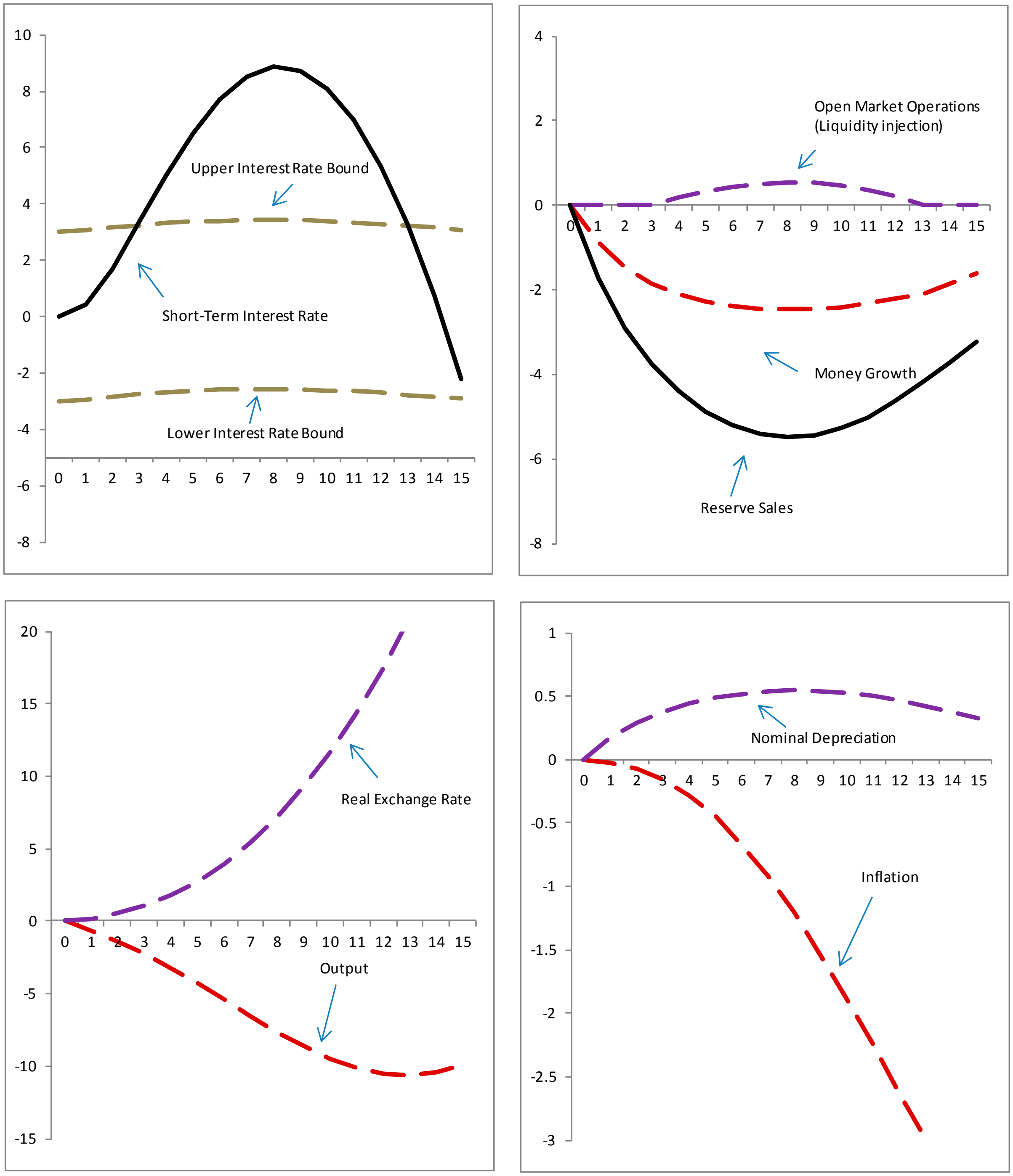
regime, the analysis of this shock would be redundant, as the macro effect would be the mirror image of the positive shock. However, the asymmetry described in the previous section implies that negative shocks to the BoP will have different effects. We study these effects here.

