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Strengthening the Monetary Policy Framework in Korea

by Kevin Clinton, R. Sean Craig, Douglas Laxton, and Hou Wang

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Abstract

Adoption of inflation targeting by the Bank of Korea (BOK) in 1998 contributed to low and stable inflation. However, after the global financial crisis (GFC) monetary policy faced more challenging conditions. Inflation slipped below the target range in 2012 and remains below it despite a cut in the target to 2 percent in 2016. Policy also became more complex with the addition of financial stability to the central bank's mandate. To address these challenges, this paper proposes a two-pronged approach to strengthen the effectiveness with which monetary policy can meet its objectives: first, enhanced communication on how the target will be achieved over the medium-term, building on a forecasting and policy analysis system; and, second, by clarifying the complementary role of macroprudential policy in containing financial stability risks so that monetary policy can focus on the inflation target. Simulation of a macro model calibrated to Korea illustrates how it can be used to provide this greater medium-term focus on achieving the inflation target and strengthen communication.

Author's E-Mail Address: KClinton@rogers.com; RCraig@imf.org; DLaxton@imf.org; Hwang2@imf.org

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Boxes

Glossary

CPI	Consumer Price Index
BOK	Bank of Korea
ELB	Effective Lower Bound (of the Nominal Interest Rate)
ERIR	Equilibrium Real Interest Rate
FPAS	Forecasting and Policy Analysis System
GFC	Global Financial Crisis
IFB	Inflation-Forecast Based Policy Reaction Function
IFT	Inflation-Forecast Targeting
IMF	International Monetary Fund
IT	Inflation Targeting
MPC	Monetary Policy Committee
MPR	Monetary Policy Report
OPT	Optimal, Loss Minimizing Policy Reaction Function

Strengthening the Monetary Policy Framework in Korea

"Credibility comes from the demonstration that the government has a consistent policy framework and can explain and learn from past errors in the context of that framework." (Dooley, Dornbusch and Park, 2002.)

I. INTRODUCTION

This paper assesses the challenges facing monetary policy under inflation targeting (IT) since the Global Financial Crisis (GFC) when the economic environment become more challenging and financial stability was added to the central bank's mandate. It argues that the effectiveness of policy could be enhanced by further strengthening communications and the policy framework. The next section reviews Korea's experience with IT after the GFC as inflation fell below its target range. Section III outlines the key challenges facing monetary policy: the risk of de-anchoring inflationary expectations; a declining equilibrium real interest rate; exchange rate volatility; and potential tensions between central bank inflation and financial stability objectives. Section IV outlines a two-pronged approach for how enhanced communications with a greater medium-term policy focus can address these challenges, by: (i) elaborating how the policy rate needs to be adjusted to achieve the target over the medium term (i.e. communicating the central bank's "reaction function"); and (ii) clarifying the complementary role of macroprudential policy in containing financial stability risks, which limits incentives for monetary policy to "lean against the wind." Section V uses simulations of a model calibrated to Korea to illustrate how development of a forecasting and policy analysis system can strengthen the medium-term focus of monetary policy. Section VI concludes.

II. INFLATION TARGETING AFTER THE GFC

A. Inflation Targeting Performance

Korea adopted inflation targeting as the foundation for monetary policy in 1998. The government and the Bank of Korea (BOK) agreed on a new IT policy framework in conjunction with other reforms following the 1997–98 Asian crisis. Policy performance improved, with inflation remining relatively stable around its target (Figure 1). This success partly reflected the benign global environment associated with "the great moderation," and the steady appreciation of the won after its sharp fall in the Asian crisis (Park and Wyplosz (2009)). After the GFC, however, monetary policy faced a more difficult environment. Growth was relatively weak and remained below potential. The associated output gap and a global deflationary shock from a fall in commodity prices pushed inflation below its target range in 2012. In 2014, inflation expectations also fell below the target range, pointing to a weakening of the nominal anchor provided by monetary policy.

The policy framework also evolved, notably with the addition of a financial stability objective to the mandate of the BOK in 2011 (Box 1). This required balancing inflation and financial stability objectives, making the communication challenge more complex as the central bank needs to

explain how it will achieve both objectives. A conflict between objectives arises when the policy interest rates needed to narrow the output gap is low enough to also exacerbate financial stability risks.[1] This may have been the case in Korea when inflation fell below target and the policy rate was cut to a low of 1.25 percent. The concern that the central bank will deviate from its inflation

Figure 1. Inflation and Consensus Inflation Expectations

Korea: Actual and Expected Inflation and the Inflation Target
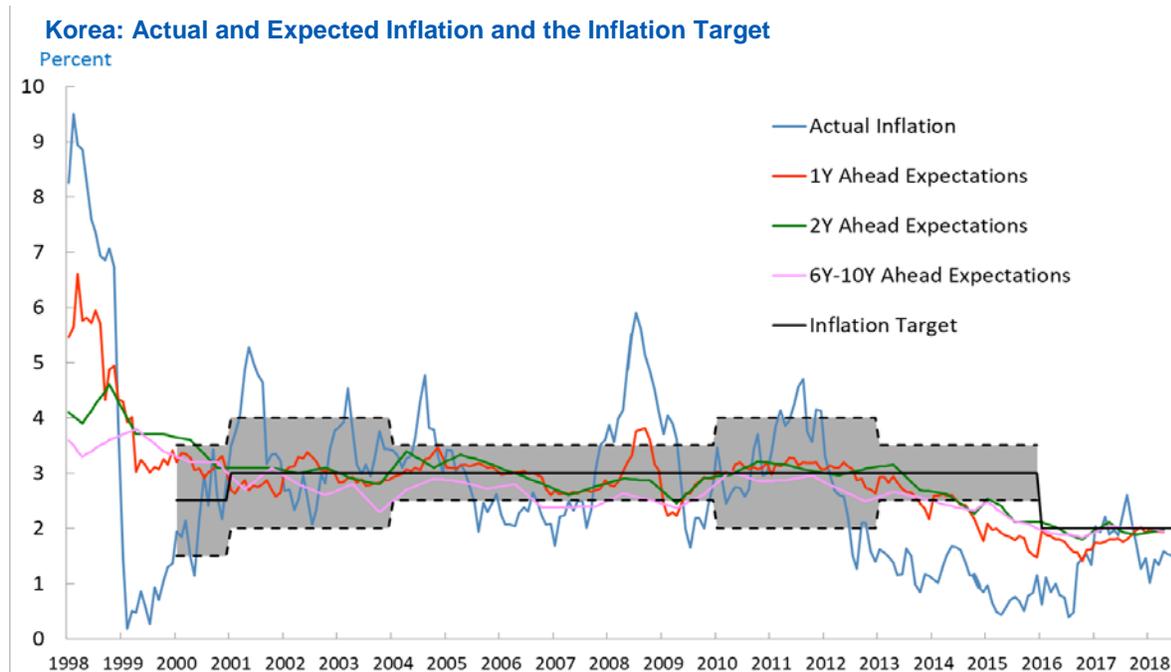
Source: Consensus Economics

target to target financial stability weakens the credibility of the nominal anchor.

In June 2016, the BOK replaced the 2½–3½ percent target range with a point target of 2 percent —a percentage point cut relative to the midpoint of the range. This was done as part of the BOK's regular triennial review of the monetary policy framework, based on an assessment that the optimal inflation target had declined owing to structural changes in the inflation process due to factors such as rapid population aging. It also aligned the target with what had become the standard in most advanced economies.[2] While this cut may be justified, it's timing posed a risk to the credibility of the anchor provided by the inflation target. With inflation below target, it contributed to a perception that the target was cut to match the lower inflation rate in preference to the aggressive easing needed to push inflation back to the old target.

