

Central Bank Communication Policy

A Comparative Study

Client: Markets Group, The Federal Reserve Bank of New York (FRBNY)

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Chapter 1: Introduction

Abstract

The objective of this project is to compare the current forward-looking communication practice of four central banks—the Federal Reserve (*U.S.*), Riksbank (*Sweden*), Norges Bank (*Norway*), and Reserve Bank of New Zealand—in relation to policy rate forecasting (*i.e. forward guidance*), and provide recommendations based on our findings to Federal Reserve Bank of New York. In past decades many central banks have moved toward greater transparency in monetary policy, as well as in communication. Leading the trend, these four central banks began explicitly communicating the reasoning behind policy rate decisions, while also providing forward guidance on expected policy rate paths.

Methodology

There are five major central banks that provide substantive forward guidance assessments today: New Zealand, Sweden, Norway, US, and Czech Republic. The Czech Republic was the last country to join this group in 2008. Because their financial markets and institutions are less developed, this makes Czech Republic dissimilar than the other four cases we are considering, and as such, less interesting from a comparative point of view.¹ Sweden, Norway, and New Zealand are all small open economies, substantially different than the US in this regard. By observing cross-comparison of policies and outcomes we can then learn if there is a common trend in small-developed countries with respect to forward guidance that is substantially different than that experienced in the most systemically important economy in the world, the US.

We will survey the advantages and disadvantages of forward guidance and evaluate the details of each bank's strategies and methodologies of forward guidance communication. First, each chapter will have a self-contained description of monetary policy framework and individual country analysis of forward guidance practice. *Chapter 2* to *Chapter 5* will contain analyses of each country—New Zealand, Norway, Sweden, and the United States. In addition, we will look at separate analysis of the Fed's balance sheet communication practice in comparison to the Bank of England in *Chapter 6*. Finally, we will provide findings drawn from our comparative study of communications practices and important criteria that must be considered to design optimal communication strategy for the case of U.S. economy. Due to the marked difference in size between the comparison countries and the U.S., the lessons from these county cases should be extended to the Fed's communication strategy with prudence. But we do feel a number of findings from the comparison countries will be worthy of note.

We start each chapter with a historical narrative of how each central bank's policies related to forward guidance have evolved. We then carry out qualitative assessments of each central bank's

¹ Clemens J. M. Kool, and Daniel L. Thornton, "[How Effective Is Central Bank Forward Guidance?](#)" Federal Reserve Bank of St. Louis, December 2012.

main institutional aspects, governance structure, the models used for forward guidance, and the most salient aspects of the bank's information content of forward guidance statements. In order to attempt to assess the effectiveness of forward guidance in each country, we carry out two distinct quantitative analyses.

The first analysis involves looking at changes in market expectations on days when each central bank has provided a forward guidance statement. Each country uses different future rate in its analysis. (e.g. forward rate of 90-day interest rate for RBNZ, of 3-month NIBOR for Norway, STIBOR for Sweden and 1-month OIS for U.S.) This event study analysis allows us to assess the market reaction to new projections of the key policy rate. Second, we then look at the volatility in the market rate (*appropriate market rates were used for each country analysis as well*) over different time periods (pre and post forward guidance). This allows us to assess how volatility in interest rates have changed in the periods prior to forward guidance and the period after. In particular, we examine volatility of the market rates on announcement days and compare it to an average volatility level over distinct periods. It is worth noting that market volatility is not always associated with detrimental effect on economy. If an optimal monetary policy action was unexpected, it is only natural to observe volatility in the market.

The degree of impact and policy implication from forward guidance between smaller central banks (Sweden, Norway & New Zealand) and the Fed (United States) varies greatly. Due to the variation in small open economies, lessons obtained from small country cases will be carefully extended in making suggestions to the Fed. The Fed's unparalleled influence in international financial markets forces it to consider different set of circumstances and responsibilities with respect to forward guidance practice.

Brief History of Central Bank's Communication Policy

Period I—Pre-Explicit Inflation Targeting

Central banks in years previous have tended toward being uncommunicative, even secretive, about their operations. There were perceived advantages to the public not being aware of their objective, strategy, monetary policy decision-making process and the settings of policy instruments. The conventional belief behind opaque central bank practice was to safeguard the autonomy of the institution with the aim of keeping the central bank free from political pressure and conducting monetary policies with long-term goals in mind.² With the advent of inflation targeting in the early 1990's, some central banks have become more transparent about both their inflation objective and mandate. In some cases this has appeared to allow the central banks studied in this paper to have greater influence over their monetary policy objectives.

Period II—Explicit Inflation Targeting

Among the countries in our study RBNZ was the first to adopt explicit inflation targeting (in 1990), followed by Norway, Sweden, and the United States in 2001, 2007 and 2012 respectively in this order (*Timeline 1*). Historically, the U.S. has been committed to implicit inflation

² Frederic S. Mishkin, "[Can Central Bank Transparency Go Too Far?](#)" *The National Bureau of Economic Research (NBER)*, 2004.

targeting (*i.e. tightening of monetary policy*) since October 1979 under the leadership of former chairman Paul Volker and consistently conducted inflation-fighting actions in their monetary policy the past three decades.³ In the FOMC statement of “Longer-Run Goals and Policy Strategy,”⁴ released on Jan. 2012, the Federal Reserve explicitly stated its numerical inflation target for the first time, making a historical shift from implicit to explicit inflation targeting.

Inflation targeting practice alone had substantially increased the transparency of the central banks. Benefits from this change in central bank’s practice were apparent and widely acknowledged; the regular communication with the public and the improved transparency had increased the credibility of the central bank while anchoring inflation expectations. Woodford (2012) and Mishkin (2004) strongly believe that the strengthening of nominal anchor allowed the market to achieve low and stable inflation, as well as lower volatility that helped the economy to move toward an efficient frontier in productivity.⁵ Although moving to inflation targeting had improved transparency, the public was still far from being acquainted with monetary policy decision without disclosure of inflation/output forecast or policy rate forecast. There is a general consensus in academic and policy circles that moving toward transparency in central banking is conducive to a more stable economy; however, no consensus has emerged with regards to the optimal level or form of transparency in central bank’s communication strategies. Blinder and Woodford have advocated for greater transparency in central banks’ communication because it could incentivize central banks to increase the predictability within the institution; therefore enhancing the effectiveness of monetary policy. Woodford, in particular, has claimed that market expectation is the key to having a successful monetary policy. This said, clear communication will improve the ability of central banks in managing expectation.

Period III—Publication of Future Policy Rates

RBNZ was the pioneer in introducing forward guidance in 1997. In 1990 they started communicating inflation targets and projections for the 90-day bank bill rate via Monetary Policy Statements (MPS). This move to forward guidance was meant to give the central bank greater leverage in achieving monetary policy objectives. Not only did they project key policy rates and inflation expectations, but they provided reasons for any deviations from targets in previous MPSs. Then (*Timeline 1*), the decision to publish policy rate forecasts was followed by Norway in 2005, Sweden in 2007 and 2012 in U.S. How each country moved from inflation targeting to forward guidance practice actually happened in more gradual terms (e.g., U.S. had conducted forward guidance in 2003 and the practice was removed, then re-introduced.), which will be broken down in much details in the following chapters.

The thinking behind moving to inflation targeting and introducing forward guidance for these three countries—Norges Bank, Riksbank and RBNZ—was to follow the trend of bringing more transparency into monetary policy decision framework to gain greater influence over the monetary policy objectives, as well as to align. Whereas, the US’s action was triggered by

³ Marvin Goodfriend, “[The Monetary Policy Debate Since October 1979: Lessons for Theory and Practice Review](#),” Federal Reserve Bank of Richmond, October 5, 2004.

⁴ Federal Reserve System, [FOMC Statement of Longer-Run Goals and Policy Strategy](#), (press release, January 25, 2012).

⁵ Frederic S. Mishkin, “[Central Banking after the Crisis](#),” *National Bureau of Economic Research* (Graduate School of Business, Columbia University), November 2012.

different reasons. In addition to the argument of transparency, the extraordinary environment induced by the financial crisis in 2008 led to the change in how the Fed communicates to the market and the public. In 2008, the Fed immediately lowered the Fed Funds rate to the zero lower bound. Even with this swift policy response, it, alone was not sufficient to attain the Fed's dual mandates; therefore, the Fed started employing two unconventional policy tools: (1) the large-scale asset purchases (*i.e.* *QE*, *Quantitative Easing*) and (2) the communication of forward guidance. On December 16, 2008, the FOMC established a target range for the federal funds rate to be 0 to 1/4 percent and it is the lowest feasible rate and even if the Fed feels the need for lower rate, their policy rate reduction is restricted. For this reason, signaling effect of future exit from ZLB becomes much relevant in managing market expectation and forward-looking communication play a much larger role in the ZLB environment.

In analyzing forward guidance effectiveness, we will consider the following criteria: (1) managing market expectation, (2) reducing market volatility, and (3) achieving their sole mandate of price stability (inflation targeting). The Fed's monetary policy aims to achieve price stability and maximum employment to a large extent through its effects on public expectations about future policy.

Forward Guidance

According to Woodford, forward guidance can be defined as communication (*i.e.* both explicit and implicit statements) by central banks about (1) signaling the likely future path of policy rates and/or the (2) outlook of monetary policy in general.⁶ With short-term policy rates at the zero lower bound (ZLB), forward guidance has become a key tool for many central banks. For this reason, our project focuses on forward guidance communication and investigates the optimal approach of communicating forward guidance. According to the FRBSF Economic Letter in 2008, policy communication could be segmented into three types—"indirect signals, direct qualitative signals, and direct quantitative signals."⁷ This classification is essential to our analysis for understanding the optimal form of transparency in communication and how much information should be communicated to public.

By analyzing the years of experience that RBNZ, Norges Bank, and Riksbank have with forward guidance we attempt to then gauge the pros and cons of their communication strategies.

In 2010 Norges Bank's Monetary Policy Analysis in Practice Staff Memo declared,

"We know of nobody today who argues that the Norges Bank should abandon interest rate forecasting, or analysts or observers who claim that they would be better off without this information."

Also, ECB's comparative study on the effectiveness of quantitative forward guidance provided their findings that even longer-term inflation expectations have been well anchored in the three economies—RBNZ, Norway and Sweden—and monetary policy decisions have been highly

⁶ Michael Woodford, "[Methods of Policy Accommodation at the Interest-Rate Lower Bound](#)," Columbia University, 2012.

⁷ Federal Reserve Bank of San Francisco, "[Publishing Central Bank Interest Rate Forecasts](#)," *FRBSF Economic Letter* Number 2008-02, January 25, 2008.

predictable. We could conclude that, overall, forward guidance communication strategies work well, at least, in small economies.

Currently, Norges Bank is the most communicative among all central banks in our study as they publish output, inflation and other macroeconomic forecasts, as well as the future policy path, and even their objective function. Does this level of openness help them to conduct optimal monetary policy with longer run objectives in mind for central bankers? If so, what and how much central banks should communicate to the market participants and the public about their decision and forecasts?

Literature Review of Pros and Cons on Forward Guidance

Most authors reviewed in this study (Woodford 2005; Goodhart & Lim 2001; Mishkin 2004, 2012; Kool & Thornton 2012, Svensson 2006, 2011, Archer 2005; Rudebusch and Williams 2006) are at least limited proponents of forward-looking central bank communication practices. But even proponents of forward guidance communication often voice significant reservations. Mishkin, though he supports forward guidance on output fluctuation, cautions against central banks providing projections of the policy interest rate path, since it could create an “expectation trap.” That is, if a central bank projects a policy rate path, and conditions change, it might still try to adhere to its previous projection to maintain credibility. This behavior could be detrimental to the overall economy.

In the case of central banks having better market information than private agents, more communication rather than less would reduce the uncertainty and central banks influence over market expectations. It is believed that more transparent monetary policies and clear communication of its policy path have the following benefits: (1) improvement of accountability of policy decisions, (2) public’s better understanding and anticipation of central banks’ policy decisions with respond to newly developed market information, (3) greater influence over short-term interest rates that have more direct impact on consumption and investment decision, and (4) an increased ability of central banks to steer market expectation which bears better economic outcome as a result.

However; there are slight disagreements in the opinion for the optimal level of openness in central banks’ communication. (Mishkin 2004; Goodhart 2005; Archer 2005; Gosselin, Lotz & Wyplosz 2008; Blinder 2009). Some scholars note a number of concerns that transparency can be counterproductive beyond a certain degree for several reasons: (1) potential credibility loss problem; (2) misperception of conditionality as promise or commitment; thus it could indirectly influence the central banks not to deviate too much from its projection and settle on suboptimal monetary policy decision; (3) information asymmetries between central bank and private agents (*e.g. when central banks do not have better information than private agents, more communication by central banks could actually create noise and error rather than reduce negative volatility*). Menno Middleport (2010) pointed out that increasing transparency may crowd out the acquisition of private information and thus may impair the ability for the public to predict monetary policy, thus increasing the volatility in the market. Finally, (4) feasibility or difficulty of adding another decision making layer for forward guidance estimates. Archer, Mishkin and Goodhart question the feasibility for the monetary policy committee of agreeing on the future path of policy rate in addition to the current policy rate decision.

Since 2012 the Fed started publishing quantitative forward guidance, and the debate of fed funds interest rate projections has received much attention.

“A more useful form of forward guidance, I believe, would be one that emphasizes the target criterion that will be used to determine when it is appropriate to raise the federal funds rate target above its current level, rather than estimates of the lift-off date. (Woodford (2012))”

The newest paper published by Janet L. Yellen (2013) reviewed recent FOMC policy actions and pointed out that the guidance provided is not complete. (e.g. what will trigger the increase in federal funds rate and what the Fed will do after lift-off.)

Since the onset of the recent financial crisis, when several central banks hit the zero lower bound, balance sheet policy and forward guidance were advocated as unconventional monetary policies to provide further economic stimulus. Yet forward guidance not only implies providing future information about the policy rate, but also about balance sheet policy, which is why the literature on balance sheet policy communication is intertwined with that on policy rate forecasting.

At the outset, balance sheet policy refers both large-scale asset purchase (LSAP) programs and credit and liquidity programs. However, this paper focuses exclusively on LSAP given that they represent an overwhelming majority (approximately, 92%) of the Federal Reserve’s balance sheet (approximately, 92%). Clarida (2010) defines LSAP programs as the creation of money to buy treasury securities and select private sector obligations. Additionally, he classifies LSAP into quantitative easing (the purchase of treasury securities) and credit easing (the purchase of select private sector obligations). Nevertheless, this paper uses the terms LSAP program and quantitative easing interchangeably.

Woodford (2012) comments about the effectiveness of forward guidance for balance sheet policy, arguing that – just as in the case of the policy rate – it works better when central banks communicate the criteria under which they will adjust their LSAP programs in the future. In opposition, Posen (2012) claims that a closer look at the Fed’s “Operation Twist”, the Bank of England’s quantitative easing (which was done with very limited forward guidance), and the Japanese experience since the 1990s suggests that forward guidance is irrelevant for balance sheet policy.

Gagnon et al. (2010), Meaning and Zhu (2012), and Joyce et al. (2011) argue that most empirical exercises suggest that the most important transmission channel for LSAP programs in the United States and the United Kingdom has been the portfolio rebalancing. Forward guidance has also had an important effect, but it has been lower than that of portfolio rebalancing. The event studies literature also concludes that the effects were stronger in the early years of the crisis, when market functioning was more impaired.

Carpenter et al. (2013) project the Fed’s balance sheet and income over time under several plausible LSAP program scenarios – with zero (baseline), \$500 billion, and \$ 1trillion of additional asset purchases in 2013 – as well as with higher and lower paths for interest rates, and in accordance with the “Exit Principles” outlined in the June 2011 FOMC meeting’s minutes. Their results basically show that the size of the balance sheet is expected to normalize around 2020 without threats to the conduct of monetary policy, and that income remittances to the

Treasury might halt at some point when the Fed starts realizing losses from its agency securities sales in a context of higher interest rates that also imply greater interest payments on reserves held at the Fed.

Monetary Policy Decision Making Body

By design central banks in most countries operate largely independent of political influence. This way the system can ensure that central bankers can govern monetary policy insulated from political agendas. Given the lack of accountability due to the institutional design for political insulation, the trust and credibility of central banks play a significant role in managing expectation. Market participants must be able to trust that monetary policy is being conducted to ensure stable prices. More publically supported central banks will be able to exercise larger influence in the market. The structure of both the decision-making body and the decision-making process has a determining factor in central banks' communication policies and framework. Also, the comparison of communication policy and framework between the comparison countries and the Fed should take into consideration that the Fed's organization structure is very decentralized, demonstrable difference from centralized structures of RBNZ, Norges Bank and Riksbank.

Governance

All central banks in our study make a decision through monetary policy committee. (*Table 6*) The composition of committee in our study varies slightly country by country. In RBNZ's case, the Assistant and Deputy Governors do not have voting power—sole power to conduct monetary policy lies with the Governor of RBNZ. Yet this does not mean that the decision is arbitrarily made by the single person. The committee members and research staff members' views are used to assist the governor in formulating his policy. The policy decisions of the other three banks in this study are made by consensus and voting, though the process and etiquette in each country varies significantly because of historical differences or structural differences as mentioned. These distinctions will be explained in detail in each of the succeeding country chapters. In the case of Sweden and US, the decisions are made by Executive Board Members, consisting of six individuals for the Riksbank. The Federal Open Market Committee (FOMC), total of 12 voting members, for the Fed. The policy rate decision votes are individually accountable in both central banks. The difference between these two decision-making bodies is that the FOMC's chairman has a dominating decision power whereas 6 individual members are equally accounted and accountable for their own decision.

Stylized Facts about Forward-looking Communication

Now we will look at the schedule when and how often monetary policy decision is being made through these committees. *Table 4* shows a calendar for scheduled monetary policy committee meetings for 2013, with the exception of Sweden. Sweden does not provide the exact date of next meeting, so the dates were used from 2012 meetings. New Zealand is scheduled to meet 7 times in 2013 and 6 times for Norway and Sweden, and 8 times for Fed. The frequency of meetings is subject to change depending on the condition of their economies and additional meeting can be scheduled, if necessary. All four banks also release a publication regarding their forecast in addition to policy rate announcement in a subset of their scheduled meetings. *Table 5* describes the publication schedule of forward guidance statements.

Norway, Sweden, and New Zealand provide much lengthier and more substantive reports than the Fed's Summary of Economic Projection (SEP). These publications (1) not only provide their forecast on future path of policy rate (2) but also include forecast of other economic indicators such as various inflation index, output gap, as well as conditionality of future course of monetary policy explained in providing various scenarios. On the other hand, SEP provides a succinct explanation of economic projections and the policy path. The policy path represents 19 'policymakers' assessment of the appropriate path for the FOMC's target federal funds rate." The Fed's presentation of the forward policy rate path is substantially different from other three central bank's forecast charts, which are based on stochastic economic models that can also incorporate central banker judgment.

As mentioned, Norges Bank, Riksbank, and RBNZ use Dynamic Stochastic General Equilibrium (DSGE) model in their forecasts. These forecasting systems are modified to meet each country's specific economic condition, which will be expanded upon in greater detail in subsequent chapters. Norges Bank and Riksbank "fan charts" portray the bands of uncertainty in terms of standard deviations from their central forecasts of the key policy rate. However, during the recent financial crisis, the actual path moved far out of even the 90 percent confidence level, showing that forward guidance projections could be interpreted as far less useful under an extraordinary economic environment.

The introduction of interest rate forecasts demanded increased focus on making the framework comprehensible to financial market participants, to journalists, to banks and to a broader audience. A key issue and concern was to convey the contingency and the uncertainty in the forecast. Roughly a decade long experience of forward guidance confirms that the conditionality was well understood by the market⁸. The uncertainty in the projection is explained/portrayed in slightly different format for central banks in our study. In case of Norges Bank and Riksbank express uncertainty in the color variation that represents different level of confidence. RBNZ expresses it by including previous projections from four previous monetary policy committee meetings. Therefore, the chart includes five projection lines including 1 current projection and 4 historical projections.

Attention has been devoted to developing a framework that could be easily interpreted without large noise or error and that ensure a systematic response to upcoming information. In general, the interest rate forecasting has worked well, and the concern regarding publication of policy rate path that were discussed ex-ante have not proved unmanageable. For instance, the concern regarding conditionality being understood as promise was lifted as market has proven that this is well received.