The simulation results are presented in Figure 6. A decrease in x_1 triggers FX sales by the central bank, to help offset incipient depreciation pressures. The interventions result in a withdrawal of liquidity and raises interest rates. If the shock is large enough, the interest rate eventually hits the ceiling of the corridor, which in this simulation takes place in period 3. Once it does, the central bank undertakes OMOs to inject liquidity. However, the response is insufficient to prevent the rate from breaking the ceiling; the more passive the central bank the higher interest rates will go. The calibration of the model assumes a very passive policy, which can be seen in the very small volume of OMOs relative to the decline in reserves and the overshooting of interest rates relative to the ceiling. The real effects of the shock, in absolute terms, are therefore larger: a larger decrease in output and inflation and a larger real depreciation.

The above simulation can also help understand the effect of an expected devaluation of the tenge. If market participants fear a devaluation they will reduce their local currency positions and put pressures on FX reserves. This will result in a contraction of liquidity and raise interest rates, which at the margin will help offset the demand for FX. In this simulation, the combination of higher interest rates and reserve drawdown is all that is needed to reestablish external balance. However, this configuration may prove unsustainable if pressures persist and the central bank starts to run out of reserves, or if the interest rate increase is considered too high. In this case, an actual devaluation (which we do not study here) may be inevitable.

One implication of a soft ceiling on interest rates is that reserve loss is smaller than in the case of a hard ceiling (results not shown). Unlike in the case of a hard ceiling, a soft ceiling allows interest rates to do more of the work in terms of stabilizing the BoP. This may reflect a hierarchy of objectives: in the context of a heavily managed exchange rate, preserving reserves may be considered more important than stabilizing interest rates. As we will see next, alternative frameworks will imply different policy priorities.

Figure 6. Impulse Response, Negative Shock to x, Current Framework



Source: IMF staff model simulations.

IV. A Model-Based Analysis of Alternative Policy Regimes

We now discuss the effects of the same shocks under two alternative regimes. In these regimes, we assume that the central bank has the framework in place to perfectly control short-term interest rates, the dynamic of which are now given by a policy rate. What sets the regimes apart is the relative importance of the various factors that drive the policy rate and the degree of exchange rate flexibility. The purpose of these simulations is to illustrate both the advantages and some of the challenges of having greater influence over short-term interest rates while also trying to manage the exchange rate.

Interest rates are now given by a rule and are no longer the result of changes in money demand and money supply. The alternative regimes differ in the values given to three policy parameters: $\sigma_\pi, \sigma_{\Delta RR^*}$, β (see Appendix I). In both cases, the interest rate rule is as follows:

$$R_t = \rho_R R_{t-1} + (1-\rho_R)(\sigma_\pi \pi_t \ - \sigma_{\Delta RR^*}\, \Delta IR_t^* \ )$$

While we assume that there is still an interest rate corridor, with $\bar{R}_t = R_t + \bar{R}$ and $\underline{R_t} = R_t + \underline{R}$, the corridor is not as relevant as before, given that the central bank actively engages in OMOs.

The two regimes can de described as follows:

- Under alternative regime 1, the central bank uses the interest rate both to respond to inflation and to help support the management of the exchange rate. Specifically, when FX reserves accumulation increases, the central bank lowers the interest rate, which reduces BoP inflow pressures ($\sigma_\pi > 0, \sigma_{\Delta RR^*} \ > 0$).

- Under alternative regime 2, the central bank uses the interest rate to focus exclusively on inflation ($\sigma_\pi > 0, \sigma_{\Delta RR^*} \ = 0$) but allows for greater exchange rate flexibility (lower value of β).