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[1] This potential tradeoff is discussed extensively in the literature. See IMF (2015) and Borio (2016).

[2] Some economists argue that the inflation target should be higher than 2 percent to reduce the risk of hitting the effective lower bound (e.g., Ball 2014, and Blanchard, 2014).

Box 1. General Principles of Monetary Policy Operation

In 2016, the Bank of Korea provided a statement of General Principles of Monetary Policy. The goal of monetary policy in the Bank of Korea Act is to: "contribute to the sound development of the national economy through ensuring price stability, while giving due consideration to financial stability in carrying out its monetary policy." In accordance with this, the Bank sets specific targets and objectives to enhance the transparency, predictability and effectiveness of monetary policy that reflect the general principles summarized below:

- **Inflation targeting.** The BOK maintains a flexible inflation targeting system to achieve price stability, which is the primary objective of monetary policy. The inflation target is currently set at a 2 percent rate of consumer price inflation (year-on-year).

- **Medium-term horizon.** The inflation target is meant to be achieved over a medium-term horizon. This reflects domestic and external factors that can have transitory and irregular effects on inflation in addition to the effect of monetary policy; and, the lag in monetary policy transmission.

- **Forward-looking operation.** The BOK conducts its monetary policy in a forward-looking manner, while considering symmetrically the risks of inflation remaining persistently above or below the target. The path of convergence of inflation toward the target is assessed based on the overall inflation and growth outlooks, as well as their uncertainties and risks, and on financial stability conditions.

- **Flexible operations.** The Bank conducts its monetary policy to support real economic growth to the extent that this does not hinder attaining the inflation target over the medium term.

- **Financial stability.** In ensuring price stability over the medium term, the Bank pays careful attention to the impact of monetary policy on financial stability.

- **Relation of financial stability to inflation targeting.** As persistent financial imbalances could undermine macroeconomic stability; and, consistent with the rationale behind flexible inflation targeting, due attention is paid to financial stability in conducting monetary policy.

- **Assessment of financial stability.** The Bank examines, assesses and reports on financial stability conditions on a regular basis to help prevent excessive buildup of financial imbalances that may be brought about by monetary policy implementation.

- **Harmonization with macroprudential policy**. Since there are limits to maintaining financial stability solely by monetary policy that affect the whole economy, monetary policy needs to be complemented by macroprudential policies to prevent accumulation of financial imbalance.

B. The Effectiveness of Monetary Policy after the GFC

The decline in inflation below target, the addition of a financial stability objective, and reduction in the inflation target, could potentially weaken the effectiveness of monetary policy. Effectiveness can be gauged by assessing the transmission of policy rate changes into long-term interest rates. An indicator of this is how well the future path of the policy rate is reflected in forward interest rate curves at different points in time (Figure 2). While the two can differ due to a risk premium in forward rates and unanticipated shocks, a closer alignment of the 2-year forward with the policy rate path over the subsequent two years would indicate that markets are correctly anticipating, and pricing-in, future policy rate decisions. This also depends on effective communication of policy intentions and the credibility of IT, which also should contribute to a closer alignment.

After the GFC, the upward slope of these forward curves correctly anticipated that the policy rate would be raised following sharp central bank rate cuts triggered in response to the GFC. In the rate cutting cycle starting in 2012, forward curves were mostly flat and just shifted down with each policy rate cut, suggesting that markets were not anticipating, and pricing-in, future rate cuts that occurred. This reflects BOK restraint in providing any specific forward guidance for the policy rate. It may be associated with the failure of bank lending rate to decline by the full extent of the policy rate reduction, as indicated by the widening of the gap between the two in Figure 2.

Figure 2. Policy Rate and 2-Year Forward Rate Curves in Korea

Source: Bloomberg.

Source: CEIC Data Company Ltd.
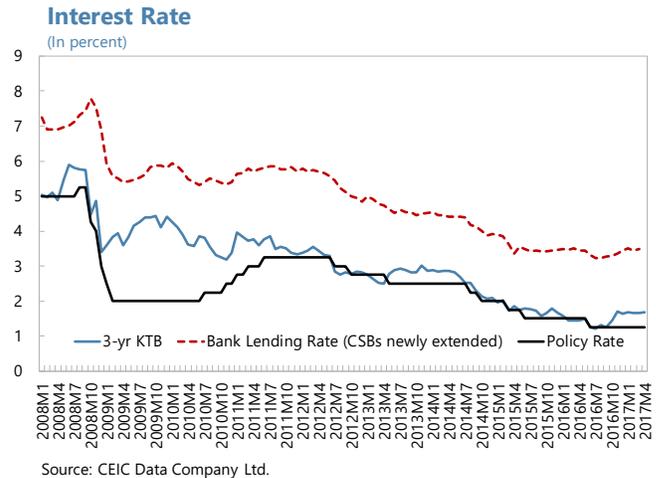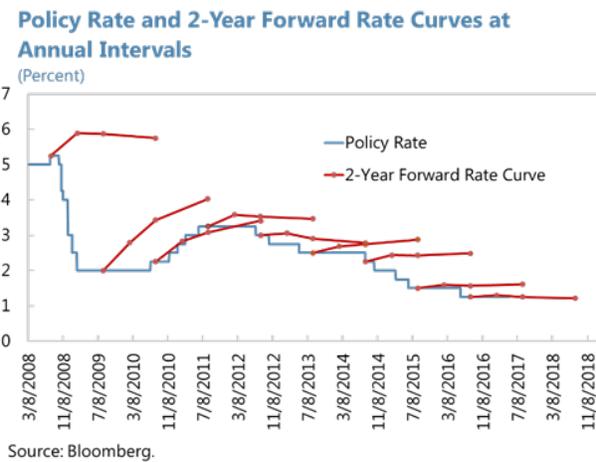
Overall, this analysis points to a weakening of credibility in the anchor as expected inflation fell below the target after 2014. With the cut in the target to 2 percent, inflation is now closer to, albeit still below, the new target. If it remains near the target, the credibility of the nominal anchor should improve gradually over time. However, monetary policy can accelerate this process through more active management of inflation expectations and by strengthening communication to address challenges that tend to weaken credibility.

III. MONETARY POLICY CHALLENGES AFTER THE GFC

To strengthening monetary policy effectiveness and the nominal anchor provided by the inflation target, four key challenges need to be addressed: management of inflationary expectations in a more uncertain post-GFC environment; the decline in the equilibrium real interest rate; exchange rate volatility, and tensions between financial stability and inflation objectives.

A. Managing Inflationary Expectations in a More Uncertain Environment

After the GFC shocks became larger and more varied, resulting in more persistent deviations of inflation from target. This makes credibility harder to sustain as it becomes more difficult for the public to verify that the central bank is acting to return inflation to target. As credibility weakens

this, in turn, undermines the effectiveness of monetary policy and increases the cost of achieving the target (i.e. raising the sacrifice ratio). This challenge can be addressed through more active management of expectations to help ensure that long-term inflation expectations remain more firmly anchored by the target. Active management of expectations involves strengthening communications of how the central bank intends to adjust the policy rate path to return inflation to target over the medium term. And, convincing the public that inflation is being brought back to target through implementation of policy that is seen to be consistent with this communication. In essence, this involves communicating the reaction function of the central bank.