⁸ Norges Bank, "[Monetary Policy Analysis in Practice](#)," (staff memo No. 11, 2010).

Chapter 2: Reserve Bank of New Zealand

Background

For New Zealand the trend toward increased transparency began with a move to explicit inflation targeting in 1990. Explicit inflation targeting presented new policy challenges, as well as potential credibility issues for RBNZ if inflation targets were missed. To solve this problem the bank sought a policy tool that would provide them with greater influence over their monetary policy objectives. The experimental solution they enacted would provide even more transparency to financial markets, and would draw the attention of central banks around the world. The RBNZ began publishing Monetary Policy Statements (MPS) in 1997. MPS's are 30-40 page documents outlining the various quantitative and qualitative assessments of key macroeconomic conditions. MPS's are published quarterly and are written by the Governor of the Central Bank.⁹ The innovative aspect of the MPS was to be not just backward looking, but to give the market information about the RBNZ's future projections on important macro economic variables affecting monetary policy decisions, such as the consumer price index, a monetary conditions index (MCI), interest rate (the 90 day bill rate), and inflation.

The overall impact of the Monetary Policy Statements to date is a central point of debate in academic and policy circles. And the effects are somewhat difficult to assess over the entire span of forward guidance due to substantial subsequent policy changes the RBNZ has enacted. Yet nobody has conclusively recommended that the RBNZ should step back from forward guidance. On the contrary, several authors such as Moessner and Nelson, and David Archer have concluded that RBNZ Monetary Policy Statements have given the bank small but significant influence over short-term interest rates.¹⁰ Changing global macro economic conditions in the period after forward guidance, namely the Asian financial crisis and the 2008 financial crisis, has also made blanket assessments difficult to render. Furthermore, New Zealand is a small open economy and is significantly affected by fluctuations in its exchange rate. It is also heavily affected by monetary policy decisions in the US, Japan, Europe, and Australia—its interest rate tends to move in tandem with these nations.

This chapter will consider the governance structure of the RBNZ, the models it uses for forecasts, and the RBNZ's historical experience with forward guidance. This part of the chapter will also have a descriptive analysis of the content of Monetary Policy Statements. With a micro level event study the paper looks at various announcement shocks, not only by announcements from the RBNZ, but from announcements by the Federal Reserve Bank of the United States as well. Finally, through a volatility analysis of announcement day interest rate changes, conclusions will be discussed about the overall effectiveness of forward guidance publishing for the RBNZ.

⁹ Monetary policy statements are produced quarterly, however, since 1999 the RBNZ sets the Official Cash Rate (overnight deposit rate) 8 times a year.

¹⁰ David Archer, "[Central bank Communication and the Publication of Interest Rate Projections](#)," (paper for a Sveriges Riksbank conference on inflation targeting, Stockholm, June 2005), p. 12.

Richhild Moessner and William R. Nelson, "[Central Bank Policy Rate Guidance and Financial Market Functioning](#)," *International Journal of Central Banking*, December 2008, p. 200.

Empirical Literature Review

Empirical analysis from many academics like David Archer (2005), and Moessner and Nelson (2008), have concluded that RBNZ's projections have a weak effect on market expectations. Moessner and Nelson use a regression analysis to examine the effect of all forecast surprises since RBNZ started publishing forward guidance in 1997. They find that RBNZ has limited but significant influence on financial market interest rates for horizons of two to six quarters ahead.¹¹ They correlate the size of the forecast surprise with the change in market expectations, and find that the actual change in market expectations is generally equal to or smaller than the size of the surprise.¹² However, this could suggest then that market participants do not take RBNZ forecasts all that seriously.

Ferrero and Secchi take the analysis of Moessner and Nelson further. They look at whether the RBNZ has been able to influence control over the curvature of the interest term structure by looking at 3 and 12 month projection shocks, and their effects on the market expectations of 3 and 12 months interest rate futures. They find that the RBNZ can and does affect market expectations, but that it is the same effects that influence both the 3 and 12 month horizon. Thus, the RBNZ cannot affect different horizons independently. Through additional quantitative analysis Ferrero and Secchi conclude that forward guidance does enhance the ability of market participants to predict monetary policy decisions, and that market participants do understand the conditional nature of forward guidance statements by the RBNZ. Finally they conclude that Monetary Policy Statement releases are responsible for approximately 35% – 50% of the variability of the expectations of market operators about the future evolution of short-term interest rates.¹³

On the contrary, in their recent study comparing New Zealand's experience with forward guidance to Norway and Sweden, Kool and Thornton cast doubt on the efficacy of New Zealand's current policy regime. They find that New Zealand's forecasts have significant predictive power for periods of one and two quarters ahead, though they have no accuracy for time horizons beyond that. However, similar studies on the Bank of England have found comparable results.¹⁴ Kool and Thornton go on to conclude that RBNZ's forecasts are no better than a random walk, and if this is the case, how can it be expected that they would be able to significantly influence market expectations? This stands in contrast to their assessment of Norway's forecast accuracy following adoption forward guidance. While most studies compare forecasting performance against a random walk, a study conducted by the RBNZ staff compared the bank's forecasting performance to professional forecaster's results in the 2003-2005 period. Though it is a small cross section of time, they find that the RBNZ's forecasting has been slightly better than other forecasters.¹⁵

¹¹ Moessner and Nelson, "[Central Bank Policy Rate Guidance and Financial Market Functioning](#)," *International Journal of Central Banking*, December 2008, p. 200.

¹² Archer, "[Central Bank Communication and the Publication of Interest Rate Projections](#)," p. 12

¹³ Guiseppe Ferrero and Alessandro Secchi, "[The Announcement of Monetary Policy Intentions](#)," *Banca D'Italia Eurosystema* 720, September 2009, 33, pp. 48-49.

¹⁴ Kool and Thornton, "[How Effective Is Central Bank Forward Guidance?](#)," pp. 9, 14.

¹⁵ Jane Turner, "[An Assessment of Recent Reserve Bank Forecasts](#)," *Reserve Bank of New Zealand: Bulletin* vol. 69, no.3, Sept. 2006, p. 43.

Dieter Nautz and Gunda-Alexandra Detmers carry out a quantitative analysis of the effects of New Zealand's forward guidance on volatility levels in market expectations by looking at futures data between two and six quarters ahead. They find that the bank's projections have a stabilizing impact on interest rate futures data for two quarters ahead, but that in the post crisis period, forward guidance statements have actually increased volatility on long-term rates (one year and two year rates). Furthermore, they argue that forecasts have had less of an effect on market expectations when information content of Monetary Policy Statements has been less.¹⁶

The theme that emerges is that RBNZ's predictive power is limited, and though it does weakly influence market expectations at short horizons, it lacks influence over the longer-term yield curve. According to Woodford (2003), influence over the long-term yield curve is the key element in gaining influence on shorter-term rates and macroeconomic objectives.¹⁷ Yet the New Zealand experience appears to invert Woodford's logic, since it's the long-term yield curve that New Zealand has thus far failed to significantly influence.

Much of the critiques of New Zealand specifically focus on this shortcoming, or the lack of influence and accuracy that is associated with their forecasts and their (perhaps) subsequent lack of effect on long-term yield curves. With a large residential market, one of the main variables the RBNZ would like to influence is the long-term yield structure. The reasons for these dynamics will be investigated in coming sections. One could also suggest that the small open economy position of New Zealand makes it acutely susceptible to endogenous shocks that then tamper with forecast accuracy and the market participant's faith in these forecasts. But also, it might have to do with the content the bank provides in its forward guidance statements. Though the bank has a one-man decision making body this is not discussed in the literature as weakness in creating forward guidance estimates. On the contrary, it can be seen as a strength.

Governance

In 1989 many government institutions in New Zealand were reformed. The RBNZ was one of these institutions that underwent significant change. The end result was the Reserve Bank of New Zealand Act in 1989, which gave the bank its explicit mandate of inflation targeting in conducting monetary policy. Going forward, every time a new government was formed (which historically has happened roughly every one to five years since 1989), the RBNZ would sign an agreement with the new government. These agreements are called Policy Target Agreements (PTA). They are two page documents outlining the primary monetary policy objectives of the RBNZ, and they indicate the explicit inflation-targeting band (usually between 0-2% or 1-3%, which it is set at currently).

The governance regime of the RBNZ is unique among the countries being examined in this report. It is unique because the power to determine monetary policy lies solely with the Governor of the RBNZ. Therefore there is no formal consensus or voting structure within the bank. The Governor has the exclusive power to both determine monetary policy (setting of

¹⁶ Gunda-Alexandra Detmers and Dieter Nautz, [“The Information Content of Central Bank Interest Rate Projections: Evidence from New Zealand.”](#) *Discussion Paper Series (RBNZ)* 03, 2012, pp.1-11.

¹⁷ Gauti B. Eggerston and Michael Woodford, [“The Zero Bound on Interest Rates and Optimal Monetary Policy.”](#) *Brookings Papers on Economic Activity* no. 1, 2003, pp. 139-207.

Official Cash Rate post 1999) and for concluding predictions for forward guidance. However, the current and past governor has chosen to use a committee of advisors who provide written advice, which can be seen as an informal voting procedure.¹⁸

The Governor and his three deputies and assistants are appointed by the Minister of Finance for five year terms. The parliamentary terms in New Zealand are only three years. As set forth in the Reserve Bank Act of 1989, the five-year term length for RBNZ governors was meant to allow the governor to conduct monetary policy without any routine political involvement. The explicit intention was to provide clear focus for accountability.¹⁹

The three deputy and assistant governors have significant and distinct management responsibilities (Chart 1: RBNZ—Organizational Structure).²⁰ One of the Assistant Governors heads the economics research department. The other Assistant Governor is responsible for bank operations, such as managing currency, human resources, communications, and risk assessment. The Deputy Governor oversees the Prudential Supervision arm of the RBNZ. But all three deputy and assistant governors are also responsible for auditing the performance of the Governor, and reporting on his performance to the Minister of Finance. If the Deputy Governors lose confidence in the Governor, they can then seek the agreement of the Minister of Finance in order to remove the Governor from his post. However, removal of the Governor must be initiated by the Minister of Finance himself. But failing to meet the terms of the PTA is not in itself considered a failure by the governor of adherence to monetary policy. If, for example, macroeconomic conditions are the prevailing reason for a miss on inflation targets that are outlined in the PTA, then this would not be grounds for dismissal.²¹

The Governor also has responsibilities to produce a Monetary Policy Statement every six months, but the convention has been to issue them four times per year, which has happened in every year so far since 1997.

Move to Forward Guidance and Historical Experience

The RBNZ was the first central bank to produce substantial forward guidance statements. Market participants now had a better idea of how the bank viewed the economy. The theoretical underpinnings of the move to publishing forward guidance were grounded in macro-economic theory that evolved in the 1970's, the so-called "Lucas Critique." The Lucas Critique argued that parameters of the large macroeconomic models of the 1960's and 1970's depended implicitly on expectations of market participants. The parameters of the models would change as policy makers changed their behaviors, creating a feedback loop between policy and market expectations.²²

¹⁸ Archer, "[Central Bank Communication](#)," p. 9.

¹⁹ Michael Reddell, "[Monetary Policy Accountability and Monitoring](#)," accessed April 21, 2013.

²⁰ Reserve Bank of New Zealand, "[Statement of Intent](#)," 1 July 2012 – 30 June 2015, p. 11.

²¹ Ibid..

²² Grant Spencer and Özer Karagedikli, "[Modelling for Monetary Policy: The New Zealand Experience](#)," *Reserve Bank of New Zealand Bulletin* 69, no. 2, June 2006, p. 18.

In the early and mid-1990's the RBNZ was targeting inflation through a very indirect method of controlling the money supply. This presented challenges and credibility problems for the bank when they were trying to maintain inflation in an explicit narrow band. In order to gain greater influence over policy objectives, the bank decided upon moving to publish forward guidance statements (Monetary Policy Statements) to attempt to gain greater influence market expectations, thus producing its first forward guidance report in March of 1997. The key policy rate is the 90 day interest rate, and projections on this rate have been published in every Monetary Policy statement since June of 1997. However in the first two Monetary Policy Statements concerns were raised about the RBNZ projections of inflation. The published projections were initially prepared under the assumption that there is no change in policy and no change in the exchange rate. Publishing an official forecast showing inflation moving off target, while simultaneously indicating the bank would do whatever necessary to keep inflation in the explicit band was thought to be a potential public relations problem. But as Archer points out, critics perhaps underestimated the public's ability to understand the conditionality of forecasts.²³

Credibility issues aside, it was seen as relatively painless for New Zealand to move to forward guidance since the governor was the sole decision maker in implementing monetary policy. Other central banks were hesitant to follow RBNZ's lead because the idea of forming forecast estimates by committee was seen as onerous.²⁴ Complicated in part by exogenous shocks such as the Asian Financial Crisis, forecasting in the initial period after the move to forward guidance became exceedingly difficult. Volatility levels in the 90 day interest rate in this period remained quite high (see Chart 7: RBNZ—Historic Average Daily Volatility).

One particular notable forward guidance shock came on November 18, 1998. Following the release of the Monetary Policy Statement on this day, which included a less optimistic outlook than the previous monetary policy statement, the 90 day bank bill interest rate dropped over 10% by market close.²⁵ The weak outlook was attributed to headwinds in aggregate demand downturns in key trading partner economies due to the Asian Financial Crisis. Interestingly, the bank was predicting a possible predicted downturn in the US economy in 1999. Because the RBNZ was not setting the Official Cash Rate yet in 1999, likely some of this move in the interest rate was due the forecast shock effect. These types of forecast shocks were unfortunately not uncommon in 1997 and 1998 on RBNZ announcement days. The effect was the opposite of what the bank had hoped to achieve. In fact, the goal of monetary policy transparency is to limit surprise announcements effect on asset prices and interest rates.²⁶

In 1999, the RBNZ was able to move from controlling only the money supply, to a much more direct transmission mechanism of controlling the overnight interest rate on deposits, the Official Cash Rate (OCR). The bank had wanted to move in this direction since 1990, but lacked the political support to do so. The OCR, similar to the Fed Funds rate in function, is the key policy

²³ Archer, "[Central Bank Communication](#)," p. 3.

²⁴ Thorvador Tjorvi Olafsson, "[Publication of Its Own Policy Rate Paths Boosts the Effectiveness of Central Bank Monetary Policy](#)," *Monetary Bulletin* no. 1, 2007, p. 76.

²⁵ Reserve Bank of New Zealand, "[Monetary Policy Statement](#)," Nov 18, 1998, pp. 1-5.
[Data on exchange rates for Chart 7 and the interest rate change is from RBNZ.](#)

²⁶ Özer Karagedikli and Pierre L. Siklos, "[Explaining Movements in the NZ Dollar: Central Bank Communication and the Surprise Element in Monetary Policy?](#)" *RBNZ Discussion Paper Series*, 2008, pp. 1-2.

rate that the RBNZ sets eight times per year. Deposits earn 25 BP below the published rate, and banks can borrow at 25 BP above market rates. The bank decided upon the wide band since they did not want to interfere with interbank overnight lending, and in fact, to encourage interbank lending which can usually be accomplished at more favorable rates than the 50 BP spread in the OCR.²⁷

In 2002, the bank moved to flexible inflation targeting. Per the 2002 Policy Target agreement, the bank relaxed short-term mandates on maintaining the inflation band of 1-3%. Inflation in the short term could move out of the band, as long as it was contained in the medium term. This allowed the bank to pursue other macroeconomic objectives more directly, such as managing policy to output and exchange rate data. The bank has continued with this regime to present day.²⁸ And in 2009, the RBNZ updated its forecasting model to a Dynamic Stochastic General Equilibrium (DSGE) model called KITT, which was more robust than the model the bank had been using since 1997.

Forecasting Models: FPS and KITT

Throughout the 1990's the RBNZ was improving upon its Forecasting Projection System (FPS). This model was a macroeconomic model that utilized structural models, and then cross-checked these models with a statistical patterns model. It was a combination of factor models, bi-variate indicator models, vector autoregressive models (VARs), and Bayesian vector autoregressive models (BVARs).²⁹ RBNZ used this system until 2009, when it introduced KITT, a DSGE model. Following in the path and experience of The Bank of England, Riksbank, Bank of Canada, and Norges Bank, the RBNZ began developing their own in house DSGE model in 2006. Rather than use an off the shelf model, which was considered at one point, they opted to build KITT in house. The logic behind this decision was that the bank could build essential skills of staff members, while more easily customizing the model to the specifics of the New Zealand economy.³⁰

KITT built off of the FPS framework, but was taken a few steps further in terms of robustness. Where FPS told an aggregate story of how demand factors translated into inflation for a single good, KITT can tell a richer story where demand and supply side factors translate to inflation. Taking into account an enhanced market ability to incorporate expectations on inflation into purchasing decisions, KITT actually simplifies household behavior in the model. Where FPS considered both long term and short-term rates in terms of consumption behavior, KITT only looks at longer term rates.³¹ From a use standpoint, KITT also has the ability to produce fan charts for projections, in the style of Norges Bank and Riksbank. However, to date, RBNZ has not used fan charts in any of its MPS.

²⁷ David Archer, Andy Brookes and Michael Reddell, [“A Cash Rate System for Implementing Monetary Policy.”](#) *RBNZ Bulletin* vol. 62 no. 1, 1999, p. 54.

²⁸ Spencer and Karagedikli, [“Modelling for Monetary Policy: The New Zealand Experience.”](#) p. 22.

²⁹ Chris Bloor, [“The Use of Statistical Forecasting Models at the RBNZ.”](#) *RBNZ Bulletin* vol. 72 no. 2, June 2009, pp. 21-24.

³⁰ Kirdeen Lees, [“Introducing KITT: The Reserve Bank of New Zealand New DSGE Model for Forecasting and Policy Design.”](#) *RBNZ Bulletin* vol. 72, no. 2, June 2009, pp. 5-12.

³¹ *Ibid.*, pp. 5-6, 12.

Norges Bank and Riksbank also both publish their loss functions that they manage monetary policy in accordance with. The RBNZ does not use a loss function. According to Michael Reddell of the RBNZ research department, the closest the bank comes to using a loss function is outlined in the Policy Target Agreement (Section 4b)³²:

*In pursuing its price stability objective, the Bank shall implement monetary policy in a sustainable, consistent and transparent manner, have regard to the efficiency and soundness of the financial system, and seek to avoid unnecessary instability in output, interest rates and the exchange rate.*³³

In addition to the explicit inflation target in the PTA document (between 1-3%), this particular section is the primary measure by which the Governor of the RBNZ is to conduct monetary policy. It is also the conditions under which he is audited by the Assistant and Deputy Governors.

Forward Guidance and Monetary Policy Statements

The 30-40 page Monetary Policy Statements from the Reserve Bank of New Zealand have been released quarterly since March of 1997. The hallmark of the statements is the projection of the 90-day bank bill interest rate for a time horizon of three years. The style with which these forecasts are presented has changed from statement to statement, and continues to change even today. The baseline presentation involves a straight-line projection of the 90 day interest rate alongside the projection(s) from previous monetary policy statements (*Chart 2: RBNZ—Policy Rate Forecast Chart Dec. 2012 vs. Mar. 2013*).³⁴ The graph on the left shows multiple projections from four previous Monetary Policy Statement with the current projection (from MPS December 2012). This is non-standard, and similar charts rarely appear in Monetary Policy Statements. The chart on the right (from MPS March 2013), is the standard presentation style of the banks projection (typically it is found in the first pages of the MPS report). It shows only the prior MPS projection versus the current projection.

As the exception rather than the rule, the RBNZ also sometimes publishes alternative scenarios in their MPS. The alternative scenario charts are surrounded by analysis and reasoning behind the various headwinds that could account for upside or downside on the projected rate. The alternative scenarios are not confidence intervals, as the Norges Bank and Riksbank produce. Rather, they are straight-line projections above or below the baseline projection. The two charts below depict two such charts, the graph on the left is from December 2005 MPS, and the downside in the 90 day interest rate is due to possible rapid decline in housing prices, a trend the bank forecasted to occur for two to three years ahead (*Chart 3: RBNZ—Policy Rate Forecast Chart Dec. 2005 vs. Mar. 2013*).³⁵ The upside projection was a possible scenario where house prices remain 10 percent higher than what is expected for longer than expected. The chart on the

³² Michael Reddell (Special Advisor, Economics), e-mail message to Nicholas Zagaria, April 18, 2013.