Analysis of a positive shock to the balance of payment under two alternative regimes

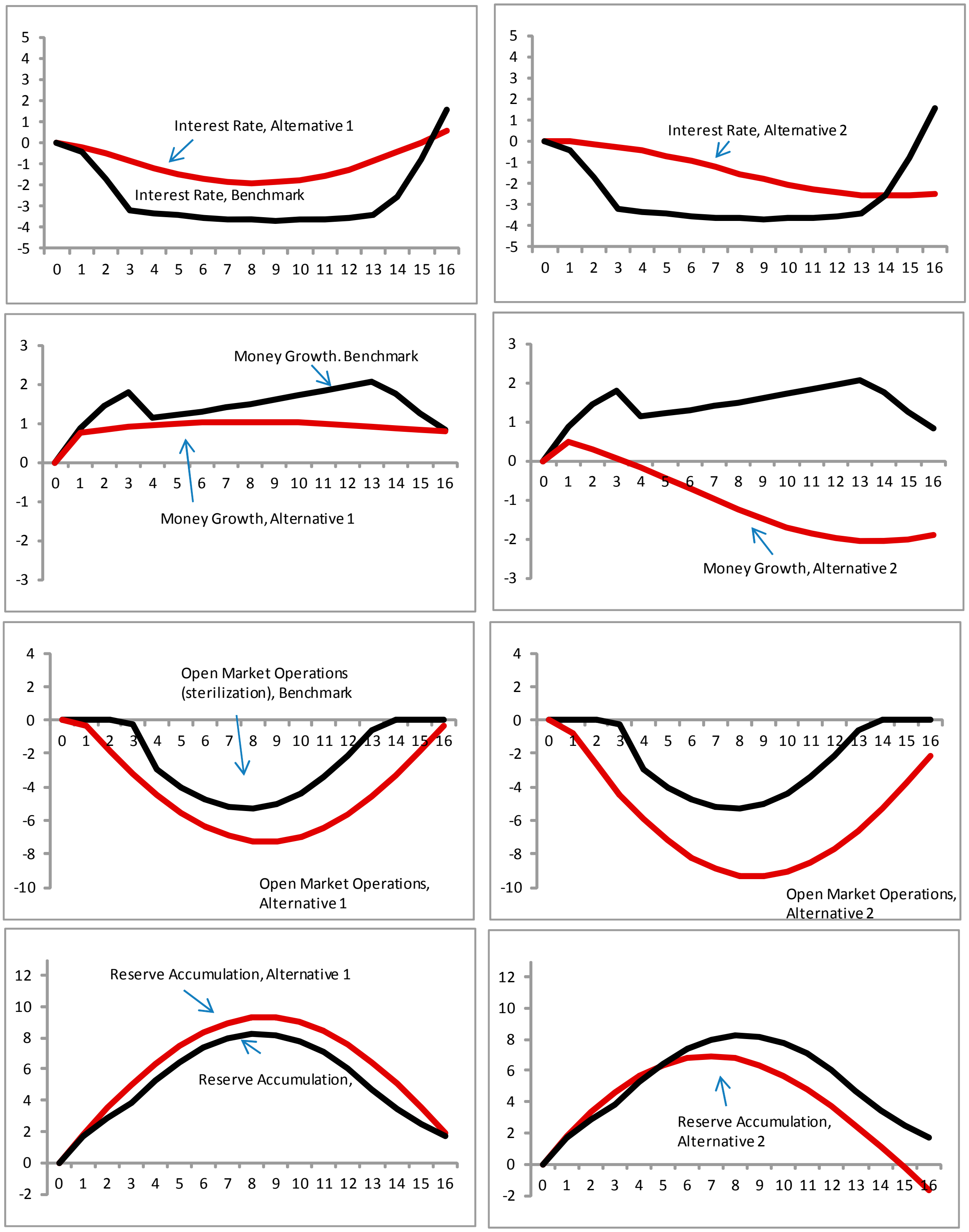
Figures 7 and 8 compare the dynamics under the current system—referred to as the benchmark case—and the two alternative regimes.