Monetary policy effectiveness depends on the transmission of policy rate changes into long-term interest rates. As a short-term money market rate, the policy rate has a limited direct impact on economic activity. Rather, policy rate changes have an impact to the extent that they move long-term rates – the rates at which households and firms typically borrow and lend. This transmission is strengthened by communication of how the central bank intends to adjust the policy rate, which then is priced into longer term rates markets by financial markets.

B. The Decline in the Equilibrium Real Interest Rate

The equilibrium real interest rate (ERIR), the rate at which actual output stabilizes at potential output in the absence of temporary shocks, has declined in advanced economies since the GFC (Figure 3). The level of the ERIR relative to the real interest rate indicates the stance of monetary policy and how the central bank needs to adjust the policy rate path to return inflation to target. The decline in the ERIR implies that a lower policy rate is needed to hit the target.

Figure 3. Measures of Equilibrium Real Interest Rate
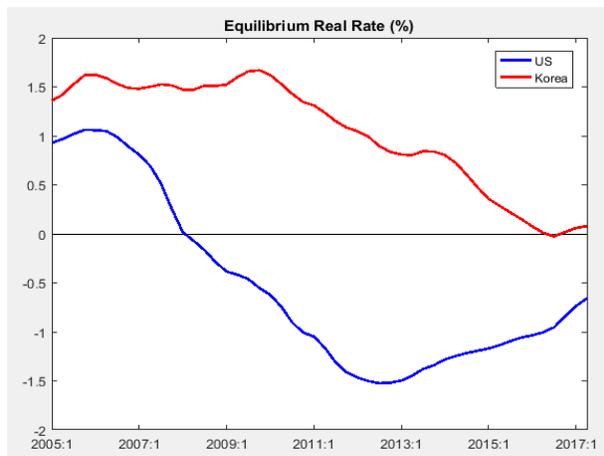
Source: Estimates derived from model in Section V.   Source: April 2017 Asian and Pacific REO.
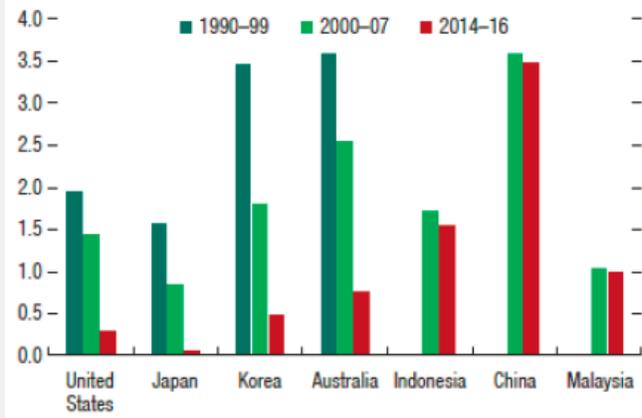
The decline in the ERIR makes the monetary stance more difficult to assess, increasing the scope for error in setting the policy rate. While more rigorous estimation of the ERIR can help; this uncertainty, and how the central bank will manage it, needs to be effectively communicated. This

helps limit the adverse effect of this uncertainty on monetary policy credibility. The decline in the ERIR appears substantial in many advanced economies, although there are a wide range of estimates depending on the model used. The model presented in Section V estimates the ERIR fell substantially in Korea and the US (Figure 3). A related challenge is that the decline in the ERIR increases the risk that the policy rate could hit the ELB in the event of a large negative shock. Given that monetary policy becomes less effective at the ELB, this justifies a more aggressive policy response when close to ELB, as discussed below.

C. Heightened Exchange Rate Volatility

While exchange rate flexibility is important to the effectiveness of monetary policy over the medium term, in the short-run exchange rate volatility can increase policy uncertainty. This tension is illustrated by the experience of Korea after the GFC, when the sharp increase in the output gap was associated with a roughly 30 percent depreciation of the won against the dollar, which helped reverse this increase. The won then rebounded 35 percent to reach a post-crisis high in 2014 as the gap narrowed (Figure 4). Since 2013, the correlation of the won with the output gap weakened, as volatility remained relatively high while the output gap stabilized. This suggests that the exchange rate plays an important role when shocks are large; but, in normal times it's role is muted by high short-term currency volatility.

Currency volatility increases the communication challenge of the central bank. By adding to the variability of inflation, it makes the inflation target more difficult to hit. This makes it harder to convince the public and financial markets that policies are being adjusted appropriately to achieve the target. This challenge can be addressed by strengthening communication of (i) the transitory impact of this volatility on inflation, and (ii) a commitment to a flexible exchange rate and to allow it to play its role in monetary transmission. When currency volatility is high, central banks can come under pressure to use foreign exchange intervention (FXI) to smooth this volatility. This can adversely affect the credibility of monetary policy by raising concerns that the exchange rate will not be allowed to play this role. Effective communication of a commitment to exchange rate flexibility and of the limited role of FXI (i.e. to address disorderly market conditions) can help avoid this risk.

Figure 4. Korean Output Gap (Red) and Won Exchange Rate (Blue)
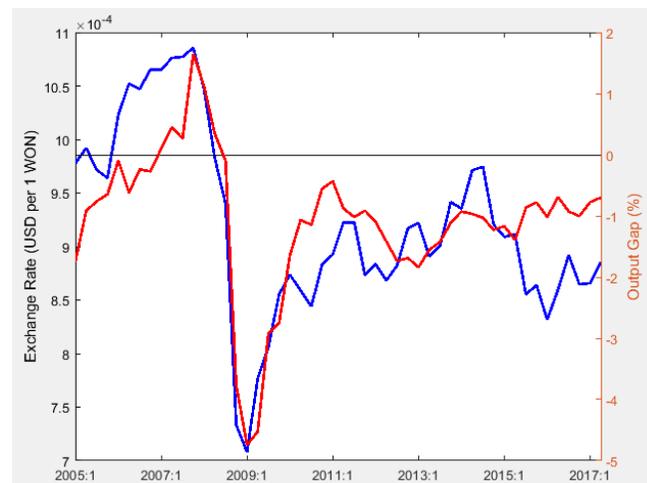
Sources: Output gap, authors' calculation. Exchange rate, IMF.

D. Balancing Financial and Monetary Stability Objectives

A conflict between financial stability and inflation objectives can arise when low interest rates needed to return inflation to target exacerbate risks to financial stability. This can compromise

the credibility of the inflation target by creating an incentive to raise policy rates prematurely and "lean against the wind" to contain financial stability risks (IMF 2015). This challenge arises when the central bank uses one instrument, the policy rate, to address two objectives. Use of macroprudential policy as a second policy instrument that targets financial stability risks can resolve this dilemma by allowing monetary policy to focus on the inflation target.

A strong macroprudential policy framework needs to be in place to enable the central bank to manage this conflict among its objectives. This ensures it has the influence over macroprudential policy needed to implement policies pre-emptively enough to contain financial stability risks, and that they will be sufficiently effective. Lack of these preconditions creates incentives for monetary policy to lean against the wind and diverts it from achieving its inflation target.

While in general monetary policy should stay focused on the inflation target, there are some circumstances when it has a role in addressing financial stability risks. When these risks materialize, monetary easing can help prevent financial distress from worsening the downturn. Also, in the wake of a collapse in asset prices or a banking crisis that disrupts financial intermediation, it may need to be diverted from its inflation objective temporarily to help stabilize financial or exchange markets (Woodford (2012)).

IV. STRENGTHENING MONETARY POLICY EFFECTIVENESS

This section outlines a two-pronged approach to strengthen the effectiveness of monetary policy. BOK communication is already very good but can still be improved further by clarifying: (i) how the inflation target will be achieved over the medium-term, building on a forecasting and policy analysis system; and (ii) how macroprudential policy will be used to contain financial stability risks so that monetary policy can focus on achieving the inflation target.