³³ Reserve Bank of New Zealand, [Policy Target Agreement](#), 2012.

³⁴ Reserve Bank of New Zealand, [Monetary Policy Statement](#), December 2012, p. 6.
Reserve Bank of New Zealand, [Monetary Policy Statement](#), March 2013, p. 5.

³⁵ [MPS, March 2013](#), p. 7.

Reserve Bank of New Zealand, [Monetary Policy Statement](#), December 2005, p. 7.

right is from the most recent March 2013 MPS and the downside is based on possible upward pressures on the exchange rate that could affect trade balances.

The bank provides similarly styled graphs for the inflation rate and for the trade weighted exchange rate index (TWI). Previous to moving to the OCS rate setting, the TWI and the Monetary Conditions Index (MCI) was a more important metric for communication and setting market expectations, second only to the 90 day interest rate projection.

Though the RBNZ does not use a loss function, it does occasionally give insight into the reasons for its misses in various projections of different key variables that are central mandates of monetary policy. Chart 3 in (from MPS, March 2013) explains the miss in inflation projections from a year previous. The blue bar on the left is the projection for inflation levels that was given in the MPS, December 2011. The projection was for inflation in December of 2012. The blue bar on the right shows the actual inflation rate in December of 2013, and the intervening bars show the misses in inflation projections for various goods and services that net out to the actual miss in the overall projection (*Chart 3: RBNZ—Policy Rate Forecast Chart Dec. 2005 vs. Mar. 2013*).³⁶ Though the bank often misses projections significantly, as in this case, multiple studies on the credibility of banks statements suggest that markets do still incorporate MPS projections into their expectations.³⁷

Analysis of Forecasting Experience

There are essentially two types of studies conducted to analyze the effectiveness of forward guidance on interest rate yield curves. The predominant method of analysis is to examine the efficacy of New Zealand’s forward guidance policy has been to examine the effect of forward guidance announcements on futures rates for interest rates of different time horizons. This is the so-called “path surprise” analysis. Because the 90-day bank bill interest rate is the key policy rate that New Zealand focuses on in its Monetary Policy Statements, this is the rate that is most often considered. More comprehensive studies using this approach, like that carried out by Nautz and Detmers, looks at rates as long as two years. The premise of forward guidance is that it should give the central bank greater influence over the long-term yield curve, which the RBNZ has not necessarily achieved according to most recent scholarship.³⁸

The second type of analysis involves looking at announcement surprises (or “target surprises”) of central banks practicing forward guidance policy. Andersson and Hofmann implement both target and path surprises into their analysis. They find that there is at least weak evidence that RBNZ’s announcement surprises and path surprises add to the sensitivity of the medium term interest rate. Yet there is no evidence that either of these surprises influence long-term market expectations. This suggests that inflation expectations are well-anchored and independent from forward guidance. The increased sensitivity of medium term rates indicates that forward guidance possibly increases the influence of RBNZ over this term structure.³⁹ However, since

³⁶ [MPS, March 2013](#), p. 7.

³⁷ Ferrero and Secchi, [“The Announcement of Monetary Policy Intentions.”](#) pp. 48-49.

³⁸ Detmers and Nautz, [“The Information Content of Central Bank Interest Rate Projections.”](#) pp. 1-3.

Kool and Thornton, [“How Effective Is Central Bank Forward Guidance?”](#) pp. 9, 14.

³⁹ Andersson and Hofmann, [“Gauging Effectiveness of Quantitative Forward Guidance.”](#) pp. 1-21.

announcement surprises appear to cause medium term sensitivity, one might also conclude that New Zealand's forward guidance is perhaps not entirely effective at preparing market participants expectations to potential future interest rate shocks.

To gain a micro level view of how target and path surprises might have influenced market expectations in the 90 day interest rate in New Zealand, we look at two separate instances where the Bank announced an interest rate change of .5 BP. On November 17, 1999 the RBNZ increased the OCR rate due in order to put the brakes on high GDP growth in order to ensure a sustained recovery from the Asian Financial Crisis. While presenting the rate hike in the Monetary Policy Statement, the governor inserted a hedge that the rate hike was not due to higher than normal expected inflation. He expected inflation to rise at the time due to increased energy prices, but saw it as an aberration that would correct. Despite the large increase in OCR rate, the 90 day interest rate only increased by .17 BP on announcement day. In the previous Monetary Policy Statement the RBNZ had alluded to a coming rate increase, and perhaps this is part of the reason for virtually no adjustment in the 90 day bank bill futures prices⁴⁰ (*Chart 7: RBNZ—90 Day Bank Bill Interest Rate: Projection vs. Market Futures*).

On December 4, 2003, the RBNZ released a statement that could be characterized as a path surprise. There was no change in the OCR rate, though inflation expectations were adjusted downward from previous predictions in the short term, but were forecasted to rise again in the medium term. The 90 day interest rate dropped 2.7% by market close, perhaps in response to the short term inflation guidance.⁴¹ Consistent with much of the academic literature that indicates RBNZ projections have influence of time horizons two quarters ahead, this could then suggest that market participants put more weight on the banks short-term guidance than long term guidance. That is, they might not believe inflation will return to previous levels in the medium term, as the banks forecast projects (*Chart 8: RBNZ—90 Day Bank Bill Interest Rate: Projection vs. Market Futures*).

The Small Open Economy of New Zealand

In their article on the real effects influencing monetary policy in New Zealand, Karim, Lee and Gan examine the effects of New Zealand's large trading partners on domestic output. Due to the small open economy effect, they find that the domestic interest rate moves in tandem with those of its large trading partners, (US, Japan, UK, and Australia). Domestic output falls significantly following foreign monetary contractions, and fluctuations in industrial output is heavily linked to its trade volume with these nations. The trade partnership with Japan alone explains 23% of fluctuations in NZ industrial output. Furthermore, effects of restrictive monetary policy shocks on industrial output are faster when Australia and the US variables are included in the model of monetary transmission.⁴² The sensitive nature of the New Zealand economy to foreign exogenous shocks also then influences market expectations with respect to key economic variables.

⁴⁰ Reserve Bank of New Zealand, [Monetary Policy Statement](#), September 17, 1999, pp. 1-3.

⁴¹ Reserve Bank of New Zealand, [Monetary Policy Statement](#), December 4, 2003, pp. 1-8.

⁴² Md. Shahnawaz Karim, Minsoo Lee and Christopher Gan, "[Real Effects of Monetary Policy in NZ](#)," *Commerce Division Discussion Paper* No. 106, 2005, pp. 1-17.

To examine Karim, Lee and Gan's first claim in detail we look at two announcements by the Federal Reserve Bank, and how they may have influenced short term interest rate futures in New Zealand. Since the Fed issues statements at 12:30pm EST, the announcement would not affect New Zealand markets until the following day. In their statement on June 20, 2012, the Fed held their ground on maintaining the zero lower bound, per previous forward guidance statements, and they announced that they would continue to purchase treasury securities, while retaining their portfolio of non-standard assets. What we see in (*Chart 32*) is that the yield curve on 90 day NZ bank bill futures moves up a modest amount by market close on the day of the announcement in New Zealand.

On September 13, 2012 the Federal Reserve Bank announced QE3, which involved the explicit target of purchasing \$40 Billion in non-standard mortgage backed securities. Since guidance was previously given by the Fed that this event might occur, perhaps New Zealand markets had already accounted for this. The futures rates on the 90 day interest rate in New Zealand barely moved as a result of this announcement, with the only noticeable change being at the longest end of the futures chain (3 years out) (*Chart 33*).⁴³

Volatility

In subsequent chapters, for Norges Bank, Riksbank, and the Federal Reserve Bank there will be a comparison of volatility levels on announcement days for the time period before forward guidance began, and for the period after. New Zealand did not have regular meetings prior to the move to issuing forward guidance in 1997. In the period of 1990 to 1997, the bank met sporadically, when conditions were severe enough to warrant public statements. They also held irregular, "Wednesday Windows," where the governor would speak about current policy headwinds. There were no rates being set at this time, and as such no regular meetings were held.

As mentioned in the previous section, scholars have tended to agree that projections by the RBNZ have a small but quantifiable effect on market expectations. But rather than examining a direct link between market participants reaction to forward guidance statements, the volatility study carried out here will look at the average net-volatility in the 90 day bank bill interest rate on forward guidance announcements over distinct time periods. The periods are distinct due to progressive and substantial policy changes that change the way the RBNZ conducts monetary policy. By looking across these periods we see how net volatility has worsened or improved.

This analysis will use a similar conceptual framework to Nautz and Detmers. We control for other macroeconomic factors around announcement days by taking the standard deviation of the average net-volatility over different time periods in the past 15 years. We calculate net-volatility by averaging the absolute value of the daily change over different time periods, which forms the baseline volatility level. Then we subtract net-volatility from the absolute value of changes on forward guidance announcement days. The time periods being considered are all distinct due to substantial changes in the way the RBNZ has conducted monetary policy. The years 1997 to 1999 is the first period of forward guidance. In 1999, the RBNZ moved from setting the quantity of money to setting the Official Cash Rate (OCR) for overnight deposits and lending, representing a significant departure from a policy perspective. In 2002 the bank moved to a

⁴³ Data Source: Bloomberg Terminal.

flexible inflation targeting mandate. These are all dividing lines in the analysis. (*Chart 6: RBNZ—Volatility Chart*)

After forward guidance began in 1997, average volatility on announcement was quite high relative to subsequent periods (standard deviation of 3.7). But over this same period average net volatility day over day was also much higher. Following the policy change to set the Official Cash Rate in 1999 volatility levels on announcement days drop significantly. They then remain low through the period of flexible inflation targeting starting in 2002 until the onset of the financial crisis. In 2008, Volatility levels then increase significantly once again.

Detmers and Nautz indicate in their study that volatility levels on long term time horizons actually worsen on announcement days in the post crisis period. The extent to which they worsen is dependent on the amount of content the bank provides. If the RBNZ provides scant analysis and data points in their MPS, then this increases volatility on long term rates. But what we see in the average volatility chart over time, going back to 1990, is that volatility increases significantly in during crisis periods (*Chart 7: RBNZ—Historic Average Daily Volatility*).

Conclusion and Lessons Learned

The literature does seem to agree that market participants in New Zealand well understand the conditionality of the RBNZ forecasts. There also appears to be a consensus that RBNZ has been ineffective at influencing market expectations beyond short-term horizons (two to six quarters ahead). Of the three small open economies examined in this report, RBNZ is alone in its perceived weakness in this regard. Though there are many studies questioning the forecasting effectiveness of the RBNZ when compared to a random walk, it is not clear if forecasting ability is the culprit for their lack of relative influence. And analyses of other central banks forecasting ability have concluded similar results to RBNZ's accuracy.

It seems that forecasting ability is not nearly as important as the actual content of the Monetary Policy Statements themselves. Over the entire course of its forward guidance history, the RBNZ has not substantially changed the content or the style of its Monetary Policy Statements. Sweden and Norway's statements are 10-20 pages longer on average, and provide more substance in terms of statistical analysis. If we conclude similarly to Detmers and Nautz, perhaps one of the current problems with RBNZ's forward guidance policy is that they are not providing enough information in their statements. While other banks like the US have used forward guidance and increased transparency as an additional policy tool under extraordinary conditions, the RBNZ has treaded water. They were once a trend-setter in transparency, but now seem to be losing that status. Thus it might be a worthy experiment for the RBNZ to now follow the lead of others and further expand their communication practices. Likely it would not hurt their attempts at managing monetary policy under the duress of the current financial crisis. It has helped other banks conduct monetary policy, particularly for the Federal Reserve Bank.

The changes that have occurred in the substance of Monetary Policy Statements are inconsistent and irregular. Michael Reddell, Special Economics Advisor at the RBNZ, has stated that these changes in presentation style and content of Monetary Policy Statements are not due to an organized experiment by the bank. Rather, they are the result of the Governor addressing issues

that he sees as pertinent to forecasts at the time of the Monetary Policy Statement writing.⁴⁴ Perhaps an organized experiment is what is needed to reinvigorate the current forward guidance policy regime at the RBNZ.

One empirical question that remains murky is the exact effect of how forward guidance in the US affects New Zealand, Norway and Sweden. For further study it would be interesting to conduct a robust model to evaluate the market response on short and long-term effects on domestic interest rate yields in these three countries when the Fed announces forward guidance statements. This could then be compared to a period before forward guidance, to see if volatility levels in interest rate yields in foreign markets has decreased as a result of being able to better incorporate expectations of policy moves by the Federal Reserve into their own projections.

Chapter 3: Norges Bank

Background

The Norges Bank is the national central bank in Norway. Its primary responsibilities are to maintain price and financial stability and to provide additional value through its investing arm. As of the end of 2012, the Bank, which is headquartered in Oslo, employed 660 staff members and had offices in London, New York, Shanghai, and Singapore. Its role in setting Norway's national monetary policy is governed by the Norges Bank Act of 1985 (amended in 2010, most recently).⁴⁵ And it seeks to accomplish its goals by targeting inflation and providing forecasts of various economic indicators so as to provide transparency and a measure of predictability to its actions.

The Norges Bank began its long-term move towards greater communications transparency in 2001, when it officially adopted an inflation target of 2.5 percent (see Table 3).⁴⁶ As with most central banks that had started experimenting with more extensive forward guidance around this time, Norway hoped to increase market trust and improve the symbiotic relationship between the central bank and the financial markets.

In reality, however, the Norges Bank had already adopted an implicit inflation target two years earlier, in 1999. At that time, the European Central Bank's inflation target was set at 2 percent. Since Norway's official monetary policy was to maintain exchange rate stability with the euro, the confluence of these two elements created the conditions for an implicit inflation target for the Norges Bank.⁴⁷

The decision to shift to an official inflation target was finalized mostly outside the bank, however. The Norwegian Ministry of Finance, eyeing skyrocketing oil prices and wary of the potential for

⁴⁴ Michael Reddell (Special Advisor, Economics), e-mail message to Nicholas Zagaria, April 18, 2013.

⁴⁵ Norges Bank, [About Norges Bank](#).

⁴⁶ Norges Bank, [Regulation on Monetary Policy](#), March 29, 2001.

⁴⁷ Svein Gjedrem, "[Inflation Targeting in An Oil Economy](#)" (address at Sparebanken Møre, Ålesund, Norges Bank, June 4, 2002).

correspondingly high inflation, determined to reorient the Norges Bank's mandate towards a longer time horizon by providing a specific numerical target for annual inflation starting in 2001.⁴⁸

Three years later, the Norges Bank began publishing short-term forecasts of its key policy rate, known as a "sight rate" for banks' deposits up to a quota in the Norges Bank. These "strategy intervals" projected this sight rate until the Norges Bank's next Monetary Policy Report, which was then produced three times per year.⁴⁹ (In 2013, this was revised to four times annually and switched to a quarterly system: reports and accompanying interest rate projections now appear in March, June, September, and December of each year.⁵⁰)

Just over a year later, in November 2005, these short-term projections were extended into long-term forecasts, as the Norges Bank officially joined the ranks of the central banks that conduct their own interest rate forecasts.⁵¹ This practice has continued to this day, as the Norges Bank releases projections of inflation, output, and its interest rate in every Monetary Policy Report.

Empirical Literature Review

Meredith Beechey and Pär Österholm (2013) compared the interest rate forecasts of Norges Bank and Riksbank to their respective market expectations. They found that the root mean square errors (RMSEs) of Norges Bank forecasts at one quarter, one year, and two years out were virtually identical to those of the market, and were superior to a naive forecast. For forecasts two years into the future, however, the Norges Bank's projections failed the test for bias (they overestimated the interest rate); and both its one- and two-year projections were inefficient (they did not make adequate use of macroeconomic information).⁵²

These findings are largely consistent with an earlier study by the Norges Bank (2007) that found insubstantial gaps between the forecasts of the central bank and the markets up to the one-year horizon.⁵³ Clemens J.M. Kool and Daniel L. Thornton (2012) found that the Norges Bank's projections improved on random walk forecasts "at horizons up to three quarters," but concluded that the effect on markets' accuracy was modest when compared to the performance of markets in countries with less transparent central banks.⁵⁴

Magnus Andersson and Boris Hofmann, meanwhile, noted that both target and path surprises decreased following the introduction of interest rate forecasts in 2005, but cautioned that

⁴⁸ Christoffer Kleivset, "[From a Fixed Exchange Rate Regime to Inflation Targeting](#)" (working paper of Norges Bank, 2012), p. 40.

⁴⁹ Norges Bank, "[Inflation report with Monetary Policy Assessments](#)," (IR 2004/2), July 2004, p. 7.

⁵⁰ Norges Bank, "[Monetary Policy Report with Financial Stability Assessment](#)," (MPR 2013/1), March 2013, p. 7.

⁵¹ Norges Bank, "[Inflation Report with Monetary Policy Assessments](#)," (MPR 2005/3), November 2005, p. 8.

⁵² Meredith Beechey and Pär Österholm, "[Central Bank Forecasts of Policy Interest Rates: An Evaluation of the First Years](#)," (working paper of *National Institute of Economic Research*, January 2013): p.11.

⁵³ Amund Holmsen, Jan F. Qvigstad, and Øistein Røisland, "[Implementing and Communicating Optimal Monetary Policy](#)," (staff memo of Norges Bank No. 3, December 7, 2007), p.26.

⁵⁴ Clemens J.M. Kool and Daniel L. Thornton, "[How Effective Is Central Bank Forward Guidance?](#)" (*working paper of Federal Reserve Bank of St. Louis*, December 2012), p.24.

inflation expectations over the long term have remained steady.⁵⁵ Another paper, also published by the Norges Bank (2008), showed that announcement-day volatility in 12-month NIBOR rates decreased substantially following the implementation of short-term interest-rate forecasts in July 2004.⁵⁶

Over time, as the Norges Bank has revised its loss function and honed its interest-rate forecasts, the number of criteria it officially uses to determine its interest-rate path has gradually decreased from six to three.^{57, 58, 59, 60} But an April 2013 paper by Nikola Mirkov and Gisle James Natvik found that the Norges Bank appears to feel constrained by prior projections when deciding the key policy rate in subsequent meetings.⁶¹

Finally, a Norges Bank Watch review (2013) suggests that the market's surprised reaction to the central bank's policy rate reduction in March 2012 was in part a response to a miscommunication by the bank's governor, Øystein Olsen, during his annual address.⁶²

Governance

The Norges Bank's Executive Board, which conducts national monetary policy, consists of seven members: the governor, the deputy governor, and five regular members. Although all seven are appointed by Norway's King in Council, the governor and deputy governor are both full-time employees of the Bank selected for six-year terms with a maximum of two terms total. The remaining five members of the Executive Board are not employed by Norges Bank. They serve part-time and are chosen for four-year intervals, with a maximum of three terms total.

The current governor is Øystein Olsen, who was appointed by Norway's King in Council to a six-year term that began in January 2011. Olsen's previous position was a five-year stint (2005-2010) as the Director General of Statistics Norway, and his previous roles included a position at the Ministry of Finance and professorships at the Norwegian School of Management and University of California at Berkeley.

The deputy governor is Jan Qvigstad, who has served in this role since April 2008. Previously, Qvigstad worked in various positions throughout the Bank since 1997, and he also taught at the Norwegian School of Management and University of Oslo.

⁵⁵ Magnus Andersson and Boris Hofmann, "[Gauging the Effectiveness of Quantitative Forward Guidance: Evidence from Three Inflation Targeters](#)," (working paper of European Central Bank, October 2009): pp. 21-25.

⁵⁶ Amund Holmsen, Jan F. Qvigstad, et al., "[Communicating Monetary Policy Intentions: The Case of Norges Bank](#)," (working paper of Norges Bank, November 24, 2008): p. 22.

⁵⁷ Jan F. Qvigstad, "[When Does An Interest Rate Path 'Look Good'? Criteria for An Appropriate Future Interest Rate Path](#)," (working paper of Norges Bank, June 2006): pp. 3-14.