Under alternative regime 1, the authorities' influence of the interest rate is reflected in the flatter path of this variable and the smaller nominal money growth. Preserving the level of interest rate results in higher FX reserves accumulation than under the benchmark case, as the large decline in interest rates under the latter helps offset the positive BoP pressures. Under the alternative regime, the resulting accumulation of FX reserves leads to small decline in interest rates (following the interest rate rule described above) and a slightly accommodative stance. Higher reserve accumulation does result however in significantly higher OMOs, which, as expected, are triggered sooner than under the benchmark case. The increase in output and inflation is smaller than in the benchmark case.

Under alternative regime 2, greater exchange rate flexibility is associated with lower accumulation of FX reserves and a much larger nominal exchange rate appreciation. The nominal appreciation helps reduce the aggregate demand pressures, which is reflected in a more stable level of output. Inflation declines as a result of the large real exchange rate appreciation. Lower prices and stable output result in lower demand for money balances; and OMOs must increase despite the lower accumulation of FX reserves, simply because the demand for nominal money balances declines with inflation.

Figure 7. Impulse Response, Current vs. Alternative Regimes

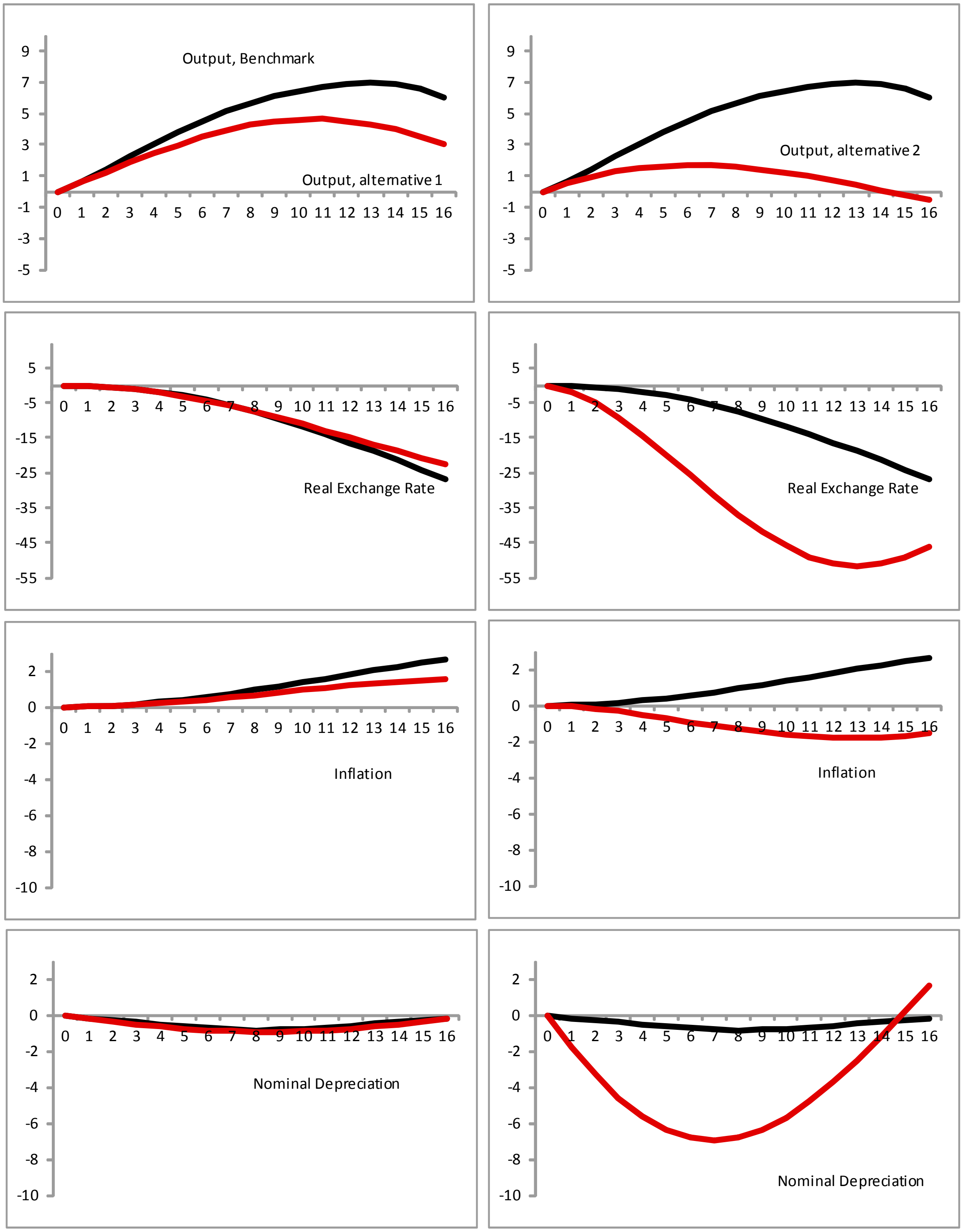
(Short-Term Interest Rate, Money Growth, OMOs, Reserve Accumulation)