A. Bank of Korea Communication of Monetary Policy

Monetary Policy Reports (MPRs) during 2012–16 regularly highlighted weakness in the economy but generally provided limited guidance on how the policy rate would be adjusted. They note that lending rates did not respond fully to policy rate cuts and question whether markets are adequately pricing-in policy easing. The BOK recognizes that the effectiveness of IT depends on the credibility and communication of policies and, in 2016, signaled its intention to strengthen communication further:

"The Bank will improve the content and method of presentation of its monetary policy statements to strengthen the explanation of the backgrounds behind its policy decisions and the signals of its future policy directions. While maintaining consistency with the announced general principles, the statements will also be written in a way that enhances their connections with the economic outlooks. The scope of disclosure of materials from the MPB meetings for determining the policy directions will be expanded, through the Monetary Policy Report and press releases".

BOK communication now provides a very high level of transparency surrounding monetary policy decisions. Monetary Policy Committee (MPC) members' views on economic conditions,

and how policy should be adjusted are summarized in a statement by the Governor after each meeting. When a member casts a dissenting vote that differs from the MPC decision on whether to hold constant, or change, the policy rate, that member's assessment of macroeconomic and financial conditions underlying their vote is reported separately. This communicates well the MPC's assessment of the current policy stance, the diversity of views among MPC members, and the macroeconomic developments that could lead to policy rate adjustments in the future. Nevertheless, the experience of other countries suggests that there may be scope to strengthen monetary policy effectiveness through enhanced communication on how the central bank intends to adjust the policy rate to return inflation to target over the medium term.

B.   Bank of Korea Communication Relating to Financial Stability

The BOK's Financial Stability Report (FSR) provides high quality analysis of risks to financial stability and the impact of macroprudential policies. Overall, it shows that macroprudential policy has been effective, and that the policy framework is being strengthening (e.g. by the addition of a new Debt Service Ratio instrument). The effectiveness of this communication could be enhanced by broadening the scope of the FSR to clarify how tensions between inflation and financial stability objectives will be managed. Recent BOK (and MPC) statements on this have been relatively general. They indicated that monetary policy decisions are influenced by financial stability risks stemming from low policy rates and cite this as a factor in policy rate decisions. While this may reflect legitimate concerns about whether macroprudential policies can adequately contain risks, it can entail hidden costs by contributing to uncertainty about how the trade-off will be managed and, hence, the commitment to the inflation target.

This cost can be reduced through communication of the complementary roles of monetary and macroprudential policy. This can involve an assessment of the effectiveness of macroprudential policy and whether it can play its role as a second instrument targeting financial stability risks. When weaknesses are identified, this can be complemented with discussion of circumstances under which monetary policy may need to lean against the wind. Communication can address how to strengthen the macroprudential framework to enable macroprudential policy to play this role and lessen incentives to lean against the wind. This could encompass the roles of other government entities with responsibility for macroprudential policy, who influence whether the BOK can achieve its financial stability objectives. It includes, for example, the Financial Stability Committee and whether it implements measures pre-emptively enough to contain risks?

C.   Communicating Medium-Term Policy Intentions

The management of interest rate expectations by the BOK could be strengthened through forward guidance on how it intends to adjust the policy rate to return inflation to target over the medium term (Obstfeld 2016). The challenge is how to avoid the risk that this could be misinterpreted as commitment to a specific path for the policy rate. Many central banks have successfully implemented forward guidance using a variety of communication strategies to avoid this risk. They all rely on quantitative models to identify a path for the policy rate that returns inflation over a medium-term forecast horizon. The results of this "inflation forecast targeting"

(IFT) exercise can then be used to communicate a conditional path for policy rates in a variety of ways, ranging from a qualitative description to publication of a numerical path. Reliance on a model raises a variety of communication challenges related to the interpretation and limitation of models. These can be addressed by putting in place a forecasting and policy analysis system (FPAS) that integrates model-based analysis with the analysis of a wide range of available data and information tailored to the needs of the country, as outlined below.

D. Central Bank Experiences with IFT

Central bank experiences with IFT confirms that it can enhance the effectiveness and credibility of monetary policy (Box 2). IFT has been implemented by central banks in a variety of ways. While some publish a specific policy rate path and others characterize the path qualitatively, they all make clear that it is a conditional path and can be revised in response to shocks and new data. This avoids the risk it could be misinterpreted as a precommitment to a specific path. The experience of IFT central banks suggests that the public and financial markets understand the distinction between a conditional, model-based projection and a policy rate commitment.[3] Transparency is critical to the effectiveness of IFT as it allows the public to verify that the policy rate is being adjusted to achieve the target. The Dincer-Eichengreen index shows that IFT central banks have made the most improvements in transparency over time (Figure 5). They also appear to have more firmly anchored inflationary expectations (Box 2), and smaller deviations of inflation from target (Table 1).

**Figure 5. Dincer-Eichengreen Central Bank Transparency Index**
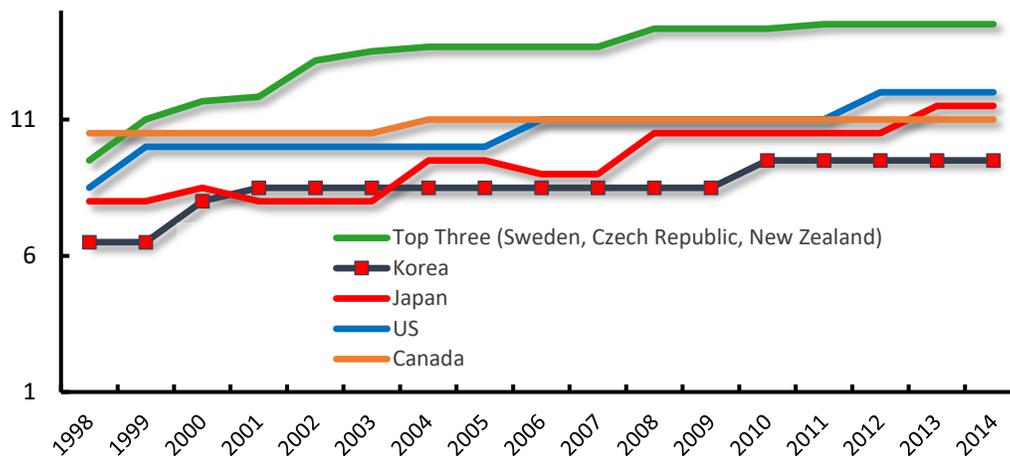
Source: Dincer and Eichengreen (2017).

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[3] Freedman and Laxton (2009) and Chapter 3 of Adrian and others (2018).

Box 2. Central Bank Experiences with Inflation-Forecast Targeting

Inflation-forecast targeting (IFT) can strengthen the monetary policy framework. The framework varies across countries and encompasses a wide range of communication strategies: from a more qualitative description of the path for policy rates to publication of a numerical path of the interest rate. It can enhance credibility by communicating the central bank's "reaction function" that needs to be well explained so it is not misinterpreted as a commitment to a policy rate path.