⁵⁸ Holmsen, Qvigstad, et al., "[Communicating Monetary Policy Intentions](#)," p. 13.

⁵⁹ Ragna Alstadheim, Ida Wolden Bache, et al., "[Monetary Policy Analysis in Practice](#)," (staff memo of Norges Bank, October 25, 2010): p. 19.

⁶⁰ Norges Bank, [Monetary Policy Report](#), October 2012, p. 16.

⁶¹ Nikola Mirkov and Gisle James Natvik, "[Announcements of Interest Rate Forecasts: Do policymakers Stick to Them?](#)," (working paper of Norges Bank, April 8, 2013), p. 24.

⁶² Katrine Godding Boye and Tommy Sveen, "[Norges Bank Watch 2013: An Independent Evaluation of Monetary Policy in Norway](#)," *BI Norwegian School of Management*, March 4, 2013, p. 11.

The five current part-time members have experience in a range of fields. However, several have worked in the petroleum industry, a fitting background for a central bank committee member in an oil-rich country. Others have academic backgrounds or have worked for the Norwegian Ministry of Finance.⁶³

The Norges Bank’s decision-making board is sometimes characterized as an “autocratically-collegial” monetary policy committee, a scenario in which “the Chairman...merely dictates the ‘consensus.’” However, a Norges Bank study released in January 2013 revealed that, while the part-time members of the Executive Board felt that the governor exerted more control over forecasts than other members did, “they did not...agree that [he] can influence the interest rate decision by steering the discussion.”⁶⁴

Nevertheless, the Norges Bank produces key policy rate decisions and forecasts in such a way as to “provide one story in the monetary policy report that is supposed to fully explain the interest rate decision.”⁶⁵ As a model-based forecaster, the Norges Bank must select a narrative based on a consensus view of the economy, rather than producing a combined projection that incorporates multiple divergent assumptions.

Forecasting Framework and Models

For all of its long-term forecasts, the Norges Bank uses a dynamic stochastic general equilibrium (DSGE) system called NEMO: the Norwegian Economy Model. One of NEMO’s underlying premises is that Norway is able to determine its own inflation rate over the long run. The purpose of monetary policy, therefore, is to maintain expectations of low inflation such that economic actors can confidently make decisions in an environment of monetary stability.

NEMO assumes dual outlooks depending on the timeframe: in the short and medium terms, demand can be manipulated by monetary policy, which consequently affects output and employment. However, over the long run, the model assumes that structural elements – such as technological innovation and the supply of input materials – determine the state of the economy.⁶⁶

NEMO operates under a relatively standard loss function whose resulting forecasts must satisfy three fundamental criteria (see Equation 1). The first requires that annual inflation meet the target of 2.5 percent over time. This is essentially a restatement of the inflation gap portion of the loss function.

The second criteria states that the inflation target must be met over time: in short, it must be flexible. In the loss function, this criteria is represented by the interaction between the inflation and output gaps. Implementing a flexible inflation targeting regime necessitates a more patient

⁶³ Norges Bank, [The Executive Board](#).

⁶⁴ Mikael Apel, Carl Andreas Claussen, et al., “[Monetary Policy Decisions - Comparing Theory and ‘Inside’ Information from MPC Members](#)” (working paper of Norges Bank, January 15, 2013), pp. 20-22.

⁶⁵ Carl Andreas Claussen and Øistein Røisland, “[Explaining Interest Rate Decisions When the MPC Members Believe in Different Stories](#)” (Working Paper of Norges Bank, February 7, 2013), p. 17.

⁶⁶ Norges Bank, [Models for Monetary Policy Analysis \(NEMO\)](#).

approach to monetary policy, as high unemployment or subpar economic output demands policymakers' continued attention even during periods of moderately high inflation.

Finally, the Norges Bank must produce a monetary policy that is robust. This requirement factors in three elements of the loss function. First is the output gap: just as with the flexible inflation targeting criteria, the health of the economy is of paramount importance in setting monetary policy. However, two additional considerations also come into play: changes in interest rate over time, and the gap between the current interest rate and an "ideal" one.

The time element simply accounts for the fact that, in monetary policy, predictability is increasingly perceived as beneficial. Large, unexpected changes to the interest rate (or to its projected path) may be damaging to the economy, as well as to the Norges Bank's credibility. The ideal interest rate criteria signifies the interest rate's relation to a theoretical reference point "that is consistent with an inflation and output gap at zero over the medium term."

Each of these gaps is multiplied by a constant that is occasionally changed from one Monetary Policy Report to another. The most recent change to the loss function's actual composition took effect in March 2012, which placed higher emphasis on the output gap and replaced the gap between the policy rate and a "simple rule" with the current gap between the policy rate and an ideal one. During that meeting, the constants for the output gap, interest rate changes over time, and interest rate to ideal rate gap were, respectively, 0.75, 0.25, and 0.05.⁶⁷

In its Monetary Policy Reports, the Norges Bank depicts interest rate projections in the form of a forward-looking fan graph that forecasts the key policy rate three years into the future. The fan is subdivided into four strata representing 30 percent, 50 percent, 70 percent, and 90 percent confidence that the sight rate will fall within these respective bands at that moment in time. Of course, the fan expands as it moves further into the future.

Along with this primary graph, the Norges Bank produces complementary ones that highlight specific elements of its monetary policy. One such illustration portrays alternative future paths of the key policy rate if only one or two of its core criteria for the loss function were achieved. Another contrasts the actual projected rate with various rules (such as the Taylor rule). In addition, each Monetary Policy Report includes a chart portraying what economic elements caused the new interest rate path to deviate from the previous one (see Charts 9-12).

Analysis/Conclusions

Projection Accuracy

There are several ways to measure the effectiveness of a central bank's monetary policy. Even in relation to the specific practice of interest rate forecasting, a few possible evaluations immediately present themselves. Most obvious is the question of accuracy: to what extent does the key policy rate follow the projected path depicted in prior Monetary Policy Reports?

⁶⁷ Kathrine Lund and Ørjan Robstad, "[Effects of A New Monetary Policy Loss Function in NEMO](#)" (staff memo of Norges Bank, 2012), pp. 2-3.

Recent history suggests that the Norges Bank's interest rate projections have been only marginally accurate (see Chart 13). However, an important caveat is necessary here: given the Bank's relatively recent implementation of forecasts and the advent of the financial crisis just three years later, the bulk of the central bank's projections have been conducted in crisis and recovery environments.

At such moments, when economic shocks are significantly more frequent than during periods of relative financial calm, projections are subject to more drastic miscalculation than usual. A 2011 article by Charles A. E. Goodhart and Wen Bin Lim demonstrated that, in New Zealand, Sweden, and the United States, central bank projections consistently underestimated future interest rates during periods of rate increases, and made the converse error when rates were decreasing.⁶⁸

This has been much the same in Norway. In March 2009, for example, the key policy rate was set to 2 percent. But in the prior Monetary Policy Report from October 2008, the projection for March 2009 had been 4.49 percent. The June 2008 projection for that same date had been even higher, at 5.88 percent. Indeed, as rates continued to fall in Norway before largely stabilizing in mid-2009, bank forecasts consistently and severely overestimated future interest rates.

But in mid-2009, the opposite dynamic took hold. The Norges Bank's forecasts, finally having absorbed the full impact of its abrupt interest rate reductions (from 5.75 percent as late as October 2008 to 1.25 percent by June of the following year), began to under-project future rates. By March 2010, with the key policy rate at 1.75 percent, the previous three Monetary Policy Reports had all been underestimations: 1.71 percent (October 2009 report), 1.25 percent (June 2009 report), and 1.06 percent (March 2009 report).

It is only since the policy rate was stabilized at 1.50 percent in March 2012 (where it has now remained for more than a year) that the current rate has been consistently close to previous projections. Prior to the Norges Bank's Board meeting in March 2013, during which it decided to maintain the 1.50 percent key policy rate, the last three Monetary Policy Reports had all provided forecasts for this period between 1.50 and 1.60 percent.

Volatility

A second benchmark concerns the relationship between the central bank and the markets. There are many possible angles for measuring the effects of interest rate forecasting on financial markets.

One such metric is volatility. As mentioned in the literature review, a 2008 paper by Holmsen, Qvigstad, et al., found that announcement-day volatility decreased significantly following the implementation of short-term interest rate forecasting in July 2004. The study examined day-over-day changes in the 12-month NIBOR rate on announcement days and found reduced changes in the post-strategy interval forecast period. (Projections beyond the "strategy interval" – that is, the period between adjacent Monetary Policy Reports – began in November 2005, but

⁶⁸ Charles A. E. Goodhart and Wen Bin Lim, "[Interest Rate Forecasts: A Pathology](#)," *International Journal of Central Banking* Vol. 7, No. 2, June 2011, pp. 139-140.

the effect on announcement-day volatility was not as dramatic as the one following the enactment of short-term projections.)

Several caveats to this study are in order, however. First, because it measured daily changes in 12-month NIBOR rates, it is unclear exactly which portion of the volatility resulted from the announced interest rate (which takes effect immediately), as compared to the volatility resulting from the content of the bank's announcement of the new policy rate *path*. (For policy rate announcements from meetings in which the Norges Bank did not provide new projections, the policy rate decision may serve as a proxy for a new path: either affirming the previous one or indicating an unanticipated deviation.)

In order to isolate policy rate surprises from path surprises, then, it is perhaps more useful to analyze announcement-day volatility via 3-month NIBOR rates. This shorter time horizon excludes the longer-term variation that may be attributable to new projections of future interest rates, rather than the announced rate itself.

Another potential shortcoming of the 2008 study centers on the variation of interest rates themselves. Holmsen, Qvigstad, et al., published their paper in November 2008, when the Norges Bank's key policy rate was set to 4.75 percent. The volatility graph they produced incorporated all monetary policy meetings from 2001 through their paper's release.

This period can be divided into two subsections: pre- and post-implementation of interest rate forecasting. The average policy rate set at each meeting from 2001 through September 2005 (the last meeting before implementing long-term interest rate forecasts) was 4.35 percent. The average following the implementation of projections through November 2008 was 4.11 percent. Given the similar interest rates during these two periods, it was logical to compare announcement-day volatility without adjustment.

However, in the time that has elapsed since that paper, the Norges Bank's key policy rate has been set at a consistently low level: as previously noted, it has rested at 1.50 percent since March 2012 and has not risen above 2.25 percent since March 2009. A revised calculation of average monetary policy meeting rates since November 2005, then, reveals the significantly lower figure of 2.92 percent. Since absolute rate volatility is likely to decrease as interest rates are reduced, it is likely that the 2008 study's methodology, if revised to include monetary policy meetings through the present, would over-interpret the effect of interest rate projections on reduced volatility.

To usefully contrast the pre- and post-forecasting eras, therefore, one must remain aware of the fact that average key policy rate levels dropped precipitously following the implementation of projections. As in the original 2008 study, this revised version will subtract average baseline volatility (that is, day-over-day volatility in 3-month NIBOR rates) from announcement-day volatility in order to arrive at a net figure. Baseline volatility will be divided into pre- and post-forecasting periods, with two versions shown: before and after the launch of strategy interval forecasting in July 2004, and the same metric for the periods bisected by the introduction of long-term forecasting in November 2005.

As an example, assume that average daily volatility for the 3-month NIBOR rate was 20 basis points for the period from 2001 until the implementation of long-term projections in November

2005. Therefore, an average volatility of 20 basis points indicates that the rate on the 3-month NIBOR on a theoretical Day 2 is, on average, 20 basis points higher or lower than it was on Day 1. If, for example, the 3-month NIBOR rate were 2 percent on Day 1, a statistically average rate for Day 2 would be 2.20 percent or 1.80 percent. Therefore, if the 3-month NIBOR moved 50 basis points on a specific announcement day during a period of 20 basis points of baseline volatility, the net volatility would be 30 basis points.

Using this measure, as in the original study, has the potential to reveal the impact of interest rate forecasts on market expectations: does net announcement-day volatility decrease, and if so, is this a metric that should be used to evaluate the success of a specific monetary policy?

As seen in Chart 14, the effect of interest rate projections on announcement-day net volatility depends on which date is considered the official launch of policy rate forecasting. Average net announcement-day volatility prior to the November 2005 benchmark was 5.03 basis points, followed by 4.27 basis points from then onward (through the March 2013 monetary policy meeting). This suggests a minimal effect for the implementation of quantitative forward guidance in the form of interest rate projections.

However, consistent with the results of the above-mentioned 2008 study, a more dramatic change occurs when using the introduction of short-term forecasts in July 2004 as the benchmark instead. In this case, the non-forecasting period measured an average of 6.52 basis points of net announcement-day volatility, as compared to 3.76 basis points afterward. This occurred almost entirely due to the onset of interest rate projections: while average day-over-day period volatility stayed nearly constant (barely moving from 2.71 average basis points in the pre-strategy interval forecasting period to 2.84 thereafter), announcement-day volatility plummeted from 9.23 to 6.60 average basis points.

The gap between the divergent narratives implied by these two choke dates is essentially entirely explained by the behavior of the Norges Bank and the markets in the interim period from the introduction of short-term forecasts in July 2004 to just before the implementation of long-term projections in November 2005. During that timeframe, the Bank's policy rate never strayed from the 1.75 – 2 percent range, and the markets responded correspondingly: the average change in 3-month NIBOR rates on announcement days during this time was a mere 2.42 basis points. Average day-over-day volatility was likewise low, at only 1.12 average basis points.

In retrospect, this transitional period was an uncommonly uneventful stretch for the Norges Bank and the markets. Whereas during this time the key policy rate was only changed once, by the one-year anniversary of long-term forecasting the Norges Bank had changed the rate four additional times. The next year saw seven further rate changes.

Indeed, in the 2008-2009 period, average day-over-day volatility was 5.93 basis points, and announcement-day volatility reached a staggering 14.33 average basis points. After the December 17, 2008 meeting in which the key policy rate was reduced from 4.75 to 3 percent, for example, the 3-month NIBOR fell 60.00 basis points in one day (from 4.54 to 3.94 percent). The next year, average announcement-day volatility jumped to 12.25 basis points.

In short, volatility increased markedly in the late 2000s, regardless of which date is considered the beginning of interest-rate forecasting. But because the post-strategy interval forecasting

period began with just over a year of relative calm during which both day-over-day and announcement-day volatility were strikingly low, the net effect produced markets that were jolted less by policy rate announcements than they had been previously.

Areas for Further Research

A prime candidate for future exploration would be market volatility as measured by multiple interest rates. Whereas the 3-month NIBOR rate was preferred here for reasons of simplicity, a comparison of net volatility on announcement days for progressively longer-term securities may help to differentiate the simultaneous effects of policy rate surprises from path surprises.

Research into interest rate projection accuracy is also constrained by the extraordinary events of the financial crisis, which comprised a significant portion of Norway's post-forecasting timeframe. A more useful study will be possible after the experiment with forecasting has continued for longer, as it now has in New Zealand. This research would also delve into possible explanations for the often-counterintuitive reactions of the market to Norges Bank policy rate path announcements (see Chart 15).

Finally, an examination of the effect on volatility of lower interest rates in the wake of the financial crisis would help to determine more precisely to what extent interest rate projections truly produced lower volatility on announcement days.

Chapter 4: Riksbank

Background

The evolution of Riksbank's forward guidance experience dates back to the adoption of the statutory objective of maintaining price stability in 1999. This objective bestowed the Riksbank with greater independence from the Swedish Parliament (the Riksdag), and it gave the rights to conduct monetary policy to the Executive Board.

In 1993, Riksbank set the explicit inflation target at 2 percent, which remained in effect until 1995. Before 2005 the inflation forecasts were conditioned to maintain a constant policy rate assumption through the forecast horizon. This unrealistic assumption is now substituted with market expectations of the policy rate between 2005-2007. Starting in February 2007⁶⁹, Riksbank took a further step to increase transparency by publishing its own forecast for the key policy rate. The published forecast horizon also increased from two to three years. In April 2009, Riksbank started publishing individual votes and brief descriptions of dissenting views simultaneously with the policy decision at press conferences. Thus, there is now no need to wait until the minutes are published anymore. This step made it immediately apparent whether the decision was unanimous or not. The market participants could then absorb dissenting views at the same

⁶⁹ The Riksbank, [Riksbank to Publish Its Own Forecast for the Repo Rate](#), Box in MPR 2007:1.

time that the monetary policy decision was presented. The evolution of Riksbank's transparency and communication policy is summarized in Table 8.

The value-added through the forward guidance practice could be summarized in three points: 1) monetary policy becomes easier to predict, 2) forward guidance supports independence and accountability, and 3) it forces Riksbank to work more efficiently with increased participation from board members. This chapter proceeds with a brief description of how the Riksbank started publishing its own forecasted repo rate path, followed by a description of the process that the Riksbank follows when making repo rate decisions, with details of the current decision making framework. Finally, concluding remarks are given about the country-specific conduct of forward guidance.

Governance

Structure

According to the Sveriges Riksbank Act⁷⁰, the Executive Board of Riksbank consists of six full-time members that are appointed by the General Council for a period of six years. Thus they are appointed for their skills in relevant matters rather than their political affiliation. The Board is organized as an individualistic committee in terms of Blinder's⁷¹ taxonomy, where the chairman has the casting vote. The monetary policy decisions are made jointly by means of majority vote, six times a year.

Decision Making Process

The structure of the decision making process influences the publication of Riksbank's own forecast for the repo rate⁷². A further increase in transparency required Riksbank to make it easier for the public to understand how the Monetary Policy Committee (MPC) justifies its decision. This also includes insights into the individual responsibility of members, how they are positioned, and what their underlying considerations are. This has impacted the way that Riksbank organized the internal work flow. Furthermore, it has increased the MPC member's participation in the process, and it has increased the importance of the role the staff plays in meeting board member's need for background material and data as a basis for their decisions.⁷³

The decision making process that resulted in the Monetary Policy Report (MRP) briefly described below is based on Rosenberg (2008) and Hallsten and Tagtstrom (2009).⁷⁴ The entire process usually takes about six weeks as Table 9 shows. The Monetary Policy Department (MPD) mainly prepares the material for MPC meetings in close cooperation with Executive

⁷⁰ The Riksbank, [The Sveriges Riksbank Act](#) – as from July 2012.

⁷¹ Alan S. Blinder and Charles Wyplosz, "[Central Bank Talk: Committee Structure and Communication Policy](#)," (paper presented at the ASSA meetings, Philadelphia, January 9, 2005).

⁷² Overnight repo rate for a period of 7 days

⁷³ Mikael Apel, Carl A. Claussen and Petra Lennartsdotter, "[The Executive Board of Riksbank and Its work on Monetary Policy - Experience from the First Ten Years](#)," *Sveriges Riksbank Economic Review* 2010:1, pp. 84-119.

⁷⁴ The process is shorter for MPC meetings when a Monetary Policy Update (MPU) is published.

Irma Rosenberg, "[The Monetary Policy Decision-Making Process](#)," (speech of June 13, 2008).

Kerstin Hallsten and Sara Tagtstrom, "[The Decision Making Process - How the Executive Board of the Riksbank Decides on the Repo Rate](#)," *Sveriges Riksbank Economic Review* 2009:1, pp. 69-86.

Board. The first step is the discussion of several risks and associated alternatives related to the possible course of future economic outcomes. At this meeting, the alternative scenarios described in the second chapter of MPR begin to take shape.

Scenarios would include different levels of productivity, the oil price or economic growth abroad, etc. These scenarios are then used to determine the main scenario, which as a result of further discussions is likely to reflect the majority's view. Alternative scenarios are also discussed, which function as a guide to systematically justifying the repo rate path if economic developments do not follow the course predicted by Riksbank. The work on alternative scenarios increases the intensity of the discussion and facilitates the effort to draw up a well-balanced main scenario that the majority can support.

As a second step, a series of meetings takes place where detailed and technical discussions around international outlook, financial markets and current status occur. The newest statistics and incidents are analyzed to determine the current status of the economy, coupled with the exogenous conditions that are particularly important for a small open economy like Sweden.

As an extension of this process, MPD establishes its view of macroeconomic developments through a top-down approach to the forecasts, and then minor revisions are made by way of bottom-up detailed checks around different parts of the forecast. The forecasts in the main scenario begin to take shape at this stage. The path produced at this point reflects the historical behavior of the Board, which is adopted from the previous MPC meetings as a starting point.