Source: IMF staff model simulations.

Figure 8. Impulse Response, Current vs. Alternative Regimes

(Output, Real Exchange Rate, Inflation, Nominal Depreciation)



Source: IMF staff model simulations.

An additional way to highlight the differences between the regimes is provided in Table 1. The table displays summary statistics for the volatility of all the variables in the model across the two alternative regimes.[18]

Table 1. Relative Volatility Across Regimes, Positive BoP Shock

Variable/Regime	Alternative Regime 1	Alternative Regime 2
R	0.18	0.33
ΔM	0.38	0.87
ΔB	2.55	4.56
ΔIR^*	1.40	0.68
y	0.45	0.05
s	0.78	7.64
π	0.42	0.83
ΔS	1.40	68.19

The summary statistics show there are advantages as well as challenges from greater central bank control over the short-term interest rate. One general lesson is that greater influence over the short-term interest rate helps stabilize inflation and output, regardless of the alternative regime specified. However, direct influence over the short-term interest rate requires that the central bank stand ready to withdraw or inject liquidity as necessary through a considerable increase in OMOs. The flip side of greater volatility in OMOs is that nominal money growth volatility is reduced significantly.

The summary statistics also shows that there are tradeoffs across the alternative regimes. Greater influence over both interest rates and the nominal exchange rate puts more pressures on FX reserves, as in the case under alternative regime 1. Under alternative regime 2, greater exchange rate flexibility can help achieve greater output stability, but it comes at the expense of very large swings in nominal exchange rates. Moreover, while it reduces pressures on FX reserves accumulation, it does not necessarily reduce the volume of OMOs.

[18] Volatility is defined as the sum of the squared values of the impulse responses over the first 16 quarters. The figures are ratios of the volatility under an alternative regime relative to the volatility under the benchmark specification; hence, ratios below (above) 1 reflect lower (higher) volatility under the alternative regime.

Analysis of a negative shock to the balance of payment under two alternative regimes

We now briefly review the performance of the two alternative regimes under a negative shock to the BoP. Unlike the baseline, the alternative regimes imply symmetric response to a negative BoP shock. We therefore abstract for impulse response analysis, which would be the mirror image of those in Figures 7 and 8, and focus instead on relative volatilities. These are summarized in Table 2.

Table 2. Relative Volatility Across Regimes, Negative BoP Shock

Variable/Regime	Alternative Regime 1	Alternative Regime 2
R	0.05	0.08
ΔM	0.20	0.43
ΔB	267.06	475.38
ΔIR^*	2.49	1.21
y	0.23	0.02
s	0.66	7.79
π	0.21	0.46
ΔS	2.49	121.05

The difference between the current framework and the alternatives are even starker in this case. Relative to the current framework, the effect of the shock on real variables is now smaller, which can be seen in the lower volatilities of nominal interest rates, output, and inflation. This requires however a fundamental change in the authorities' willingness to implement open market operations (liquidity injections) when the BoP is under pressure, which is reflected here in the two-hundredfold and four-hundredfold increase in the volatility of ΔB under the two alternative regimes.