Country experiences suggest that IFT has provided a more resilient nominal anchor. Inflation expectations remain much more firmly anchored to the inflation target during significant deviations of inflation from target. In the Figure, the horizontal axis plots the deviation of inflation expectation from target over the years 2015-17, and the vertical axes plots the associated expected inflation rate three years ahead. Five IFT countries with high monetary policy credibility (Canada, Sweden, Czech, New Zealand, and U.S.) are shown as green squares for each quarterly observation, and are mostly centered around the horizontal axis, whereas non-IFT countries, shown as blue squares for the Euro Area, and Japan, shown as red dots, are persistently below the horizontal axis. In almost all cases, current inflation is below target owing to the fall in energy prices and significant negative output gaps. In the non-IFT group, three-year ahead inflation expectations are negative, implying that the current deviation from target is expected to persist for the next three years. In contrast, this deviation for the IFT group is near zero. This indicates that for non-IFT economies, negative inflation shocks tend to be associated with a shift in medium-term inflation expectations downward, while in IFT economies they remain well anchored to the target.

Deviation of Consensus Headline Inflation Forecasts from Target
(percentage point)

Quadrant II:
Current Inflation < Target
3-Yr-Ahead Inflation > Target

Quadrant I:
Current Inflation > Target
3-Yr-Ahead Inflation > Target

IFT economies see their 3-yr-ahead expectations anchored at target or slightly overshoot

Euro Area and Japan see their 3-yr-ahead expectations drifting downwards

Quadrant III:
Current Inflation < Target
3-Yr-Ahead Inflation < Target

Quadrant IV:
Current Inflation > Target
3-Yr-Ahead Inflation < Target

Source: CDIC

Table 1. Central Bank Experiences with Inflation Forecast Targeting (IFT)

	2016	2017	2018	Cumulative Deviations from Inflation Target (2017-18)	IFT Central Bank
Canada	1.7	2.1 (0.1)	2.0 (0.0)	**0.1**	Yes (1994)
Czech Republic	0.6	1.7 (-0.3)	2.1 (0.1)	**-0.2**	Yes (2002)
New Zealand	0.7	1.7 (0.3)	2.0 (0.0)	**-0.3**	Yes (1997)
Sweden	1.0	1.5 (-0.5)	2.2 (0.2)	**-0.3**	Yes (2007)
United States	1.3	2.3 (0.0)	2.3 (0.0)	**0.0**	Yes (2012)
Euro Area	0.3	1.3 (-0.7)	1.5 (-0.5)	**-1.2**	No
Japan	-0.1	0.6 (-1.4)	0.9 (-1.1)	**-2.5**	No

Source: CDIC

E. Communications Near the ELB

With the policy rate close to a record low and inflation below the 2 percent target, there is a risk that Korea could hit the ELB in the event of a negative shock. The ELB creates an asymmetric risk to monetary policy, as it becomes less effective at the ELB. This justifies more aggressive easing when inflation and the policy rate are low, and the risk of hitting the ELB looms large. It involves returning inflation to target more quickly so that the policy rate can be raised to a neutral level. This calls for a more accommodative stance in the near term to ensure faster convergence of inflation to the target. Inflation should be allowed to overshoot the target in expectation, meaning that the interest rates staying at the ELB for longer. The monetary stimulus is generated by the reduction in the real interest rate, which results from an increase in expected inflation generated by the commitment to keep the nominal rate at the ELB for longer.

When the ELB is hit and the policy rate cannot be cut further, monetary policy must work primarily through the expectations channel. Communication can strengthen the effectiveness of this channel through an "active" policy of announcing a commitment to keep the policy rate at the ELB for as long as needed (Figure 7). This raises inflationary expectations, reduces the real interest rates and depreciates the real exchange rate. Quantitative easing measures can reinforce these effects. In contrast, a "passive" policy at the ELB, without an announcement effect, will generate less stimulus and is more likely to lead to a downward spiral of declining inflation, rising real interest rates, and falling output (Figure 7). This management of interest rate expectation near the ELB is labeled ad-hoc forward guidance to distinguish it from conventional forward guidance discussed above (Obstfeld 2016).

F.   Implementing a Model-Based Forecasting and Policy Analysis System

IFT can be implemented by using a forecasting and policy analysis system (FPAS), as illustrated by the experience of IFT central banks.[4] This is a structured approach that integrates a wide range of information with model-based analysis in policy decision making. The BOK uses a wide range of available information for monetary policy decisions but is cautious in its reliance on quantitative models despite sophisticated modeling capabilities. This reflects reservations about the reliability of models. While such caution is justified, with appropriate qualifications models can still play an important role in the communication of policy intentions. The benefit is that models help avoid an excessively short-term bias to policy and weak responses to shocks (Kim, 2012).

Figure 6. Expectations as Shock Absorbers or Amplifiers
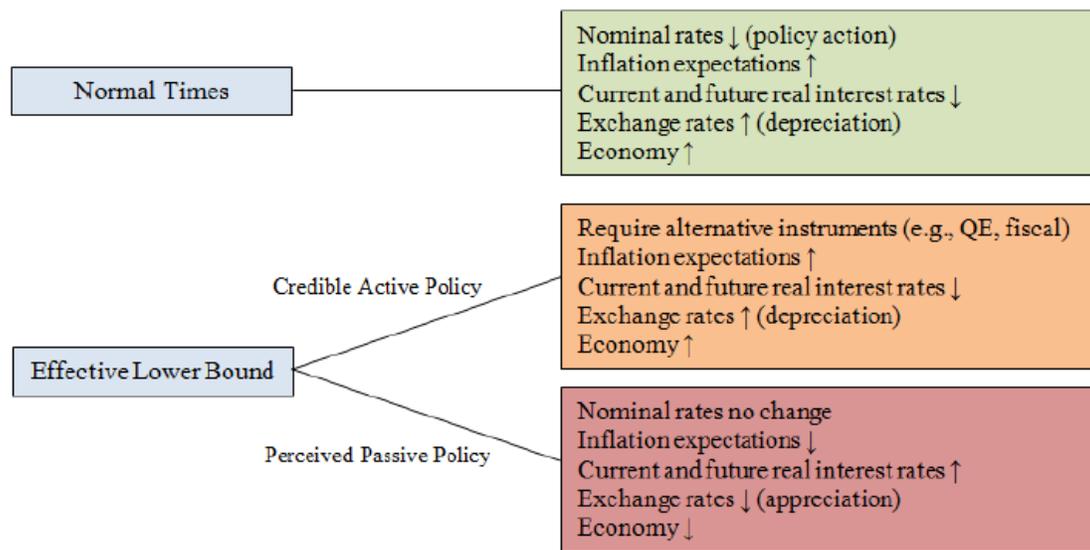
Source: Clinton, et. al. (2016).

The FPAS organizes the provision of economic information and model-based analysis for MPC decisions in an efficient and comprehensive way that is tailored to each central bank (Laxton, Rose and Scott, 2009). It helps the MPC adopt a more strategic, medium-term focus to policy. The model should have standard properties that broadly accord with the view of the MPC about how the economy works. The calibration of the parameters of the model can be done so that its performance corresponds well to the recent performance of the economy and broadly conforms with the view of the MPC (Berg, Karam and Laxton, 2006). This calibration relies on a broad range of data and theoretical priors that build on the extensive literature. This approach addresses reservations surrounding traditional, estimated econometric models that have limited their use.

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[4] See Chapter 4 of Adrian and others (2018).

The key contributions of FPAS to policy decision making and communication are:

- A model-based, macroeconomic baseline forecast. This provides an economically coherent view of the short- to medium-term outlook. The model forecast includes an endogenous path for the future short-term interest rate that achieves the inflation target.

- Quantification of uncertainty. The baseline forecast includes model-consistent confidence intervals for key variables. These reflect a normal range of variability of random shocks implied by the historical data.

- Risk assessments. The output of the forecasting team includes an assessment of risks to the baseline forecast in the form of alternative scenarios for specific assumed shocks, and options for the policy reaction function.