The Executive Board is invited to the preliminary meetings but generally they prefer to receive a summary of information and may choose to attend only the first large monetary policy group meeting that takes place during the third week. In this meeting, the Board is acknowledged about the work of the MPD and the underlying assessments, and Board members also have the opportunity to ask clarification questions to the experts.

The next day, the second large monetary policy meeting is held. Through the adjustments on the main scenario the Board attempts to arrive at a repo rate path that is likely to be supported by the majority. The Board members can usually decide the repo rate path that they prefer at the second part (with limited participation) of this meeting.

Subsequently, a compilation of the MPR efforts are supervised by the Board and the discussions are centered around the presentation of forecasts, as well as the editorial checks on the wording of the report. If any new information is published during the editorial period, it is combined with the final decision at the MPC meeting. However, the time lag due to editorial checks is criticized in Goodhart and Rochet's (2011) report. They recommend announcement should have made a few days after the second monetary group meeting with a shorter statement and MPR/MPU would then published at the same time table. Underlying point is that, it seems unlikely to make an unexpected decision at the current MPC time table and to publish a detailed and coherent MPR the day after. Moreover, they also pointed the danger of leaks in current practice due to the fact that a number of staff and the Board members carrying the inside information for couple weeks.

European Union policies might influence Riksbank's choices regarding monetary policy design in the future. The government declared, at least initially, Sweden will not join to the European

banking union, the single supervisory mechanism for Eurozone countries. Ekholm (2013) states that, even if they join or not at the end Swedish decision makers would lose some of their control over Swedish banks.⁷⁵ However, this would not be expected to impact the forward guidance practice of Riksbank at this level.

Communication Policy

The Riksbank publishes the policy rate decisions and forecasts for the repo rate for a three-year horizon. There are six meetings a year. But the MPR is published for only three of the meetings (February, July and October). These statements contain complete forecasts and alternative scenarios. However, the MPUs published at the remaining three meetings are shorter, only containing the forecasts of the most important macroeconomic variables. Both the MPR and MPU are electronically published on the Riksbank's website at 9:30 am the day after the meeting. Riksbank publishes a press release, which includes the decisions taken and the votes of the MPC members, including the primary motives behind the reservations entered. The Riksbank also holds a press conference on announcement days. Approximately two weeks later, the meeting minutes are published with detailed explanations of the dissenting views, supported by related graphs.

Once the minutes are published, MPC members may give a more detailed account of their individual stance by incorporating the new statistics, but without signaling their views about the next meeting. These speeches and minutes give insight into the contribution of the members to the MPC and facilitate democratic control over the Riksbank's work.

Furthermore, the Governor of Riksbank attends public hearings held by the Parliamentary Committee on Finance twice a year. The Riksbank compiles a written account in the spring which is renamed as the account of monetary policy,⁷⁶ while in autumn the July MPR⁷⁷ is presented. Moreover, Riksdag orders an independent and external in-depth evaluation of monetary policy every four years.⁷⁸

Forecasting Framework and Models

Model

Riksbank has developed its own model⁷⁹ for the small-open economy of Sweden called Ramses⁸⁰ and it has recently been updated to Ramses II.⁸¹ It is a neo-Keynesian type DSGE model used to derive the general picture of the economy, the policy impacts and alternative scenarios during the

⁷⁵ Karolina Ekholm, "[The Globalization of the Financial Markets Following the Global Financial Crisis](#)," *Sveriges Riksbank Economic Review* 2013:1, pp. 6-30.

⁷⁶ The Riksbank, [Account of Monetary Policy 2012](#).

⁷⁷ The Riksbank, [MPR July 2012](#).

⁷⁸ Francesco Giavazzi and Frederic S. Mishkin, "[An Evaluation of Swedish Monetary Policy Between 1995-2005](#)," (presented to Riksdag, 2007).

⁷⁸ Charles Goodhart and Jean-Charles Rochet, "[Evaluation of the Riksbank's Monetary Policy and Work with Financial Stability 2005-2010](#)," (presented to Riksdag, 2011).

⁷⁹ The Riksbank, "[Ramses- A Tool for Monetary Policy Analysis](#)," MPR 2007:1, p. 32.

⁸⁰ RAMSES stands for the Riksbank's Aggregated Macro model for Studies of the Economy in Sweden.

⁸¹ Malin Adolfson, Stefan Laséen, Lawrence Christiano, Mathias Trabandt and Karl Walentin, "[Ramses II - Model Description](#)," *Riksbank Occasional Paper Series* No: 12, 2013.

decision-making process. It is complemented with various partial Bayesian VAR models, benefits for areas not yet incorporated into the Ramses. The data produced by models is combined with the Board member's assessment of a "well-balanced monetary policy."

Representation of Forecasts and Communication of Uncertainty

Riksbank uses fan charts to illustrate the forecasted repo rate path. The recent graph from MPR of April 2013 is presented in Chart 16. The uncertainty bands⁸² at fan charts are color coded for three different probabilities of 50, 75 and 90 percent around the point forecasts without taking zero lower bound into consideration - except February and April 2009 (see Chart 17).

There is an important difference between the point forecast and the interval around it. The point forecasts are produced as a combination of forecasts from economic models and the Board's assessment of what currently constitutes sound and well-balanced monetary policy. Therefore, they cannot be described on the basis of a probability model. The forecast interval around them is based on historical forecast errors. Thus, the point forecasts for repo rate convey the Riksbank's intentions for monetary policy contingent upon the economic developments that the Riksbank predicted today. On the other hand, the forecast interval around them does not represent Riksbank's view of economic uncertainty.⁸³ The reason for this is that they are produced as a result of a backward-looking process and the width of the interval does not automatically adapt to future economic uncertainty. Rather, it is constant over time.⁸⁴ Riksbank's main purpose behind generating uncertainty bands is to strengthen the contingency message of the mean forecasts. Svensson (2010) states the importance attached to the bands have special importance around zero lower bound.⁸⁵ Also, he points consciously using the probability distribution for repo rate as a policy instrument brings new questions and inflation targeting converges to "*distribution forecast targetting*" rather than "*mean forecast targetting*".

Riksbank publishes anticipated alternative paths for the repo rate three times a year (only in MPRs). The staff does not generate uncertainty bands around these alternative scenarios (Chart 18). The main motive for producing them is for accountability purposes as a means of systematically justifying the repo rate path.

The Riksbank does not supply a quadratic loss function since the monetary policy decisions are not merely based on the model. Instead, in the minutes a detailed explanation of positions is given with a supplementary mean squared gap graph (between unemployment and CPIF) derived from Ramses. Svensson (2010) states MSG makes it possible to assess how successful is the

⁸² The Riksbank, "[Calculation Method for Uncertainty Bands](#)," MPR 2007:1, p. 22

⁸³ The Riksbank, Note from [MPR 2013/1](#):The uncertainty bands for the repo rate are based on the Riksbank's historical forecasting errors and the ability of risk- premium adjusted forward rates to forecast the future repo rate for the period 1999 up to the point when the Riksbank started to publish forecasts for the repo rate during 2007.The uncertainty bands do not take into account the fact that there may be a lower bound for the repo rate.

⁸⁴ Unlike inflation and GDP, Riksbank can not generate a RMSE calculation for spreads solely based on internal forecast errors -due to limited observations. Hence, current practice is combining Riksbanks historical forecasting errors with [the market expectation](#) errors between 1999-2007. They are continuously updated every July MPR with new outcomes but still backward looking.

⁸⁵ Lars E. O. Svensson, "[Policy Expectations and Policy Evaluations: The Role of Transparency and Communication](#)," *Sveriges Riksbank Economic Review* 2010:1, pp. 43-83.

⁸⁵Ralph C. Bryant, Dale W. Henderson and Torbjörn Becker, "[Maintaining Financial Stability in an Open Economy: Sweden in the Global Crisis and Beyond](#)," Stockholm: SNS Förlag, 2012.

alternative paths in stabilizing inflation around the target and the resource utilization around the natural level, conditional to the information available at the time. The recent MSG graph from the February 2013 meeting's minutes is given in Chart 19.

Analysis and Conclusion

Forecast History of Riksbank

The literature related to the forward guidance experience of Sweden is very limited due to a small number of observations to conduct a substantive empirical study. Chart 21 shows the actual policy rate and all forecasts made by Riksbank between the years 2007-2013. In general, Riksbank's short term projections are credible while during the financial turmoil even the uncertainty bands could not capture the depth of the crisis, like most of the others. There are several researches comparing published path and market responses and concludes to some extent 2009 monetary policy conduct of Riksbank shaved credibility of its projections.

In order to track market responses to the MPC decisions, absolute change in 3 month STIBOR rates at the day of the press conference held by Riksbank between 2000-2013 is graphed in Chart 22. The adjusted average variation at the announcement dates is slightly lower after 2007 (excluding the crisis years, 2008 and 2009) when compared to the prior period. This empirical finding suggests that publication of the repo rate path may potentially enhance the predictability of the Riksbank's monetary policy by market participants.

Riksbank's Forward Guidance Experience at Proximity to Zero Lower Bound

Goodhart and Rochet (2011, p.78) compare Riksbank's repo rate and the path with market expectations derived from futures market rates, and they classify the first seven occasions (February 2007-July 2008) of the use of forward guidance as generating a market reaction in the expected direction. The second time-frame is the global financial meltdown era (September 2008-April 2009); during these five occasions when there was a change in the concordance between the official path and market yields, they said, "*One might conclude that the market appeared to doubt whether the Riksbank was doing enough.*" Instead of questioning whether the Riksbank could have moved faster in reducing the rates, here the focus will be on how proximity to the zero lower bound influenced the Riksbank's forward guidance practices. The Riksbank's "*forecast targeting*" experience at 2009 is informative for Fed, since following Svensson⁸⁶ (2011) there is no fundamental difference between monetary policy framework of the Riksbank and the Fed, except in their communication strategies.

Svensson⁸⁷ (2010 b) states Riksbank experienced an extraordinary year in 2009 when assessing its monetary policy. Starting in October 2008, Riksbank conducted an expansionary policy. Following the Lehman Brothers' collapse, Riksbank made six consequent policy rate cuts from 4.75 to 0.25, and it faced with zero lower bound concerns for the first time in 2009.⁸⁸

⁸⁶ Lars E. O. Svensson, "[Practical Monetary Policy: Examples from Sweden and the United States](#)," *Brookings Papers on Economic Activity*, 2011, pp. 289-332

⁸⁷ Lars E. O. Svensson, "[Assessment of Monetary Policy in Sweden in 2009](#)," (speech on March 18, 2010).

⁸⁸ The Riksbank, [Riksbank Previous Repo Rate Decisions](#).

The main scenario repo rate path with uncertainty bands in MPR from October 2008 and MPU from December 2008 did not foresee a severe rate cut that would lead to the zero lower bound. However, starting in February 2009, the main scenario fan charts indicate that this is probable. Riksbank though was still unwilling to show the potential piercing of the zero lower bound, so it decided to constrain fan charts at zero for the February and April 2009 announcements.

On the other hand, Riksbank's February 2009 MPR alternative scenario for weaker growth (Chart 20) was obviously pointing to the possibility of zero repo rates both with the below quotation (MPR 2009:1, p.26) and with discussions in the boxes (p.50) about alternative monetary policy tools at zero lower bound.

“In this alternative scenario, the Riksbank makes further cuts in the repo rate. However, during the latter part of 2009 and throughout 2010, the repo rate is at zero and consequently can not be cut any more.”

At the April 2009 meeting, Riksbank announced⁸⁹ the repo rate cut of 50 basis points (from 1% to 0.5%), together with a calendar date: *“The repo rate is expected to remain at a low level until the beginning of 2011.”* Also, a fan chart constraint at zero lower bound is published in the April 2009 MPU. As Chart 23 shows, the day before the meeting market expectations measured by future rates were lower than the announced level. In response to the Riksbank's decision, the market expected path shifted upwards. Hence, the short run market expectations converged to the Riksbank's projection but still remained slightly lower. However, the market's long run expectation over a year shifted up too, which was contrary to the Riksbank's announcement.

Svensson (2010⁹⁰) put forward several possibilities to explain how Riksbank failed to bring expectations in line with the announced path. The reason for the opposite effect would be due to a lack of credibility of repo rate path, a more optimistic view of the economy by markets, or unclear communication problems associated with very low repo rates about the means and the effective lower bound for the repo rate.

Woodford⁹¹ (2012) states that Riksbank's repo rate path projection contained two notable features: April MPU contained no announcement that 0.5% was a lower bound instead it referred to *“the forecasts in this report are based on the repo rate being cut to 0.5 per cent in April, with some probability of a further cut in the future.”*

However, immediately after admitting the possibility of further cuts in principle, it cautioned,

“With a repo rate at this level, the traditional monetary policy has largely reached its lower limit. When the repo rate approaches zero, there may be

⁸⁹ The Riksbank, [Press Release](#), April 2009.

⁹⁰ Lars E. O. Svensson, [“Policy Expectations and Policy Evaluations: The Role of Transparency and Communication.”](#) *Sveriges Riksbank Economic Review* 2010:1, pp. 43-83.

⁹¹ Michael Woodford, [“Methods of Policy Accommodation at the Interest-Rate Lower Bound.”](#) Columbia University, 2012.

negative effects on the functioning of the financial markets. However, there is little experience of how the financial markets function when interest rates are so low.”

Woodford states that the market interpreted Riksbank’s announcement as revealing something not previously known about its policy intentions, rather than the judgments about the economic outlook. Thus, it is easy to see how market participants read such a remark as indicating an intension on the part of the Riksbank not to reduce the rate below 0.5%. Additionally, Riksbank’s constrained fan chart could have contributed to this perception.

Riksbank’s subsequent calendar date statement that “*the repo rate will not rise again until the beginning of 2011*” made less of an impression, possibly because it reflects Riksbank’s pessimism while market participants might have been more optimistic. However, Svensson (2010) argues that by comparing SIFO Prospera money market players’ survey with Riksbank’s forecast, the discrepancy is find unlikely to be due to optimism but rather due to the fact that published repo rate path was not credible with the market. Woodford (2012) criticizes that the mere announcement of a constant path is not enough, and that the Riksbank should have supplied its view of how it would make decisions in the future that would justify such a path. He states that, without clarifying the target criteria that is assumed to shape future policy, merely publishing a forecasted path or conducting a purely forward-looking forecast targeting would be inter-temporally inconsistent. Especially when the current rate is constrained at its lower bound, the success of the forward guidance depends on both, the people’s ability to understand the future consequences of a commitment now (having a history-dependent target criteria) and the credibility of the claimed commitment on the part of the central bank. The way of facilitating both ease of understanding and credibility is the pursuit of a more transparent forecast targeting procedure in terms of policy deliberations and effective communication of it. Hence, instead of merely communicating a calendar date or a projection, the central bank can pick a widely understood target criteria to make its intentions clear to the market participants while increasing the central banks self-commitment to it. This allows verification of the pursuit of the identified target by the public, hence the offer is a “*promise*” rather than just a “*forecast*,” but it is also not a “*commitment to the preannounced path*.”

Woodford (2012) also notes that market’s awareness of divisions within the Executive Board (minority group dissents for a further expansionary policy: Lars E. O. Svensson - since April 2009 and Karolina Ekholm - since July 2010) would have contributed to the skepticism raised after April 2009. There are two main issues impairing the resolution mechanism of MPC meetings Riksbank that have not been solved for a long time: one is about using CPI or CPIF measures, and the other is centered on decision-making based on principle-based or judgmental procedures. Here we should also state that the term of office for Barbro Wickman-Parak and Lars O Svensson will expire in May 2013. If there will be a one more addition to the minority group as a result of new appointments, the governor might have to exercise the casting vote, which is not a common situation. This would signal that the division has become deeper, or markets might question the possible overconfidence of the chairman⁹².

⁹² Carl Andreas Claussen, Egil Matsen, Øistein Røisland and Ragnar Torvik, “[Overconfidence, Monetary Policy Committees and Chairman Dominance](#),” (working paper of Norges Bank, 2009)

Svensson (2010) states that Riksbank exposed to exceptional communication challenges at very low repo rates and statements about lower bound for repo rate may have been interpreted as unconditional promises. This confusion is explained by the inconsistency between the communicated future repo rate probabilities and the published repo rate path in terms of being the mean forecasts (the required probability distribution to be consistent with the communicated probabilities is said to be asymmetrical). He also cautioned that, consciously using repo rate probability distributions as a policy instrument will raise new questions and bring inflation targeting into the realm of “*distribution forecast targeting*”.

In addition, in the analysis of Riksbank’s forward guidance during the crisis period, Bryant, Henderson and Becker⁹³ (2012) point out that not only the level of the forecast path but also the degree of the uncertainty associated with the path is of particular importance around the zero lower band. In general, focus on this aspect in communications with the public is found unsatisfactory. Uncertainties about the future are generally described in texts but insufficiently presented in the fan charts. Noting Bank of England’s detailed work of weighting the risk associated with the various different shocks, authors suggest differentiating between non-crisis and crisis conditions or they suggest that allowing asymmetrical bands might better capture the skewed uncertainty that often present in severe crisis situations.

In July 2009 meeting, Riksbank executive board decided to further cut the repo rate from 0.50% to 0.25%, along with some non-standard measures. Svensson (2010 b) states that discrepancy between Riksbank’s official path and market expected path widened during the year (Chart 24) and caused the monetary policy to become less effective than intended. This also forced Riksbank to take non-standard measures. In addition to cutting rates to record low levels, they decided to lend up to SEK 100 billion to the banks for an extended period of 12 months, by hoping that “*this should contribute to lower interest rates on loans to companies and households.*”

The press release and MPR of July 2009 involve both improvements and contradictory communication issues. For instance, Riksbank turned back to the unconstrained fan chart practice, where 90th percentile left bound show -1.46%, and published an alternative policy with lower interest rate path where repo rate is set at zero until mid-2010. Also, it verbally states that “*Riksbank’s assessment is that cutting the rate to 0.25 per cent will not threaten the functioning of the financial markets.*”

On the other hand, inconsistent content also communicated verbally i.e. “*The Riksbank’s assessment is that after cutting the repo rate to 0.25 per cent it will have reached its lower limit in practice, and that the situation on the financial markets is still not completely normal.*” Svensson (2010) interpreted this message as an indication of a further cut was very unlikely and the market participant understood this as an unconditional promise. Hence, by allowing the repo rate decision to be interpreted as the minimum level, once more Riksbank fails to gain credibility for the projected repo rate path. The Chart 24 illustrates that market expected path still not converges to the Riksbank’s long-run projection.

⁹³ Ralph C. Bryant, Dale W. Henderson and Torbjörn Becker, “[Maintaining Financial Stability in an Open Economy: Sweden in the Global Crisis and Beyond](#)” Stockholm: SNS Förlag, 2012.

The Riksbank did not buy any securities during the global financial crisis, unlike Fed. When the extra ordinary measures were no longer needed, this made the exit process much easier. Riksbank began signaling its exit strategy at winter of 2009 and completed the gradual phase out process during the autumn 2010, according to Elmer et al⁹⁴.

Chapter 5: Federal Reserve Bank

Background

The Federal Reserve System is one of the most influential central banks in the world and its decisions impact many global economies. The Federal Reserve System has a complicated structure and historically has not been the most transparent central bank. However, since the mid-1990s, the Fed has taken some steps to enhance its transparency. The most recent one is to publish the fed funds rate projections, which makes it the forth country do it.

The first part of this chapter will introduce the background of the Fed in terms of its governance body, actions taken by it in the past decade, and its framework of the fed funds rate projection as well as special characteristics of the projection. The second part will analyze whether or not the fed funds rate projection is successful in changing the market expectations, and if it helps to enhance the predictability of the monetary policy. The third section concludes.

Empirical Literature Review

In 2006, Glenn D. Rudebusch and John C. Williams noted that the FOMC's communication does better align the market expectations and thus improve the macroeconomic performance. However, it should be careful in its way of communication and should emphasize the conditionality of the projections.⁹⁵

Christina D. Romer and David H. Romer (2008) discussed how valuable of the FOMC forecasts compared with the Staff forecasts, and concluded that the FOMC didn't add significant value to the staff predictions.⁹⁶

Menno Middleport (March 2011) examined the hypothetical assumption that increasing transparency may crowd out the acquisition of private information and thus may impair the

⁹⁴ Elmér, Guibourg, Kjellberg and Nessén, "[The Riksbank's monetary policy measures during the financial crisis – evaluation and lessons learnt](#)," *Sveriges Riksbank Economic Review* 2012:3, pp. 8-31.