The difference between the two alternative regimes is also starker in the presence of negative shocks to the BoP. As in the previous simulation, the first alternative regime—which assumes stronger exchange rate management than the second alternative regime—yields lower real and nominal exchange rate volatility. This comes at the cost of higher output volatility and greater loss of reserves, i.e., higher reserve volatility. However, in this case, the loss of reserves is considerably larger than the baseline. Such pressures may expose the regime to an even stronger run on reserves, e.g., if the initial level of reserves is low or if market participants have doubts about the commitment to such a regime. These pressures, which are already present in the baseline, are less of an issue in alternative regime 2, because of the greater exchange rate volatility. So some combination of higher interest rates or greater exchange rate flexibility may be inevitable.

V. Policy Implications and Conclusion

The paper illustrates the benefits that the NBK can achieve from greater use of instruments that more directly steer key short-term interest rates. While the authorities have been successful in containing inflation, and the central bank over the past two years has taken important measures to enhance its ability to regulate liquidity in the financial system, gaining further influence over short-term interest rates requires the introduction of a new benchmark policy rate. As the model simulations show, lack of full control over the short-term interest rate can undermine the framework's ability to counteract shocks, both external and domestic. The devaluation of the tenge in early 2009 and again in early 2014 underscored the challenges facing the current framework in the presence of liquidity shocks.

Greater influence over short-term interest rates necessitates the ability to undertake substantial open market operations. As the model results suggest, the need for greater and more frequent open market operations poses an important challenge for policy making. Moreover, although control of money market interest rates in the context of considerable exchange rate management does not necessarily imply more OMOs, relative to a more flexible exchange rate regime, it does require substantially larger FX intervention. The combination of large OMOs and large FX intervention adds to the policy challenge.

To anchor expectations about policy intentions and operations, it would be important to openly communicate the transition plans to a new policy rate. The introduction of a new policy rate may involve, at first, a tightening (or easing) of monetary conditions, including some nominal exchange rate appreciation (or depreciation) of the currency, and could be phased in as macroeconomic conditions require. To ensure successful transition, and to help anchor expectations about policy intentions and operations, the NBK will need to carefully communicate the stance of policy as it prepares the markets and the public for the implementation of the new policy rate regime.

Appendix I

Model Calibration

The choice of parameters is tentative; it is meant to capture the structure of the Kazakhstan's economy while also ensuring that the model delivers plausible dynamics. The latter requirement is implemented iteratively: starting with an initial calibration, parameter values are adjusted until the various impulse responses look sensible. The calibration of the model is presented in Table A1. Note that the value of α is small but positive, which implies the expenditure switching effect of the exchange rate on aggregate demand dominates the negative effect stemming from liability dollarization. Lower positive values or even mildly negative ones yield broadly similar results.

Table A1. Calibration

Parameter	Value	Parameter	Value
ω	0.5	τ	0.05
φ	0.1	σ	0.05
δ	0.1	β	10
θ	0.5	$\bar{R}$	3
ϑ	0.5	$\underline{R}$	-3
γ	0.1	$\bar{\sigma}_{\Delta RR^*}$	0.1
α	0.05	$\bar{\sigma}_{\pi}$	0.1
μ	0.3	ρ_R	0.6
ς	0.1		

The choice of parameters merits a few comments. The value of ω is relatively low, which makes capital inflows somewhat unresponsive to movements in domestic interest rates. This seems realistic; it also allows the central bank to potentially control both the interest rate and the nominal exchange rate, as discussed under the alternative regimes. In terms of monetary policy, the values of $(\underline{R}, \bar{R})$ensure that there is a 600 basis points gap between the two rates (which seems a good approximation to the corridor in Kazakhstan). The choice of β ensures the exchange rate is heavily managed but not actually pegged, while the value of ς implies very little OMO if interest rates hit the ceiling of the corridor. Finally, the values of

($\bar{\sigma}_{\Delta RR^*}$, $\bar{\sigma}_{\pi}$) allow for very muted responses to developments in international reserves or inflation.