These model inputs are integrated with other inputs from a wide range of other sources of information for MPC meetings. The baseline forecast provides a common point of reference for MPC members; which, together with the alternative scenarios and measures of uncertainty, can help clarify the basis for differences of view among them.

FPAS can strengthen communications and credibility by contributing to a coherent, forward-looking, economic narrative for policy actions. Specifically, publication of the model baseline, risk assessments, and alternative scenarios, can give the public a clearer understanding of the central bank's current monetary stance and how it is likely to respond to unexpected events. With appropriate caveats, publication could include the endogenous future path for the short-term interest rate from the model. Clear explanation should ensure that the public won't misinterpret this as a commitment by the MPC to a specific path for the policy rate; but, rather, as a path that is conditional on model assumption. (i.e., it effectively communicates the MPC's "reaction function"). This communication enhancement has the potential to improve the transmission of policy decisions into long-term interest rates.

V. USING A MODEL TO ENHANCE THE MEDIUM-TERM FOCUS TO MONETARY POLICY

A. Model Structure and Design

Simulation of a model calibrated for Korea can be used to illustrate how it can help enhance the medium-term focus of monetary policy as part of a forecasting and policy analysis system. The endogenous path for the policy rate under different scenarios supports communication of policy rate intentions. It has a standard structure and properties similar to those used by many central banks. The model has been calibrated to match the recent performance of the Korean economy. Further refinements would of course be needed to tailor it to accord with the views of the MPC. The model has four key behavioral equations:

- An output gap equation, essentially an aggregate demand function, which depends on foreign economic activity, the real longer-term interest rate minus the equilibrium real interest rate, and the real exchange rate minus the equilibrium real exchange rate.

- An expectations-augmented Phillips curve determining core inflation in which the output gap drives short-term changes in the inflation rate.

- A policy reaction function determining the policy rate, which ensures that in the long run inflation returns to the official inflation target; the output gap goes to zero; and actual and expected inflation converge.

- An open interest rate parity condition, which helps ensure that in the long run the exchange rate also converges to its equilibrium value.

In addition to these key behavioral equations, identities determining the other endogenous variables, including: headline inflation; trade and financial linkages with the rest of the world; and longer-term interest rates. Expectations are forward looking and consistent with the projections of the model. The model incorporates several key nonlinearities: the Phillips curve, which becomes flatter when there is a larger negative output gap; the ELB constraint, below which the policy rate cannot fall; and, a quadratic monetary policy reaction function.

Two alternative monetary policy reaction functions are used: a linear, forward-looking Taylor rule; and a non-linear, loss-minimization policy rule. The Taylor rule uses an inflation-forecast based (IFB) specification in which the policy interest rate responds to the output gap and to the deviation between one-year ahead forecast inflation and the inflation target. The interest rate policy reaction is smoothed by the inclusion of the lagged policy rate in the equation, so that the model captures this feature of central bank behavior (Woodford 2003).

The second is the optimal, loss minimizing reaction function (OPT) that uses a non-linear, quadratic-loss specification containing the squared inflation gap (i.e. the deviation of inflation from target) and the squared output gap. The squared change in the policy interest rate is included to ensure interest rate smoothing. The effect of the non-linearity (squared terms) is to ensure that policy responds more strongly to larger shocks.

This non-linearity induces a "risk management" approach in which the central bank responds more aggressively to larger, negative shocks. This matters especially when the policy rate is closer to the ELB and the risk of hitting it is greater; as the effectiveness of conventional policy instruments is reduced, increasing the risk than the economy can get trapped in a bad "dark corners" equilibrium. As illustrated below, the non-linearities introduced by the ELB constraint and OPT policy reaction function interact near the ELB to strengthen the policy response.

B.   Simulation of Historical Scenarios using Alternative Policy Reaction Functions

Model simulations starting in 2013Q1 under each of the two reaction functions are compared to the actual, historical outcomes in Figure 7. The starting point for all three in 2013Q1. The red and yellow lines show simulations of key variables under the linear, inflation-forecast based (IFB) rule, and the non-linear loss-minimizing strategy (OPT). The blue line shows the BOK's actual policy rate changes and the associated historical evolution of key variables. The simulations start below the steady-state equilibrium (the black line) and show convergence paths

back to this equilibrium. This starting point corresponds to the values of observed variables for the Korean economy in 2013Q1. Figure 7 shows that in 2013Q1 there was a negative output gap of 1.5 percent of GDP, and an inflation rate of 1.5 percent, which was well below the inflation target range (which had a mid-point of 3 percent at the time). The gap between these data and the long-run steady state (the black line in Figure 7) represent the "shock" to the model.

Figure 7. Comparison of Actual and Simulated Policy from 2013
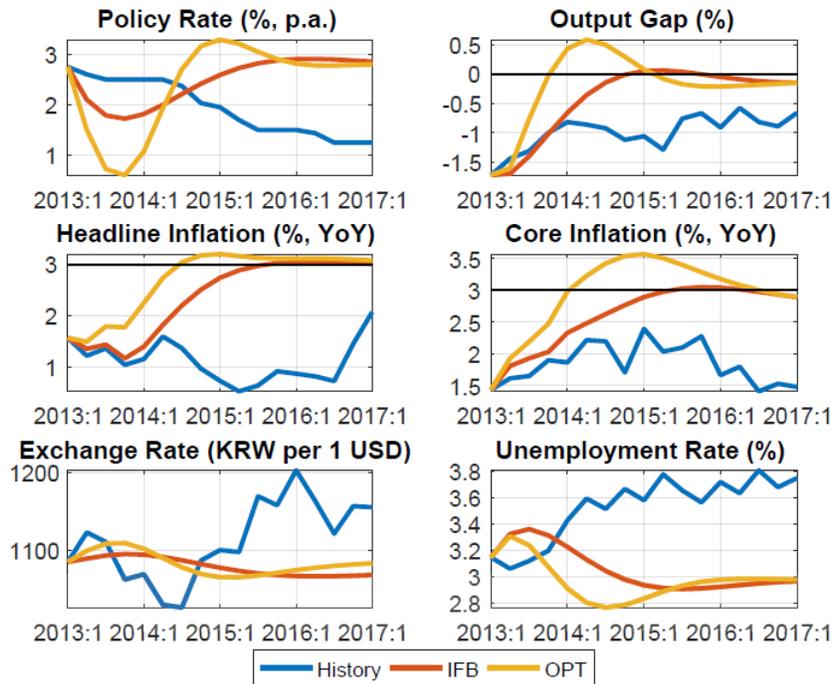
Source: Authors' calculations.

The simulations show that monetary policy response under the two policy rules is much more aggressive than was the case in practice. Under the IFB rule, the interest rate is cut 100 basis points within a year, compared to an actual rate cut of only 25 basis points. By the end of 2015, this results in the output gap closing and inflation returning to its target level. The OPT policy rule leads to an even more aggressive policy response of a 200-basis-point cut in the policy rate. This causes a more rapid closing of the negative output gap, and a temporary overshooting of inflation relative to target. This reflects the starting point of low, below-target inflation, which raises the marginal cost of a further drop in inflation relative to that of a modest overshooting of the inflation target owing to the nonlinearity of the reaction function. Moreover, the more aggressive OPT policy response reflects the greater aversion to "dark corners" imparted by the quadratic loss function and the increased likelihood of hitting the ELB from this starting point.