⁹⁵ Glenn D. Rudebusch and John C. Williams, "[Revealing the Secrets of the Temple: the Value of Publishing Central Bank Interest Rate Projections](#)," (working paper of National Bureau of Economic Research No. 12638, October 2006).

⁹⁶ Christina D. Romer and David H. Romer, "[The FOMC versus the Staff: Where Can Monetary Policymakers Add Value?](#)" (working paper of National Bureau of Economic Research, January 2008).

ability for the public to predict the monetary policy. The experimental result from laboratory asset markets rejected the hypothesis.⁹⁷

Menno, in another paper, (April 2011) introduced three dummies variables in regressions (new minutes and FOMC statement on 1994, bias and outlook on 1999, and interest rate guidance on 2003) and found that minutes and FOMC statements introduced in 1994 and explicit forward guidance started on 2003 did help predictability and increase the accuracy in the Fed Funds Futures market.⁹⁸

Since the Fed published the quantitative guidance in 2012, the debate of fed funds interest rate projections has become more intense. Michael Woodford (2012) especially researched on the policy accommodation at the interest rate lower bound and concluded that “A more useful form of forward guidance, I believe, would be one that emphasizes the target criterion that will be used to determine when it is appropriate to raise the federal funds rate target above its current level, rather than estimates of the “lift-off” date.”⁹⁹

In the newest paper published by Janet L. Yellen (2013) reviewed recent FOMC policy actions and pointed out that the guidance provided is not complete (e.g. what will trigger the increase in federal funds rate and what the Fed will do after liftoff.)¹⁰⁰

Governance

The leadership of the Fed consists of the Board of Governors, whose seven members are chosen by the president and confirmed by the Senate. The Federal Open Market Committee (FOMC) is the decision-making body of the Fed, which consists of twelve members – the seven members of the Board of Governors of the Federal Reserve System, the president of the Federal Reserve Bank of New York, and four of the remaining eleven Reserve Bank presidents, who serve one-year terms on a rotating basis.¹⁰¹

The FOMC holds eight regularly-scheduled meetings per year and may hold extra meetings as deemed necessary. At each meeting, the FOMC discusses the points of interest, and then the decisions made by the committee are released to the press. The “minutes” of the meeting are available to the public roughly three weeks after the meeting date.

A unique aspect about the Fed is its decentralization of authority. That is, the Fed bases its decisions on the entire group rather than having one central person making the decisions. This is one of the main reasons why the Fed would choose a different way to communicate its policy forecasts and projections. Compared to New Zealand that has only one governor making decisions, one for Norway, and six for Sweden, it could in theory be much harder for the 12

⁹⁷ Menno H. Middeldorp, “[Central Bank Transparency and the Crowding Out of Private Information in an Experimental Asset Market](#),” (staff report of Federal Reserve Bank of New York, March 2011).

⁹⁸ Menno H. Middeldorp, “[FOMC Communication Policy and the Accuracy of Fed Funds Futures](#),” (staff report of Federal Reserve Bank of New York, April 2011).

⁹⁹ Michael Woodford, “[Methods of Policy Accommodation at the Interest-Rate Lower Bound](#),” Columbia University, August 20, 2012.

¹⁰⁰ Janet L. Yellen, “[Challenges Confronting Monetary Policy](#),” (2013 NABE Economic Policy Conference, March 4, 2013)

¹⁰¹ Federal Reserve System, [About the Federal Open Market Committee \(FOMC\)](#)

members of the Fed to reach a consensus. In addition, the regional Federal Reserve Banks are owned by the private banks and there is not much communication amongst the Federal Reserve Banks. This constraint will be further discussed in the conclusion and recommendation chapter (Chapter 7).

Timeline of the Attempts of the Fed to Publish its Fed Funds Rate Projections

In 2003, the Fed cut the federal funds rate target to an unprecedentedly low level, eventually to 1%, in order to stimulate the stagnated economy. On August 12th, 2003, the FOMC began releasing explicit signals for the first time by including in the text, "...the Committee believes that policy accommodation can be maintained for a considerable period."¹⁰²

On May 4th 2004, the FOMC gave the signal of policy firming by announcing, "...the Committee believes that policy accommodation can be removed at a pace that is likely to be measured."¹⁰³ Starting from June 30th, 2004, the FOMC increased the fed funds rate by 25 points every meeting until the end of first half of 2006, when the rate reached 5.25%.

On February 14th, 2007, the FOMC began publishing the Summary of Economic Projections to Congress. In the paper, the Fed began to include a table of the projections of inflation, output gap, and unemployment. (See Chart 25 for the example of projections of inflation, output gap, and unemployment rate). In the table it provides not only the central tendency but also the range of each projection.

In March 21st, 2007, however, the FOMC did not include any aspect of firming in the statement "...in light of the increased uncertainty about the outlook for both growth and inaction..."¹⁰⁴ From September 2007 to December 2008, during which the sub-mortgage financial crisis exploded, the FOMC aggressively cut the fed funds rate to 0-0.25%.

On December 16th, 2008, the FOMC returned back to the calendar day guidance and stated "...the Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time..."¹⁰⁵ Since then, the FOMC further strengthened the influence of monetary easing by extending the period during which the FOMC will expect the rate to stay low.

On January 25, 2012, the FOMC published its policy rate projection. (See Chart 26 for the example of fed funds rate projections). At almost the same time, chairman Bernanke announced the inflation target to be at 2%, which made the inflation targeting explicit.

On December 12, 2012, the FOMC explicitly stated the conditionality of the fed funds rate projections in the statement by elaborating that "the Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no

¹⁰² Federal Reserve System, [Press Release, August 12th, 2003](#).

¹⁰³ Federal Reserve System, [Press Release, May 4th, 2004](#).

¹⁰⁴ Federal Reserve System, [Minutes of the Federal Open Market Committee, March 20-21, 2007](#).

¹⁰⁵ Federal Reserve System, [Press Release, December 16th, 2008](#).

more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored."¹⁰⁶ That is, the statement of keeping the interest rate low is conditional upon the unemployment rate staying high, and inflation rate staying low, otherwise the Fed would have reason to change its policy in order to better aim for its two main objectives.

(See *Timeline 5* for the entire timeline of major changes that impacted communication)

Forecasting Framework

Chart 27 summarizes the framework and methodology of how the FOMC comes up with its projections. The most unique aspect of the Fed's forecasting framework is that there are no explicit models used for the projections, and this differs widely from almost all other banks we surveyed in this study. Instead, 7 members of the Board of Governors and the 12 presidents of the District Federal Reserve Banks all give their own assessments, both short-term and long-term, of the proper timing of firming, which is depicted on the bar graph. They also give assessments for the appropriate pace at which the firming policy should take place, and each assessment is represented as one dot in the graph.

Compared to other central banks, the Fed has more varied ways in which it can communicate its interest rate forecasts. However, the information of the forecasts is less transparent than the other banks. The 19 dots depicted in the graph are anonymous and do not distinguish between voting members and nonvoting members. Therefore, the influence of the forecasts on the fed funds rate that FOMC will set in the future can vary greatly depending on the distributions of the voting members and nonvoting members in the graph. For example, if all the dots near the top are made by the nonvoting members, the Fed will be more likely to keep the zero lower bound in the next meeting, as the majority of the voting members voted to keep it low. However, if all the upward dots are actually contributed by the voting members, the fed funds rate may be raised and at a quicker pace.

Secondly, all the forecasts are based on the assumption of "appropriate monetary policy", which is defined as the future path of policy that participants deem most likely to foster outcomes for economic activity and inflation that best satisfy their individual interpretations of the Federal Reserve's objectives of maximum employment and stable prices.¹⁰⁷ In other words, the projections are based on what the candidates think the economy "should be" instead of "will be". As a result, the same projections in the graph may have different embedded assumptions for the future, or the projections may differ only because of the disagreement of the ideal economic situations in the future by FOMC members. Furthermore, since the dots don't represent what the interest rate "will be", the rate FOMC will set in the future will still depend on the real economy in the future, which may vary from the path on the graph.

Furthermore, the projection is "not only an expectation but also a conditional commitment."¹⁰⁸ By saying that, on one hand, the Fed tries to emphasize the importance of the dual mandate. The

¹⁰⁶ Federal Reserve System, [Press Release, December 12th, 2012](#).

¹⁰⁷ Federal Reserve System, [Monetary Policy Report to the Congress, July 17 2012](#).

¹⁰⁸ Menno H. Middeldorp, "Central Bank Transparency, Private Information and the Predictability of Monetary Policy in the Financial Markets," (PhD diss., University of Utrecht, September 23, 2010), p.128

rate of the projection should not be the ultimate goal of the Fed, even if it is under the assumption of ideal economic conditions. Instead, the inflation and unemployment are the real indexes that the Fed targets, using the interest rate as a tool to influence the targets. On the other hand, the Fed is doing so to minimize the risk of misleading the economy. According to Menno Middleport, the public is prone to over-rely on the central bank, and the decision that the central bank makes may crowd out other valuable information in the market, depending on the markets expectations and their faith in the Fed. However, one should also note that as the decisions the Fed makes are uncertain, the unpredictability of the interest rate will always be of some concern.

Lastly, when the board of governors and presidents of Federal Reserve Banks give their opinions, the Federal Reserve Staff, comprised of all professionals and researchers, also provides their forecasts. All the detailed information is included in the documentation known as the “Green Book.”¹⁰⁹ The Green Book is more informative in content than the governors’ projections. But the Green Book is only published with a three-year lag and therefore is not available for decision-making at the time.

Analysis

Market Expectations

As discussed in the introduction, the major reason of the FOMC publishing the fed funds rate projections was to keep the zero lower bound stable in the long run by influencing the economy’s expectation about the stability of the fed funds rate. Therefore, the effectiveness of the monetary policy is an important question to be answered. Perhaps the most important variable in the effectiveness of monetary policy lies in the market’s expectations. Chart 29 represents the three recent major changes to the statements that the FOMC made. As a proxy for market expectations, the one-month US dollar Overnight Index Swap (OIS) rates are used in this paper. An overnight indexed swap (OIS) is an interest rate swap where a fixed rate is swapped against a pre-determined published index of a daily overnight reference rate. It is equivalent to the fed funds rate futures and represents the market expectations of the fed funds rate in the future.

The top left two graphs of Chart 29 shows the decision on August 8, 2011 when the FOMC decided to keep the fed funds rate around zero “at least through mid-2013”. The shadowed area is the period that the FOMC promised to keep the zero lower bound. The blue line shows the market rates before the announcement date, and the red and green lines show the market rates on and after the announcement date, respectively. From the graph we can tell that the market rates dropped quickly on the day of the announcement, and continued to drop in the days following the announcement. Furthermore, not only the rates within the period that the FOMC promised (until mid-2013) decreased, but also the rates after the time in which the FOMC promised (mid-2013) also decreased significantly.

In the top right two graphs of Chart 29, the statement on January 23, 2012, was further strengthened to keep the fed funds rate low “at least through 2014.” As the result, the OIS rates from June 2013 to November 2014 moved rapidly towards zero, accordingly. The OIS rates between January 2012 and May 2013 stayed almost the same, as they had already adjusted to the

¹⁰⁹ Federal Reserve System, [Fedpoint - Federal Open Market Committee \(FOMC\)](#)

previous announcement of low rates. However, after the announcement the market expectations past 2014 jumped up to 1.3%, which was considerably higher than what it was even before the announcement.

In bottom right two graphs of Chart 29, in the statement on September 12 2012 the FOMC promised to keep the rate low “at least through mid-2015”. Nevertheless, this time the market didn’t follow the statement. Conversely, both the market rates on and after the announcement date increased, while the rates past mid-2015 increased more than the ones within the period.

To conclude, the three statements mentioned above did show the effectiveness of fed funds rate projections. Although we observe less and less changes, it does not necessarily mean that the market doubted the projections or didn’t follow what the statements said. On the contrary, it is more likely to show the increased predictability of the FOMC’s monetary policy. The shock was unexpected on August 8 2011, so the market reacted with huge drops of the futures rates. Throughout the next occurrences of strengthening in the statements, the public absorbed the information gradually and understood better what the FOMC intended to do. Their expectations were bolstered after each of the Fed’s statements confirmed what they had previously stated, that interest rates would remain low. As the result, the initial shock’s effect was also incorporated in the futures rates because it became more predictable. As Menno Middleport stated, “Little reaction in money market rates following a policy rate change suggests that it has been priced in and that policy is predictable.”¹¹⁰

Another interesting finding is about the OIS rates past the date that the FOMC projected to keep the zero-lower bound. Theoretically the rates should not be impacted by the statements, or they should at least follow the same direction and should decrease. However, the empirical result shows that instead of staying the same, the OIS rates beyond the Fed’s promised date substantially increased in January and September of 2012. However, this may be not entirely related to the projection itself. Since 2012 most macroeconomic indicators have suggested that US is recovering from recession. Therefore, it is likely that the public is building into its expectations the news of a significant economic recovery, and thus the subsequent increase of rates in the future.

Volatility

There are two principal approaches to examine the predictability of monetary policy. One approach is to measure the market expectations before and after the announcements, to analyze the shifts in trends due to the announcement of the projections of the rates. The other method is to compare the volatility before and after the central bank published its forward guidance. There are three critical dates in our analysis for the Fed. The first date picked is August 12th, 2003, when the FOMC first introduced its explicit signaling. The second date is March 2007, when the Fed removed the forward guidance from the statement following the FOMC meeting. The third is December 16th, 2008, when the FOMC returned back to calendar day guidance. As a result, we divide the period from 2000 to 2013 into four time periods.

¹¹⁰ Menno H. Middeldorp, “[FOMC Communication Policy and the Accuracy of Fed Funds Futures](#),” (staff report of Federal Reserve Bank of New York No. 491, April 2011), pp. 5-6

The raw data used here is the change of percentage rate of the 3-month Treasury Bills.¹¹¹ We first organized and sorted the data by taking the absolute value of the change of percentage of the rates. Then, we calculated the average of the absolute values for each of the four different periods, generating a unique variable (\bar{x}) for each of the time periods, which then were subtracted from the absolute value of each change of percentage observation accordingly in each time period. By doing this, we attempt to eliminate as much as possible the exogenous shocks not related to the forward guidance's effects on volatility. The last step is to take the absolute value again and average the new data.

The result is the volatility graph shown in Chart 28. According to the graph, the volatility between Aug 2003 and March 2007 (0.022%) decreased slightly compared to the volatility before August 2003 (0.017%). This shows that the introduction of forward guidance on August 2003 did decrease the market volatility, but not as much as we had expected it to.

The volatility from March 2007 to December 2008 hiked to 0.067% and decreased significantly to 0.007% after December 2008. This result suggests that the removal of forward guidance between March 2007 to December 2008 did largely increase the uncertainty and volatility of the rates, and the reintroduction on December 2008 did help market to predict the future and stabilize rates.

However, although our data shows some insight as to the announcement's effects on market volatility, the results are not conclusive. The years of 2007 and 2008 were the most severe years of the financial crisis. The FOMC also stated that the removal of the forward guidance from statement was "in light of the increased uncertainty about the outlook for both growth and inaction". Therefore, even as we have tried to control for the factors other than the forward guidance's effects, there would still be some uncertainty embedded within the data.

Another reason that the volatility is low after the Jan 2012 is because the economy is still suffering from the recession. The interest rate is already around 0%, so the resulting low volatility is not necessarily due to the reintroduction of the low Fed funds rate projections.

Despite the problems inherent in the data, the overall result of our volatility analysis indicates a positive relationship between the publication of forward guidance and the decrease in volatility.

Conclusion

Although the FOMC only began to publish its fed funds rate projections in 2012, it had been communicating its expectations to the public since 2003. However, after the Fed reached the zero lower bound in the sub-mortgage financial crisis, traditional monetary policy lost its power because the fed funds rate cannot drop below zero. This situation was unprecedented in our economic history, and new methodologies were needed in order to pursue economic recovery. In January 2012, the fed funds rate projection was introduced in the statements as one of the new tools that the FOMC developed for use in this situation. The objective of the fed funds rate projections is to influence the interest rate in the long term by reinforcing the market's expectations, without being bound by promises and commitments.

¹¹¹ Data Source: Federal Reserve Bank of St. Louis

However, the FOMC was careful of its influence on expectations, and apparently didn't want to become overly transparent. They only provided a rough idea about what the board of governors and the presidents of the Federal Reserve Banks thought. In light of the current situation and recent undertakings by the Fed and its methodologies, we are likely to see more structural and communication changes from the FOMC in the future.

From the empirical results, the Fed funds rate projection appears to be successful in altering the market's expectations in the short term. The long term market expectations were more volatile, but it is difficult to discern how much of the variance can be attributed to the change in the forward guidance, and how much is due to other systematic economic shocks.

For market volatility, we observe a significant change before and after the FOMC published the forward guidance. This provides evidence that forward guidance does help the market to both better predict and trust the statements regarding the fed funds rate, and thus makes monetary policy more effective.

Chapter 6: Federal Reserve Balance Sheet Policy Communication

In addition to the comparative analysis of policy rate forecasting across New Zealand, Sweden, Norway, and the United States presented in the previous chapters, this paper also provides insight into the Federal Reserve's balance sheet communication practices. To be sure, since the onset of the recent financial crisis, the FOMC began to rely heavily on forward guidance about both the future path of the federal funds rate and its balance sheet policy. Accordingly, chapter 6 carries out a comprehensive analysis of the Fed's balance sheet communication practices and contrasts them with those implemented by the Bank of England (BOE), whose balance sheet policy is the most comparable to that of the Federal Reserve among all other central banks in the world.

It is worth pointing out that this paper restricts the analysis of balance sheet policy to large-scale asset purchase (LSAP) programs – that is, the creation of money to buy treasury securities and select private sector obligations¹¹² – excluding temporary liquidity and credit programs put in place by the Federal Reserve and the Bank of England to support the functioning of their countries' financial systems. The temporary liquidity and credit programs are excluded not only because of their diverse nature – which complicates their comparison across countries – but also because they currently represent a very small share of total assets in the balance sheets of the Fed

¹¹² Clarida (2010) expands the definition of LSAP programs by classifying the purchase of treasury securities as “quantitative easing”, and the purchase of select private sector obligations – like residential mortgages and corporate bonds – as “credit easing”. See Richard Clarida, ["What have we Learned about Monetary Policy in a Low Inflation Environment? A Review of the 2000s"](#), Boston Fed Conference on Monetary Policy in a Low Inflation Environment, October 15-16, 2010; published in *Journal of Money, Credit, and Banking*, February 2012, pages 15 and 17. Nevertheless, the present paper uses the terms LSAP program and quantitative easing interchangeably, considering that this is customary both in the United States and the United Kingdom.

and the BOE, as opposed to LSAP programs.¹¹³ Not surprisingly, FOMC and MPC¹¹⁴ communications on the balance sheet focus on LSAP programs, and recent investigations – such as Carpenter et al. (2013) – use LSAP programs as the main driver of their balance sheet projections.¹¹⁵

The structure of chapter 6 is as follows. The first section briefly describes the background and characteristics of the LSAP programs implemented in the United States and the United Kingdom, explaining why it is appropriate to use the Bank of England as a benchmark to evaluate the Federal Reserve’s balance sheet communication practices. The second section describes and analyzes the full set of communication tools that are currently being used by these two central banks to inform the public about their balance sheet policies. The third section assesses the effectiveness of these balance sheet communication practices; basically, looking at their contribution to lower yields across the United States and the United Kingdom. To do so, the third section summarizes findings from the event studies literature. Finally, the fourth section presents the conclusions of the analysis, which will serve as input to formulate recommendations on how the Fed could improve its balance sheet communication practices in the future.