The calibration parameters for modeling the BoP shocks are presented in Table A2.

Table A2. Calibration of Process for x_t

Parameter	ρ_X	ε	$\epsilon_{x,1}$
Value	0.97	0.03	3,-3

The calibration parameters reflecting the two alternative regimes are presented in Table A3.

Table A3. Policy Calibration, Alternative Regimes

Parameter	β	σ_{π}	$\sigma_{\Delta RR^*}$
Alternative Regime 1	10	1.2	0.3
Alternative Regime 2	1	1.5	0

Appendix II

Analysis of a Positive Shock to Domestic Prices ($\epsilon_{\pi,1} > 0$) Under the Benchmark Case and the Two Alternative Regimes

We now briefly discuss the role of the policy regime when there is an exogenous increase in inflation, the simulation of which is presented in Figure A1 and Table A4. We assume an exogenous increase in inflation of 100 basis points. The increase in inflation has two notable effects, even before the monetary policy response is considered. First, it results in a real appreciation (not shown), which, ceteris paribus, creates BoP pressures and can affect economic activity. Second, it results in an increase in demand for nominal money balances.

Under the benchmark case, the increase in the demand for nominal balances is not accommodated and would result in a rise in interest rates,[19] by close to 300 bps (at the peak). This tightening stance of monetary policy would help lower inflation but at the cost of a sizeable economic contraction.

In contrast, under either alternative regime, the increase in money demand is automatically accommodated. Hence, its impact on monetary policy is minimal and dictated by the direct response of the monetary authorities (via their decision of what to do with the policy interest rate). Under the rule specified above, monetary policy would still be tightened somewhat, and inflation would gradually decrease over time, but the decline in output would be much smaller. The different behavior of macro variables is corroborated by Table A4: output and interest rate volatility are smaller in the two alternative regimes, while the opposite is true with money and open market operations. It is important to note that the prediction of a contractionary monetary policy response under the alternative regimes, even if small, should be interpreted with caution. An equally plausible scenario is that, in the case of shocks to fuel or food or regulated prices, the authorities may allow the first round effect of the inflationary shock without tightening policy, in which case output would not necessarily decline.

The simulations of $\epsilon_{\pi,1}$ under the various policy regimes considered highlight the importance of controlling the short-term interest rate to stabilize the economy. In regimes that do not engage in active open market operations to influence the short-term interest rate, fluctuations in the latter variable are the result of swings in the demand for nominal balances or balance of payment development. This injects unnecessary volatility in domestic financial conditions and therefore, potentially, in the real economy as well. As the

[19] Under the benchmark case, which lacks OMOs, the policy framework is not well suited for accommodating changes in money demand.