The comparison of actual and simulated paths suggest that the actual path of policy rate reductions may have been too gradual to close the negative output gap and return inflation to target over the 4-year period. However, the two paths are not fully comparable as the actual paths reflect the impact of negative shocks that occurred after 2013Q1, which are not incorporated into

the simulated paths. These shocks weakened the actual performance of this economy relative to the simulations and contributed to the undershooting of the output gap and inflation target. To make the simulated and actual paths comparable, we incorporate these shocks into the simulation.

C. Comparison of Actual Policy with Model Policy Advice

Figure 8 also shows simulations from 2013Q1, but with the historical shocks that occurred after this date added into the simulations as they occur. In this case, the simulated policy rate path determined by the reaction function is revised each quarter in response to the shocks after 2013 (i.e. the new information that actual policy had to respond to). For clarity, only results for the OPT reaction function are shown in the Figure. As before, the simulation generates much larger initial rate cuts than in the historical data; which, then, are soon largely reversed. However, in contrast to Figure 8, monetary easing then resumes in the simulation in response to the negative shocks occurring after 2013, resulting in quite similar paths for the actual and simulated rate cuts. These early aggressive rate cuts in the model simulation were sufficient to push the output gap and inflation back to the target, implying that the actual monetary easing was too cautious and gradual to accomplish this.

Figure 8. Comparison of Actual and Simulated Policy Incorporating Post-2013 shocks
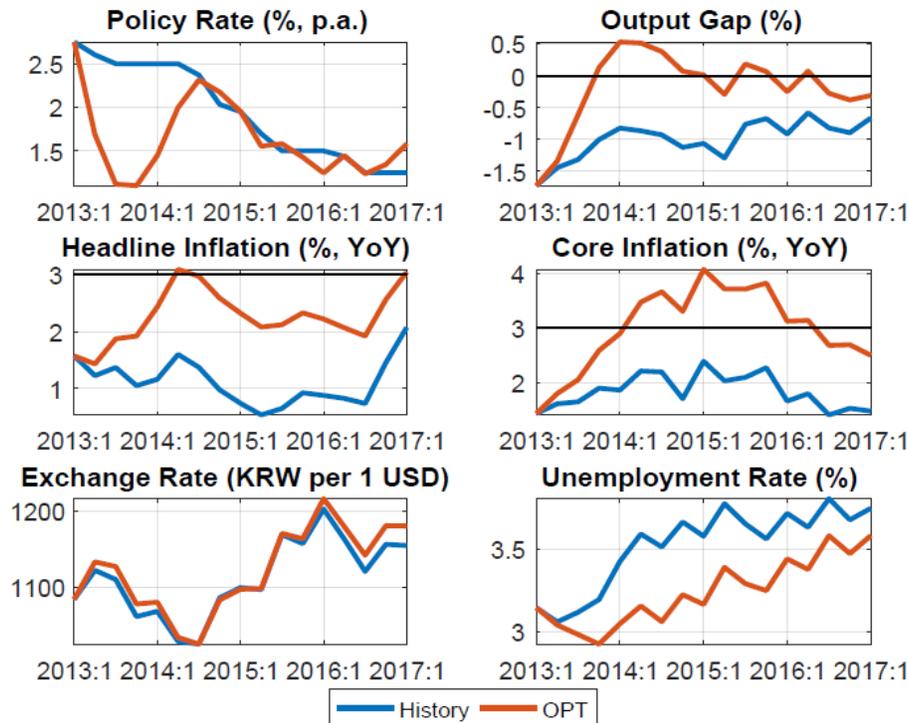

Source: Authors' calculations.

D. Baseline Projections for Achieving the Inflation Target

The model can generate an optimal path for the policy rate and associated forecasts for key variables starting from current macroeconomic conditions. This is done in Figure 9 for the initial conditions in 2017, where there was a modest negative output gap, and headline and core inflation at 2 and 1.5 percent, respectively (where the lower output gap relative to steady state is the "shock"). To counter the disinflationary pressure from the output gap, both policy reaction functions generate large, up front, policy rate cuts. The OPT policy rule does this more aggressively than the IFB policy rule, with the result that output recovers more rapidly. The IFB rule produces a smoother interest rate path.

Overall, the difference in outcomes between the OPT quadratic loss function and IFB linear policy reaction function is relatively modest. This reflects the relatively small size of the "shock" (where the starting output gap that is only 0.5 percent). For larger shocks, however, the different in outcomes between the two reactions functions is much more significant, as show below.

**Figure 9. Baseline Forecast with Optimal versus IFB Reaction Function**
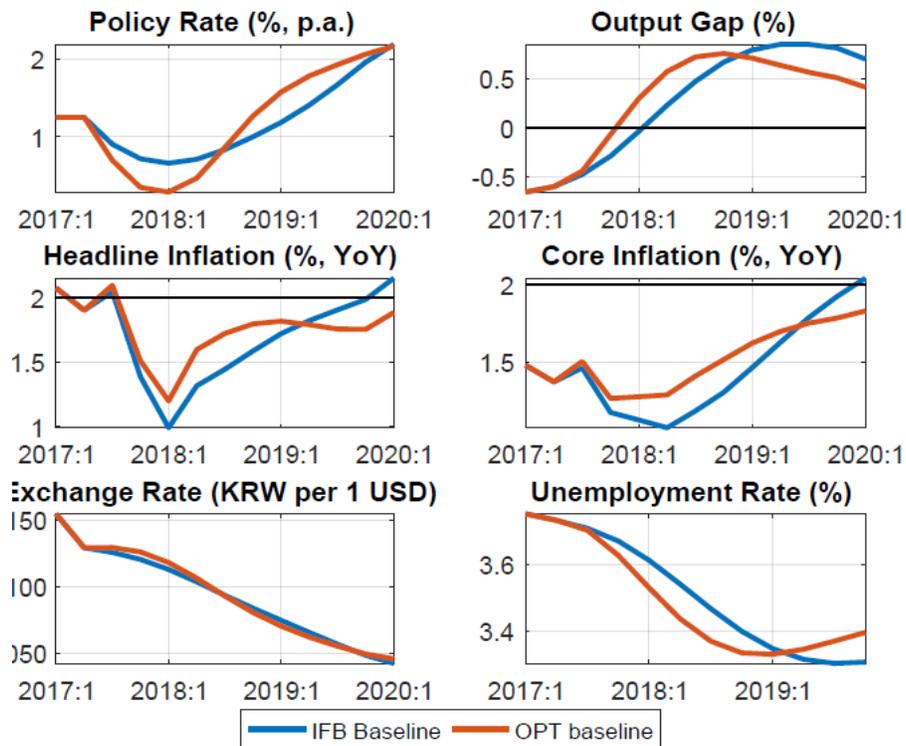
Source: Authors' calculations.

E. Downside Scenario under the Two Reaction Functions

The advantage of a greater risk management focus, represented in the model by the non-linear OPT policy reaction function, is apparent in the case of large negative shocks. These are negative

shock large enough to push the policy rate to the ELB. This scenario is illustrated by a hypothetical shock in which the output gap widens to 2 percent (instead of 0.5 percent), with inflation slowing by more than one percentage point.