Background

Timeline 6 illustrates the timing and size of the LSAP programs implemented by the Federal Reserve and the Bank of England since the onset of the recent financial crisis. The Fed hit the zero lower bound in December 2008, and started its LSAP program in that same month, launching “Quantitative Easing 1” (QE1) to purchase mortgage-backed securities (MBS), agency debt, and treasuries. The details of the Fed’s LSAP program are described in Table 10. In a nutshell – using an intuitive American football metaphor¹¹⁶ – one might say that QE1, QE2, and “Operation Twist” played defense to defeat deflation, while QE3 and QE4 are playing offense to reflate the economy. In total, the LSAP program has added about \$ 2.5 trillion to the Federal Reserve’s assets, increasing the amount of Fed’s assets as a percentage of annual GDP from 6% in 2008 (pre-crisis) to 19% by the end of 2012.

On the other side of the Atlantic, the Bank of England established its Asset Purchase Facility (APF) in January 2009 but started using it as a monetary policy tool in March 2009 when the zero lower bound was reached.¹¹⁷ Since then, the APF has been expanded six times and has

¹¹³ The Fed’s [March 2013 Quarterly Report on Balance Sheet Developments](#) shows that treasury securities, mortgage-backed securities, and agency debt (assets bought through the LSAP program) account for 92% of its total assets (see page 5). Similarly, the [Bank of England’s website](#) shows that in early April 2013 the assets held in the Asset Purchase Facility (APF), which appear as “other assets” in the balance sheet, account for approximately 90% of the BOE’s total assets.

¹¹⁴ The Monetary Policy Committee (MPC) is the monetary policy decision-making body of the Bank of England. The second section of this chapter – “Balance Sheet Communication Tools” – describes the governance of the MPC.

¹¹⁵ Seth Carpenter, Jane Ihrig, Elizabeth Klee, Daniel Quinn, and Alexander Boote, [“The Federal Reserve’s Balance Sheet and Earnings: A Primer and Projections”](#), *Finance and Economics Discussion Series*, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington, D.C., January 2013.

¹¹⁶ This metaphor was coined by Professor Richard Clarida in his spring 2013 International Monetary Economics class at the School of International and Public Affairs (SIPA) of Columbia University. The authors of this paper are indebted to Professor Clarida – their advisor – for his patience and insightful advice.

¹¹⁷ To clarify, the Asset Purchase Facility is a subsidiary company of the Bank of England. The UK Treasury provides the BOE with an indemnity to any losses arising from the APF. Initially, the APF’s aim was to improve

concentrated its purchases almost entirely in gilts – that is, UK government bonds – although it has also bought a small amount of corporate bonds and commercial paper. The details of the BOE’s APF are described in Table 11.

Some authors – such as researchers at the Bank for International Settlements (BIS) – classify the £ 200 billion in purchases between March 2009 and February 2010 as APF 1; the £ 125 billion in purchases between October 2011 and April 2012 as APF 2; and the £ 50 billion in purchases between July 2012 and October 2012 as APF 3.¹¹⁸ In total, the APF has added £ 375 billion to the Bank of England’s assets, raising the amount of BOE’s assets as a percentage of annual GDP from 7% in 2008 (pre-crisis) to 26% by the end of 2012. It is important to clarify that both the Fed and the BOE reinvest the proceeds of the securities that mature in their portfolios,¹¹⁹ and will continue doing it until they decide to undertake the “exit process” and normalize the size of their balance sheets.

Against this backdrop, the Bank of England seems to be an appropriate benchmark to compare the Federal Reserve’s balance sheet communication practices, considering that both banks have implemented very aggressive LSAP programs in terms of size as a percentage of GDP, at roughly the same timing, and in contexts of weak GDP growth and low inflation.¹²⁰ Moreover – aside from the aforementioned similarities between the LSAP programs of these central banks – it is worth pointing out that the Fed and the BOE are also comparable because they pursue relatively similar goals. Even though their official mandates are different – the Fed promotes maximum employment, stable prices, and moderate long-term interest rates, whereas the BOE pursues stable prices and financial stability – it can be argued that in practice they both have similar objectives.

Indeed, the Federal Reserve’s “Statement on Longer-Run Goals and Monetary Policy Strategy” – published for the first time in January, 2012, and again in January, 2013 – states: “[...] *the Committee’s policy decisions reflect its longer-run goals, its medium-term outlook, and its assessment of the balance of risks, including risks to the financial system [...]*”.¹²¹ In the same vein, Chairman Bernanke in his Humphrey-Hawkins testimony before congress in February

liquidity in credit markets by buying high-quality assets financed through the issue of Treasury bills and the Debt Management Office’s cash management operations. However, the APF became a monetary policy tool in March 2009 when it began purchasing gilts and select private securities financed by the creation of central bank reserves. These loans to the APF appear as “other assets” in the [Bank of England’s balance sheet](#), which is not consolidated with the balance sheet of the APF.

¹¹⁸ Jack Meaning and Feng Zhu, [“The Impact of Recent Central Bank Asset Purchase Programmes”](#), *Bank for International Settlements (BIS) Quarterly Review*, December 2011, p. 74.

¹¹⁹ Both the Fed and the BOE roll over maturing Treasury securities at auction. The Fed also used to reinvest principal payments from its holdings of agency debt and agency mortgage-backed securities in Treasuries, but since September 2011 it has been reinvesting them in agency mortgage-backed securities (see announcement on 9/21/2011 in Table 10).

¹²⁰ Nevertheless, inflation in the United Kingdom has been higher than in the United States. In fact, the Bank of England did not meet its 2% inflation target (with plus/minus 1% range) in 2008, 2010 and 2011. Moreover, as acknowledged in the overview of the [Bank of England’s February 2013 Inflation Report](#), UK inflation is expected to remain above target over the next two years (although below 3%, the upper bound of the tolerance range).

¹²¹ The Federal Reserve’s [Statement on Longer-Run Goals and Monetary Policy Strategy](#). As amended effective on January 29, 2013.

2013¹²², as well as Vice Chair Yellen¹²³ and Governor Stein¹²⁴ in recent speeches, have all made clear that the Fed cares about financial stability.

Concurrently, the Monetary Policy (MPC) of the Bank of England has communicated, quite directly, that its inflation mandate is a flexible one. For instance, the February 2013 Inflation Report – the BOE’s flagship publication – states: “*Attempting to bring inflation back to the target sooner by removing the current policy stimulus more quickly than currently anticipated by financial markets would risk derailing the recovery [...]*” and “*The Committee agreed that it stood ready to provide additional monetary stimulus if warranted by the outlook for growth and inflation*”.¹²⁵ By the same token, the March 20, 2013 remit letter of the Chancellor of the Exchequer to the Governor of the Bank of England clarified the trade-offs between inflation and output that are involved in setting monetary policy.¹²⁶

Thus, the significant overlap between the practical objectives of the Federal Reserve and the Bank of England is clear; and it is hard to argue that their large-scale asset purchase programs (and by implication their balance sheet communication practices) are not comparable because these central banks do not have identical official mandates.

Balance Sheet Communication Tools

As mentioned in chapter 5, the monetary policy decision-making body of the Federal Reserve – the Federal Open Market Committee (FOMC) – has eight, two-day, regularly scheduled meetings per year. The FOMC uses the statements, minutes, and press conferences associated with these meetings as its main instruments to communicate information regarding the balance sheet. Statements are released on the second day of each meeting, whereas minutes are published with a three-week lag, and press conferences are held quarterly; specifically, on the second day of the March, June, September, and December meetings.¹²⁷

¹²² Ben Bernanke, [Testimony before the Committee on Banking, Housing and Urban Affairs, U.S. Senate](#), Washington, D.C., February 26, 2013, p. 5.

¹²³ Janet Yellen, “[Challenges Confronting Monetary Policy](#)”, (speech on National Association for Business Economics (NABE) Economic Policy Conference, Washington D.C., March 4, 2013), p. 17.

¹²⁴ Jeremy Stein, “[Overheating in Credit Markets: Origins, Measurement, and Policy Responses](#)”, (speech, Federal Reserve Bank of St. Louis, February 7, 2013).

¹²⁵ Bank of England, [Inflation Report](#), February 2013, p. 8.

¹²⁶ [Remit for the Monetary Policy Committee – March 2013](#). The Bank of England Act (1998 plus amendment) states that the objectives of the BOE are to maintain price and financial stability; and, subject to that, to support the economic policy of the government, including its objectives for growth and employment. Hence, this Act also requires the Chancellor to write a letter to the Governor of the BOE, at least once every 12 months, specifying how price stability should be defined and what the economic policy of the Government consists of. It worth noting that the unusual wording of the March 2013 remit letter – which stated that inflation could overshoot its target if the alternative would be an economic slump – lead some people to believe that the BOE’s mandate was changed (e.g.: The Telegraph “[Bank of England expected to hold QE despite new mandate](#)”). But this was a clarification, rather than a change.

¹²⁷ The periodicity of FOMC press conferences has varied since they were initially introduced, along with the publication of the summary of economic projections (SEP), in 2011. In 2011 the FOMC held three press conferences (April, June, and November), while in 2012 it held five (January, April, June, September, and December). Nevertheless, the current periodicity is expected to be maintained, at least through 2014, as it is shown in the [FOMC calendar](#).

Table 10 – which lists the most important announcements related to the Federal Reserve’s LSAP programs since the onset of the financial crisis – shows that 15 out of 20 (75%) of these announcements were communicated through the aforementioned communication tools. The other five announcements were done through a press release (11/25/2008), a speech by the Chairman (12/1/2008), a Jackson Hole symposium (8/27/2010), a Federal Reserve Bank of New York statement (6/20/2012), and a Humphrey-Hawkins testimony before Congress (2/26/2013).

Press releases provide the Federal Reserve with the flexibility to make official announcements and reach a wide audience whenever it is deemed necessary. For instance, on 11/25/2008, under the threat of worsening economic conditions, the Fed was able to announce its first LSAP program (QE1) swiftly, without having to wait until the next FOMC on December 15-16. Of course, the FOMC has always the option to set up unscheduled meetings and issue a statement (e.g.: in 2008 the FOMC met 14 times and issued 11 statements), but occasionally it is more convenient to issue a press release rather than summoning a formal meeting of FOMC members.

To be sure, the Federal Reserve also communicates its balance sheet policy through speeches, interviews, and opinion-editorials by Board members and Presidents of Fed regional banks. Generally, the Chairman is who breaks new ground (e.g.: announcements on 12/1/2008, 8/27/2010, and 2/26/2013 in Table 10), and hence receives the greatest attention from media and market agents. Moreover, the Chairman has the opportunity to engage in interactive question and answer sessions seven times a year during the four quarterly press conferences associated with the FOMC meetings, the annual Jackson Hole economic symposium held in August,¹²⁸ and the two semiannual Humphrey-Hawkins testimonies before Congress.¹²⁹ The Chairman has been using these question and answer sessions to clarify issues about the Fed’s LSAP program both to members of Congress and the media.

Additionally, the Federal Reserve has supplementary communication tools, such as the NY Fed statements which accompany every FOMC statement that entails changes to the operating policies for conducting open market operations.¹³⁰ The NY Fed statements sometimes clarify key issues about asset purchases such as amounts, timing of operations, and maturity distribution of the securities to be purchased (e.g.: announcement on 6/20/2012 in Table 10). Likewise, the Fed publishes a quarterly report on balance sheet developments¹³¹ (since June 2009) to enhance transparency about the evolution of its balance sheet, as well as weekly statistical releases on the size and composition of its balance sheet.¹³²

¹²⁸ Since 1978 the Federal Reserve Bank of Kansas City has hosted an [annual economic policy symposium](#) which gathers prominent central bankers, finance ministers, academics, business leaders and members of the press.

¹²⁹ The Humphrey-Hawkins Full Employment Act of 1978 mandates the Chairman of the Board of Governors to offer oral testimony, along with a monetary policy report, semiannually (in February and July) to the Committee on Banking, Housing, and Urban Affairs of the Senate and the Committee on Financial Services of the House of Representatives.

¹³⁰ Federal Reserve Bank of New York, [Statements and Operating Policies](#).

¹³¹ Federal Reserve System, [Quarterly Report on Federal Reserve Balance Sheet Development](#).

¹³² Federal Reserve System, [Balance Sheet Statistics](#).

In contrast, the Bank of England – whose monetary policy decision-making body is the Monetary Policy Committee (MPC)¹³³ – relies much less on the communication channels associated with the MPC meetings relative to the Federal Reserve’s heavy use of the FOMC meetings’ communication tools. Table 11 – which lists the most important announcements related to the Bank of England’s Asset Purchase Facility (APF) programs since the onset of the financial crisis – shows that only 8 out of 20 (40%) of these announcements were communicated through the statements and the minutes of the MPC meetings (versus 75% for the Fed). Unlike the FOMC meetings, the MPC’s two-day meetings are held monthly. Statements¹³⁴ are issued on the second day of each meeting, and minutes¹³⁵ are published 13 days after (8 days quicker compared to the FOMC minutes). No press conferences accompany the MPC statements, but instead they are reserved for the day on which the Bank of England publishes its flagship publication, the inflation report.

The inflation report is published quarterly (in February, May, August, and November) and is accompanied by a press conference in which the Governor interacts in a session of questions and answers with members of the media.¹³⁶ The MPC gave strong signals in the February 2009 inflation report (and respective press conference) about the launch of the first round of quantitative easing (announcements on 2/11/2009 in Table 11), and somewhat weaker signals in the August 2010 press conference before the launch of APF 2 (announcement on 8/10/2011 in Table 11).

Another major tool used by the BOE to communicate balance sheet policy is represented by the exchange of letters between the Chancellor of the Exchequer and the Governor of the Bank of England. 3 out of the 20 (15%) announcements listed in Table 11 were communicated in this way. It is important to clarify that all of the decisions which imply changes in the APF are announced in MPC meetings’ statements accompanied by an exchange of letters between the Chancellor and the Governor (published shortly after the statements).¹³⁷ Nevertheless, the exchange of letters listed in Table 11 (announcements on 1/29/2009, 2/17/2009, and 11/9/2012) were actually the ones that included new information, and hence anticipated the MPC statements.

Similar to the Federal Reserve, the Bank of England can make use of press releases¹³⁸ as a flexible communication tool for its balance sheet policy, without having to wait until the next MPC meeting (e.g.: announcement on 1/19/2009 in Table 11), although this is quite rare. Moreover, just like the Fed, the BOE publishes a quarterly report on the APF;¹³⁹ supplements its

¹³³ The Bank of England’s [Monetary Policy Committee](#) is composed of nine members; namely, the Governor, the Deputy Governor for Monetary Policy, the Deputy Governor for Financial Stability, the Chief Economist, the Executive Director for Markets, and four independent members. It is important to point out that the MPC has independence to conduct monetary policy (instrument independence), but the inflation target is set up by the Chancellor of the Exchequer. This is a relevant difference with respect to the Federal Reserve, which is endowed with both instrument and goal independence.

¹³⁴ Bank of England, [Monetary Policy Committee’s Statements](#).

¹³⁵ Bank of England, [Minutes](#).

¹³⁶ Bank of England, [Inflation Reports and Associated Press Conferences](#).

¹³⁷ Bank of England, [Asset Purchase Facility Letters](#).

¹³⁸ Bank of England, [Press Releases](#).

¹³⁹ Bank of England, [Asset Purchase Facility Quarterly Report](#).

MPC meetings' statements on the APF with market notices¹⁴⁰ (similar to the NY Fed statements, which specify operational policies); and provides weekly updated statistics on the size and composition of its balance sheet.¹⁴¹ Also, MPC members are held accountable to Parliament through regular hearings and individual, short, annual reports presented to the Treasury Committee of the House of Commons.¹⁴²

Even though the MPC members do offer public speeches,¹⁴³ interviews (e.g.: announcements on 3/5/2009 and 10/6/2011 in Table 11), and articles to communicate their views on balance sheet policies, it is worth mentioning that they are subject to more stringent speaking restrictions (“purdah guideline”) compared with their FOMC peers. Specifically, they are forbidden from speaking to the news media or other interests, on or off the record, about monetary policy during a period of eight days from the Friday before the MPC meeting to the Friday immediately after the announcement.¹⁴⁴

Of course, these speaking restrictions do not imply that MPC members exert less effort to communicate balance sheet policy. In fact, the Bank of England has embarked upon a comprehensive strategy to communicate and explain quantitative easing to the population in simple terms. Accordingly, the BOE has revamped its arsenal of communication tools, including the publication of a document describing the distributional impact of the APF across societal groups like savers and pensioners (announcement on 7/12/2012 in Table 11); an amusing animated video¹⁴⁵ and a pamphlet¹⁴⁶ explaining quantitative easing in lay terms; a video featuring the Chief Economist clarifying misconceptions about quantitative easing (announcement on 9/14/2012 in Table 11); among others actions. To be sure, the abovementioned videos and documents were not chosen arbitrarily; for they are listed as “key resources” and “key documents & publications” under the quantitative easing tab in the Bank of England’s website.¹⁴⁷

Effectiveness of Balance Sheet Communication Practices

The aim of the large-scale asset purchase programs implemented by the Federal Reserve and the Bank of England has been to stimulate nominal spending in order to meet their mandates. At the outset, this is accomplished by lowering interest rates across the economy, which encourage firms to invest and people to buy houses, consumer durables, among others goods. Chart 30 and Chart 31 illustrate the correlation between the Fed’s and the BOE’s holdings of assets, purchased through their LSAP programs, and the 10-year Treasury rate in the United States and the United Kingdom from January 2011 through April 2013.

¹⁴⁰ Bank of England, [Asset Purchase Facility Market Notices](#).

¹⁴¹ Bank of England’s [Balance Sheet Statistics](#).

¹⁴² House of Common, [Treasury Committee Hearings and MPC Annual Reports](#).

¹⁴³ Bank of England, MPC members’ [Speeches](#).

¹⁴⁴ Bank of England, MPC members’ [Speaking Restrictions](#).

¹⁴⁵ Bank of England, [Quantitative Easing Animated Video](#).

¹⁴⁶ Bank of England, [Quantitative Easing Pamphlet](#).

¹⁴⁷ Bank of England, Asset Purchase Facility’s [“Key Resources”](#) and [“Key Documents & Publications”](#).

These figures suggest that asset purchases have been successful at lowering treasury yields after the Fed and the BOE hit the zero lower bound in December 2008 and March 2009, respectively. Yet it is evident that asset purchases alone did not cause the reduction in interest rates. As mentioned in Chapter 5, the Fed made explicit commitments during this period to maintain the federal funds rate at an extraordinarily low level, and the gloomy economic outlook in both countries may also have contributed to put downward pressure on interest rates by affecting public expectations.

In theory, there are several transmission channels through which asset purchases can affect interest rates, such as portfolio rebalancing, policy signaling, market liquidity, public confidence, among others.¹⁴⁸ Within this framework, the events studies literature focused on the LSAP programs implemented in the United States and the United Kingdom point that the two most relevant of these channels have been portfolio rebalancing and policy signaling. The logic behind the portfolio rebalancing channel is that when central banks purchase assets (e.g.: Treasuries), the price of these assets will be bid up and their yields will decrease. Subsequently, sellers of assets will be left with excess money balances which they will invest in other assets (e.g.: corporate bonds, equities, houses, etc.), unless money and Treasuries are perfect substitutes. As a result, the portfolio rebalancing triggers an increase in prices and a decrease in yields not only for Treasuries but also for other assets. On the other hand, the policy signaling channel operates through market expectations, and is closely related to communication practices. To illustrate, if a LSAP program is announced, this can lead the public to believe that the central bank is committed to lower interest rates and hence they may change their expectations accordingly. To be sure, the effectiveness of balance sheet communication practices can be measured in terms of the strength of the policy signaling channel.¹⁴⁹

Table 12 summarizes the results of three of the most influential event studies that focus on the LSAP programs implemented in the United States and the United Kingdom since the onset of the crisis. These studies provide estimates of the portfolio rebalancing and policy signaling channels, suggesting that the former channel has been more powerful than the latter. Also, the effects of all channels seem to be much more significant in the first rounds of purchases in both countries (QE1 and APF1). But – more importantly to the subject of this paper – the combined results of the three studies indicate that the policy signaling channel of asset purchases (communication effect) has been relatively stronger in the United States compared with the United Kingdom. Even though this evidence is far from conclusive, it is consistent with the fact that the Fed provides more forward guidance on its balance sheet policy relative to the Bank of England. Indeed, a central bank that communicates more information about its future policy will likely have a greater impact on expectations.