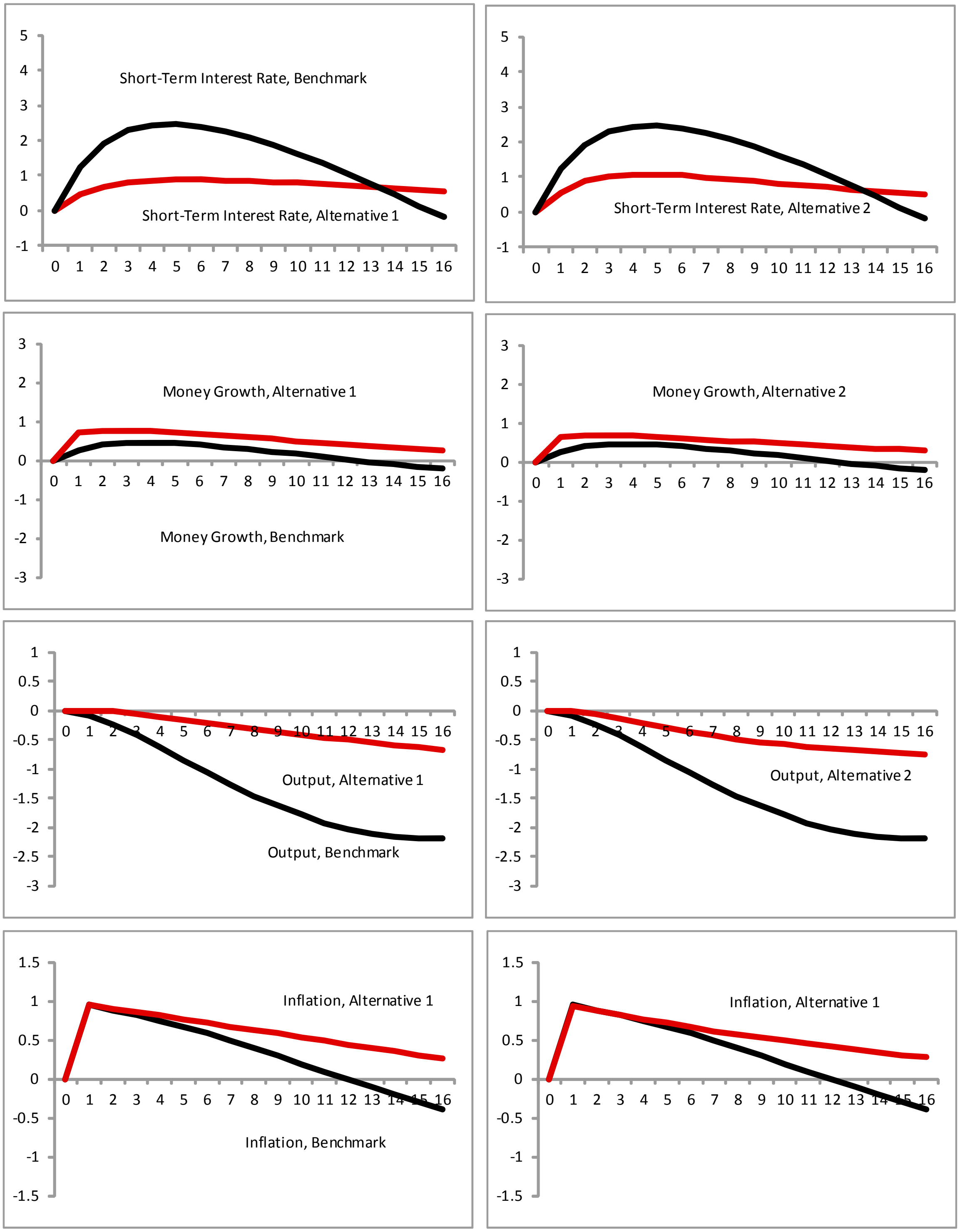
previous simulations suggest, this additional volatility can be avoided with a more active use of central bank instruments.

Table A4. Relative Volatility Across Regimes, Domestic Price Shock

Variable/Regime	Alternative Regime 1	Alternative Regime 2
R	0.18	0.23
ΔM	3.87	3.28
ΔB	27.09	21.03[20]
ΔIR^*	0.32	0.19
y	0.12	0.11
s	1.37	1.24
π	1.46	1.31
ΔS	0.32	18.92

[20] In the benchmark case, there are no open market operations in this simulation as the interest rate does not hit the ceiling. As the volatility of open market operations under the benchmark is zero, we present the *absolute* volatility of the open market operations under the two alternative regimes, as opposed to the volatility relative to the benchmark. Volatilities for the other variables are presented as in the previous case, i.e., in relative terms.

Figure A1. Cost Push Shock, Current vs. Alternative Regimes



Source: IMF staff model simulations.

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