Figure 10. Downside Scenario
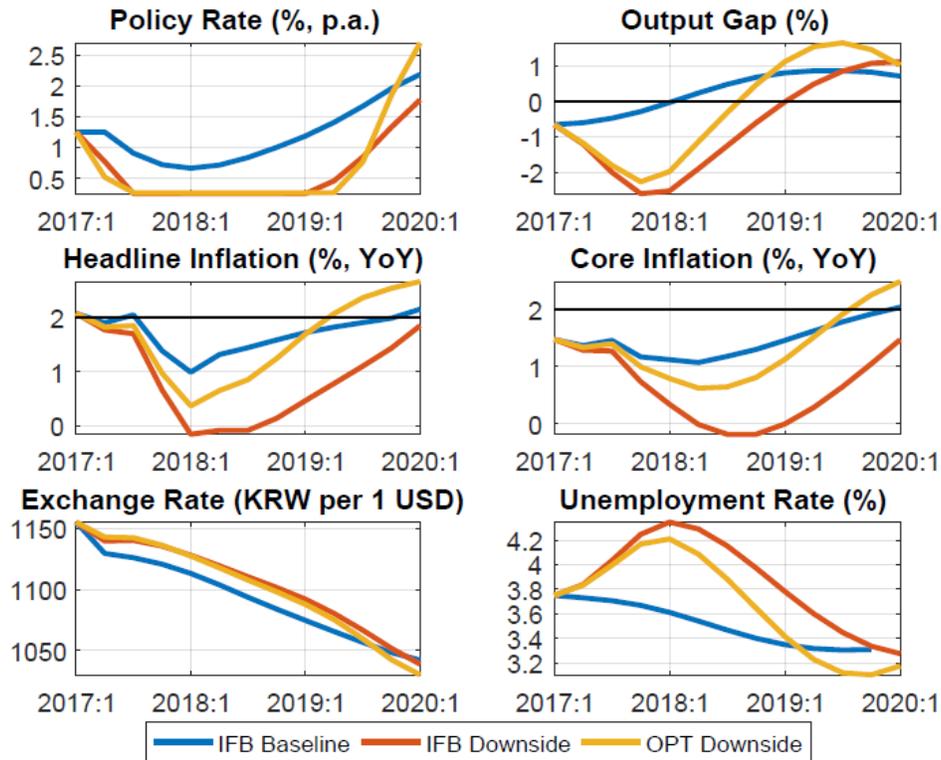

Source: Authors' calculations.

Figure 10 illustrates this scenario. Both the OPT and the IFB policy rules result in large cuts in the policy rate to the ELB (red and yellow lines, the blue line is the IFB baseline from smaller shock in Figure 9). The difference is that under the OPT rule the policy rate is cut faster and held at the ELB for one additional quarter. This imparts a significantly larger medium-term stimulus owing to the strength of the forward-looking expectations channel in the model. As a result, under the OPT strategy, the output gap is positive by mid-2018 and inflation quickly returns close to its baseline path by 2019. In contrast, under IFB rule, the recovery is much slower.

F.   Downside Scenario with Fiscal Backstop

When the policy rate hits the ELB, the fiscal multiplier is larger as there is no crowding out through interest rate increases. As a result, the benefits of combining fiscal with monetary stimulus are much greater in the case of a large shock. Figure 11 illustrates this by adding a fiscal expansion equivalent to about one percent of GDP to the downside scenario in Figure 10. This has the effect of reducing the number of quarters that the policy rate is held at the ELB for both

policy reaction functions. However, the outcome is much better under the risk management focused OPT policy rule in which the policy rate is held at the ELB for longer. The greater monetary stimulus stemming from the strength of the expectations channel combined with the fiscal stimulus produces a path for inflation similar to that in milder baseline scenario (blue line shown in Figure 9).

Figure 11. Downside Scenario with Fiscal Backstop
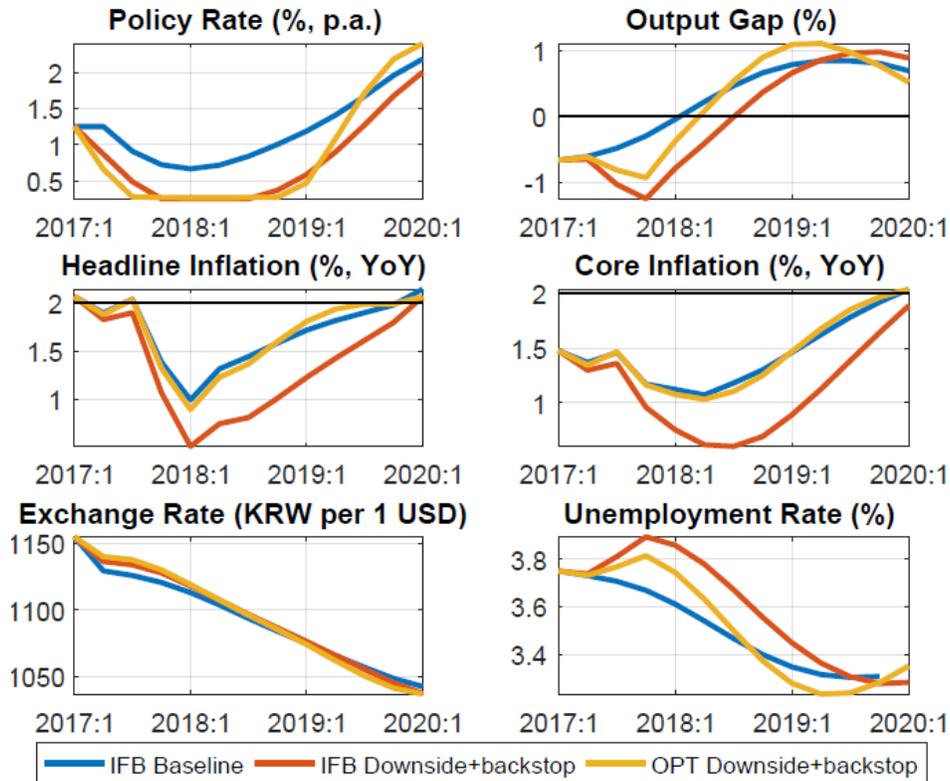
Source: Authors' calculations.

Note: In contrast, under the IFB strategy the recovery of output is more sluggish, and inflation remains below baseline for several years. Nevertheless, in each case, a complementary fiscal expansion results in a significantly stronger macroeconomic outcome over the medium term compared to where monetary policy alone is used and is constrained by the ELB.

VI. CONCLUSION

The key achievement of BOK inflation targeting was to stabilize inflation at a low level, after decades of high and volatile inflation. However, after the GFC monetary policy became more challenging as financial stability was added to the BOK mandate and inflation fell below its target range. In 2016, the target was reduced from a range of 2.5–3.5 percent, to a new level

target of 2 percent, but inflation continues to run below target. This persistent deviating of inflation from target poses a challenge to the credibility of monetary policy. Another challenge comes from the potential conflict between the financial stability objective and inflation target. This arises from concerns that macroprudential policy may not be effective as a second instrument to contain the buildup of risks to financial stability from low interest rates. And, monetary policy may deviate from the inflation target by raising the policy rate to "lean against the wind."

A two-pronged approach can help achieve both objectives. This involves strengthening communication on how (i) the inflation target will be achieved over the medium-term; and (ii) macroprudential policy will be used to contain financial stability risks. The latter involves an assessment of the effectiveness of macroprudential policy, and whether the policy framework might need to be strengthened to ensure it can contain these risks. A greater medium-term focus to monetary policy can be achieved using a forecasting and policy analysis system (FPAS) to more effectively communicate future policy rate intentions. It relies on a model calibrated to match the recent performance of the Korean economy and the views of the MPC to generate a path for the policy rate showing how the inflation target can be achieve over the medium term. This path can be communicated in a variety of ways, both qualitatively or as a numerical forecast. In effect, this communicates the central bank's policy reaction function. Central bank experiences with this approach show it to be effective and that a variety of communication strategies work. Another advantage of this approach is that it helps reduce the risk of hitting the ELB by leading the central bank to respond more aggressively when this risk is higher.

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