¹⁴⁸ Michael Joyce, Mathew Tong, and Robert Woods, [“The United Kingdom’s Quantitative Easing Policy: Design, Operation and Impact”](#), Bank of England’s Macro Financial Analysis Division, March 3, 2011, p. 2.

¹⁴⁹ A caveat must be made for many authors argue that it is impossible to disentangle the effects of the portfolio rebalancing and the policy signaling channels. See Adam Posen, [Comments on “Methods of Policy Accommodation at the Interest-Rate Lower Bound”](#) by Michael Woodford, Federal Reserve Jackson Hole Economic Policy Symposium, August 31, 2012.

Conclusions

As Michael Woodford (2012) has put it: *“Central bankers confronting the problem of the interest-rate lower bound have tended to be especially attracted to proposals that offer the prospect of additional monetary stimulus while (i) not requiring the central bank to commit itself with regard to future policy decisions, and (ii) purporting to alter general financial conditions in a way that should affect all parts of the economy relatively uniformly, so that the central bank can avoid involving itself in decisions about the allocation of credit. Unfortunately, the belief that methods exist that can be effective while satisfying these two desiderata seems to depend to a great extent on wishful thinking.”*¹⁵⁰

Woodford’s first point (i) is related to the fact that if central banks do not communicate the criteria that guide their large-scale asset purchase programs, then it is impossible for market agents to know whether an expansion of these purchases is associated with a desire to promote more financial accommodation (under current conditions) or a worsening economic outlook (lower growth and/or lower inflation). If market agents perceive the latter possibility is more plausible, quantitative easing may have a negative effect on expectations, and hence fail to stimulate the economy.

That said, and everything else constant, the Federal Reserve’s current communication practices are superior to the extent that they provide much more information about the future of asset purchases relative to what the Bank of England communicates. Indeed, the FOMC statements condition the end of the current \$85 billion monthly purchases of long-term Treasuries and mortgage-backed securities to a substantial improvement in the outlook of the labor market and/or a negative cost-benefit trade-off of additional purchases.

At the outset, these conditions may seem vague, especially compared to the macro-thresholds for the fed funds rate described in Chapter 5. But actually both Chairman Bernanke and Vice Chair Yellen have provided a fair amount of information in the March 2013 FOMC press conference and a recent speech, respectively, about what constitutes a “substantial improvement in the outlook of the labor market” in their views.¹⁵¹ Also, the cost-benefit trade-off of additional asset purchases has not only been discussed in the February 2013 Humphrey Hawkins testimony¹⁵² before Congress and the Minutes¹⁵³ of the January 2013 FOMC meeting, but also analyzed in a recent paper by the Fed staff which projects the balance sheet and income statement into the future under several scenarios.¹⁵⁴ In fact, since March 2011, the New York Federal Reserve has institutionalized the practice of projecting the net income of the System Open Market Account

¹⁵⁰ Michael Woodford, [“Methods of Policy Accommodation at the Interest-Rate Lower Bound”](#), Columbia University, September 16, 2012, p. 83.

¹⁵¹ Federal Reserve System, [FOMC Press Conference on March 20, 2013](#).

Janet Yellen, [“Challenges Confronting Monetary Policy”](#), (speech on National Association for Business Economics (NABE) Economic Policy Conference, Washington D.C., March 4, 2013), pp. 11-12.

¹⁵² Ben Bernanke, [Semiannual Testimony before the Committee on Banking, Housing, and Urban Affairs](#), U.S. Senate, Washington, D.C. February 26, 2013.

¹⁵³ Federal Reserve System, [Minutes of the January 2013 FOMC meeting](#).

¹⁵⁴ Seth Carpenter, Jane Ihrig, Elizabeth Klee, Daniel Quinn, and Alexander Boote, [“The Federal Reserve’s Balance Sheet and Earnings: A Primer and Projections”](#), January 2013.

(SOMA) in its annual reports, thereby providing information of the future revenue costs of asset purchases.¹⁵⁵

In contrast, the Bank of England has merely announced in its MPC statements that the current size of its Asset Purchase Facility, £ 375 billion, “will be kept under review”. Granted, the BOE does provide some forward guidance when it carries out quantitative easing by announcing the amount of purchases and the period of time over which they will take place (allowing market agents to infer the pace). However, this guidance is very poor compared to the one offered by the Fed. For instance, the Bank of England has not communicated anything remotely similar to the “Exit Strategy Principles” (announcement on 7/12/2011 in Table 10), which lay out a plan on how the Fed is planning to normalize to size of its balance sheet over time.

Not surprisingly, in his recent annual remit letter, the Chancellor of the Exchequer requested the Bank of England to present a comprehensive analysis in the August 2013 Inflation Report of the pros and cons of implementing the kind of forward guidance used by the Fed.¹⁵⁶ Of course, the fact that the Federal Reserve is at the forefront of balance sheet forward guidance – as it is perceived by prominent policymakers in the United Kingdom – does not imply that it cannot do better. Indeed, there is ample room to further elucidate the criteria which guide expectations on the evolution of the Fed’s balance sheet.

Specifically, the Federal Reserve could communicate what are the determinants of the desirable size of its balance sheet, in addition to just announcing the conditions under which it could adjust its LSAP program (currently, these conditions are an improvement in the outlook of the labor market, and/or a negative trade-off of additional purchases). This approach has forced the FOMC to strive to clarify LSAP issues – through speeches, minutes, among other communication tools – in order to minimize speculation. Thus, communicating the determinants of the desirable size of the balance sheet – for instance, announcing a nominal GDP target – would be an improvement in terms of balance sheet forward guidance. To be sure, nominal GDP is now well below its long-run level,¹⁵⁷ and it likely provides relevant information on how the Fed is planning to manage the size of its balance sheet.

On Woodford’s second point (ii), it is evident that both the Fed’s LSAP program and the BOE’s APF program have not provided monetary stimuli without altering financial conditions in a way that makes some groups worse off (e.g.: savers) and others better off (e.g.: homeowners in the United States, and corporations in the United Kingdom). As a result, different groups in society have different perceptions and expectations about quantitative easing. Certainly, few American and British citizens understand the purpose and mechanisms of the LSAP and APF programs, respectively; far less their future potential effects. Yet, as emphasized by Vice Chair Yellen in her recent speeches on central bank communication,¹⁵⁸ the effectiveness of asset purchases – and, more generally, monetary policy – depends critically on the understanding of the public

¹⁵⁵ The Federal Reserve Bank of New York, [“Domestic Open Market Operations” annual reports](#).

¹⁵⁶ [Remit for the Monetary Policy Committee – March 2013](#).

¹⁵⁷ Michael Woodford, [“Methods of Policy Accommodation at the Interest-Rate Lower Bound”](#), Columbia University, September 16, 2012, p. 46.

¹⁵⁸ Janet Yellen, [“Communication in Monetary Policy”](#), (speech on Society of American Business Editors and Writers 50th Anniversary Conference, Washington D.C., April 4, 2013), p. 2.

about these policies. And “the public” is not only composed of decision-makers in financial institutions, but also of common individuals whose decisions to, say, borrow funds to buy a house or invest in a start-up are contingent on their future income expectations. To be sure, these expectations are crucial to ensure that quantitative easing has a positive effect on the economy, and balance sheet communication practices must take that into account.

From that angle, the Bank of England seems to be ahead of the Federal Reserve, at least strategically. As explained in the second section of this chapter, the Bank of England has adopted an aggressive strategy to communicate and explain quantitative easing to the population in simple terms, revamping its arsenal of communication tools accordingly. For one thing, it has carried out an important innovation by publishing an official report on the distributional impacts of quantitative easing across societal groups, defying the reluctance of central banks to do so (mentioned by Woodford in the above quote). Moreover, MPC members are making regular visits to different parts of the country to explain quantitative easing policies in coordination with their 12 regional agencies. Also, the BOE has released an amusing animated video¹⁵⁹ and a pamphlet¹⁶⁰ explaining quantitative easing in lay terms; released a video featuring the Chief Economist clarifying misconceptions about quantitative easing; among other actions. In contrast, the Federal Reserve’s communication tools use more technical language and are tailored to sophisticated market agents such as primary dealers. Perhaps by drawing from the example of the Bank of England in its attempt to communicate to a wider audience, the Fed could learn lessons to improve the understanding of American citizens about quantitative easing and thus boost the effectiveness of its LSAP program.

Chapter 7: Conclusion

The introduction of forward guidance generally increases the predictability of monetary policy. We examined interest rate forecasting using two methodologies:

1. Market Expectations. Generally speaking, if market forward rates echo the central bank’s published interest rate path, then the forecast can be said to be efficient; the converse is true if the market yield curve does not follow the bank’s projections. Ideally, market expectations will closely resemble each forthcoming policy rate forecast by the central bank, as prior published paths and supplementary forms of forward guidance will have already been incorporated into market prices prior to the bank’s new announcement.

From empirical results, we have concluded that the market rarely moves strongly against central bank projections beyond short time intervals, but may vary within a reasonable range depending on many other factors. Based on the uncertainty of the future, the projection has much stronger influence in the short run than in the long run.

¹⁵⁹ Bank of England, [Quantitative Easing Animated Video](#).

¹⁶⁰ Bank of England, [Quantitative Easing Pamphlet](#).

2. Market Volatility. Although forward guidance does not reduce volatility in every case (especially during announcements containing target or path surprises), over longer time horizons (and assuming a credible approach) overall volatility is expected to decrease. This theoretical precept is consistent with our empirical studies of the four central banks.

A close examination of three of its international counterparts reveals that the Federal Reserve Bank has much room for increased transparency. These potential shifts range from color-coding the dots in its projections graph to differentiate voting members from their non-voting colleagues, reaching some sort of consensus among the committee in regards to the forecasting model, publishing the individual projections of the staff, and so on.

However, several caveats are in order here. First, there exists no platonic ideal of transparency in forward guidance: disagreement persists at every step. Second, the United States is a large economy. Any Federal Reserve decision actively influences global rates, which necessitates a greater prudence in its public communication policy. Furthermore, the structure of the Fed is markedly different than those of the other three central banks, and its monetary policy committee is considerably larger as well. If a major concern for the Federal Reserve's communication policy is its effects on foreign markets, it would be interesting to carry out a quantitative analysis of whether volatility in key policy interest rates in small open economies has increased or decreased on Fed announcement days after the recent move to forward guidance.

Nevertheless, for all four central banks under consideration, quantitative forward guidance in the form of interest rate projections is part of a long-term trajectory towards greater transparency in communication. This trend is not animated by a blind faith in greater transparency: indeed, inaccurate forecasts or communications by central banks can easily do more harm than good. But when central banks are confident and credible with their forecasts and additional information, forward-looking communication helps render monetary policy decisions comprehensible to the public.

Initially, one of the most commonly expressed concerns leading up to the implementation of policy rate forecasting was that the markets would fail to comprehend the innate conditionality of the projections and misinterpret them as an inflexible plan instead. But given the extraordinarily turbulent period of the financial crisis and the repeated policy rate announcement shocks that followed, it is apparent that market rates have internalized the concept of uncertainty in the forecasts.

During the 2008 financial crisis, for example, both the RBNZ, the Norges Bank and the Riksbank drastically lowered their policy rates to an extent that exceeded their previous projection ranges. However, the market understood the extraordinary circumstances under which these central banks were operating. Therefore, although these banks' decisions deviated far from previous forecasts, no credibility loss occurred as a result. Indeed, had they maintained the status quo for the policy rate path, they would have been justifiably criticized for their inaction in the face of enormous economic shocks.

If used properly, forward guidance can also afford central banks an opportunity to defend previous policy decisions even under newly developed economic conditions and explain why their monetary policy decision deviates from previous forecasts. If the new monetary policy decision is justifiable due to unforeseen economic conditions, the central banks' risk for

credibility loss will be minimal. To reduce the potential for this loss, both forward-looking and backward-looking communication must continue to reiterate the conditionality and uncertainty inherent to the policy rate projection and economic forecasts. This communication approach, to which markets are already accustomed as it pertains to inflation and output projections, must remain the norm if projections are to become an effective tool to manage market expectations for the policy rate.

The overarching goal of monetary policy transparency is to reduce the incidence of surprises and, therefore, to avoid the consequent turbulence in long-term asset prices.¹⁶¹ The experiences of each of the three small open economies studied here have differed with respect to their ability to gain influence over market expectations and limit the effects of policy shocks on interest rates. As Andersson and Hofmann have found, there is a distinct difference between the Riksbank's and the RBNZ's ability to limit forward guidance surprises, or "path surprises." In Sweden, interest rates do not show any extra sensitivity on days that the Riksbank publishes its monetary policy statements. On the contrary, medium-term bond yields become more sensitive in New Zealand on forward guidance days. The volatility studies of the 90 day interest rates carried out in this report suggest that Norway and Sweden have benefitted from less volatility on announcement days after moving to forward guidance communication, even without controlling for the recent financial crisis. The effect in New Zealand has been less clear. The evidence seems to suggest that during times of economic crisis, New Zealand's current communication policy is far less effective. This was the case in 1997-1998, and appears to again be the case in since 2008.

For this reason, the priority in communication strategy should be (1) to develop an accurate internal forecasting process, rather than merely increasing central bank predictability; and (2) to execute an optimal communication strategy that will adequately convey the uncertainty and alternative scenarios for the future course of monetary policy. In this manner, market participants are able to learn the central banks' patterns of reaction to various market conditions, a form of knowledge pooling that will also help central banks improve the public's understanding in the event of deviations from previous announcements. If the market accepts the central bank's action as justifiable due to new market information, the bank will suffer less from credibility loss. Moreover, there is scant evidence from the experience of any of the four countries that providing more information in forward guidance statements is detrimental to credibility or aligning market expectations.

Another crucial factor in markets' perceptions of a central bank centers on these institutions' relative global influence. Federal Reserve Bank forecasts are not only expected to flow logically from their underlying premises, but these assumptions themselves are presumed sound. As the most influential national central bank in the world, the Fed bears a unique burden for the impact its decisions exert on interest rates elsewhere. This reality stands in stark contrast to that of the three small economies under examination, whose collective decision-making power is nevertheless circumscribed by a large number of events entirely out of their control.

¹⁶¹ Özer Karagedikli and Pierre L. Siklos, "[Explaining Movements in the NZ Dollar: Central Bank Communication and the Surprise Element in Monetary Policy?](#)" *RBNZ Discussion Paper Series*, 2008.

Among the four institutions under consideration, the Federal Reserve stands out in its impetus for adding interest rate projections to its arsenal of forward guidance weapons. While the other three banks, operating in small economies, have largely communicated interest rate projections in order to improve their influence and predictability, the Federal Reserve began publishing the individual policy rate paths selected by all of its FOMC members as an additional policy tool at the zero lower bound.

To be sure, the Federal Reserve also provides considerable forward guidance on its balance sheet policy in comparison with other central banks that use this unconventional monetary policy tool, such as the Bank of England. The Fed has not only conditioned its current LSAP programs (QE3 and QE4) on a substantial improvement in the outlook of the labor market, and/or a negative cost-benefit trade-off of additional purchases, but it has also announced a strategy to normalize the size of its balance sheet over a period of approximately ten years (The “Exit Strategy Principles” published in the June 2011 FOMC Minutes).

These bold and innovative moves have captured the attention of policymakers around the world, including those in the United Kingdom. In fact, in his March 2013 remit letter, the Chancellor of the Exchequer requested that the Bank of England analyze the pros and cons of implementing the type of forward guidance exhibited by the Federal Reserve, and to publish this analysis in the August 2013 Inflation Report.

In short, the Federal Reserve’s balance sheet communication practices are superior to those of the Bank of England to the extent that they transmit more information about the future in a way that many observers believe makes monetary policy more potent. Of course, the fact that the Federal Reserve is at the forefront of balance sheet forward guidance—as it is perceived by prominent policymakers in the United Kingdom—does not imply that it cannot do better. Indeed, there is ample room to further elucidate the criteria which guide expectations on the evolution of the Fed’s balance sheet.

Specifically, the Federal Reserve could communicate the determinants of the ideal balance sheet size, in addition to simply announcing the conditions under which it could adjust its LSAP program. This approach has forced the FOMC to strive to clarify LSAP issues—via speeches and minutes, among other communication tools—in order to minimize speculation. Thus, communicating the determinants of the desirable size of the balance sheet—for instance, by announcing a nominal GDP target—would be an improvement in terms of balance sheet forward guidance. To be sure, nominal GDP is now well below its long-run level, and it likely provides relevant information on how the Fed is planning to manage the size of its balance sheet.

Yet, as pointed out in the conclusion of Chapter 6, one additional lesson that the Fed could draw from the Bank of England’s balance sheet communication practices is that the effectiveness of asset purchases depends critically on the public’s understanding of these policies. In this case, the public includes not only decision-makers in financial institutions, but unrelated individuals as well.

From such an angle, the Bank of England appears to be ahead of the Federal Reserve, at least strategically. As explained in Chapter 6, the Bank of England has adopted an aggressive strategy to explain quantitative easing to the general population in simple terms and has revamped its

arsenal of communication tools accordingly. For instance, it has achieved a substantial innovation by publishing an official report on the distributional impacts of quantitative easing across societal groups. Moreover, MPC members pay regular visits to disparate parts of the country to explain quantitative easing policies in coordination with their 12 regional agencies. The BOE has even released an amusing animated video and a pamphlet explaining quantitative easing in lay terms and posted a video featuring its chief economist clarifying misconceptions about quantitative easing, among other actions.

In contrast, the Federal Reserve's communication tools use more technical language and are tailored to sophisticated market agents such as primary dealers. It is possible that drawing from the example of the Bank of England, the Fed could attempt to reach a broader audience and improve the American people's understanding of quantitative easing, thus boosting the effectiveness of its LSAP program and monetary policy more generally.

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Appendix I (Corresponding to CH1—Cross-country Comparison)

Timeline 1: Publishing Policy Rate Forecast & Inflation Targeting



Table 1: Comparison—Basic Facts of Central Banks

Central Bank	Reserve Bank of New Zealand (RBNZ)	Norges Bank	Sveriges Riksbank	Federal Reserve System (Fed)
Country	New Zealand	Norway	Sweden	United States
Objective	Inflation Targeting in a floating exchange rate regime since 1990	Flexible Inflation Targeting in a floating exchange rate regime since 2001	Flexible inflation targeting in a floating exchange rate regime.	
Inflation Target	Average inflation near the 2% target midpoint	Annual consumer price inflation of approximately 2.5% over time.	Annual change in the consumer price index (CPI) is to be 2%.	PCE: Annual change in the price index for personal consumption expenditures, 2%
Key Policy Rate	Overnight Cash Rate (OCR)¹ * Decisions concerning the interest rate are normally held eight times a year .	Key Policy Rate² * Decisions concerning the interest rate are normally taken at the Executive Board's monetary policy meeting, held six times a year .	Repo Rate³ * The Executive Board of the Riksbank usually holds monetary policy meetings six times a year .	Federal Fund Rate⁴ * FOMC meetings are scheduled eight times a year
Decision Structure	The governor is advised for the purposes of OCR reviews by the members of Monetary Policy Committee. MPC members do not vote.	Consensus seeking committee (7 voting members include Governor, dep. Governor, +5 external members)	Executive Board of 6 members . The Executive Board makes decisions collectively at its meetings	12 voting members of the FOMC: the 7 members of Board of Governors and the presidents of 5 of the 12 Federal Reserve Banks.

¹ The Official Cash Rate (OCR) is the interest rate set by the Reserve Bank to meet the inflation target specified in the Policy Targets Agreement. The current PTA, signed in December 2008, defines price stability as annual increases in the Consumers Price Index (CPI) of between 1 and 3 per cent on average over the medium term. The OCR was introduced in March 1999 and is reviewed eight times a year by the Bank. Monetary Policy Statements are issued with the OCR on four of those occasions. Unscheduled adjustments to the OCR may occur at other times in response to unexpected or sudden developments, but to date this has occurred only once, following the 11 September 2001 attacks on the World Trade Centre in New York.

² Norges Bank's key policy rate is the sight deposit rate, which is the interest rate on banks' deposits up to a quota in Norges Bank.

³ The repo rate has been the Riksbank policy rate since 1994. The repo rate is the rate of interest at which banks can borrow or deposit funds at the Riksbank for a period of 7 days

⁴ The federal funds rate is the interest rate at which depository institutions lend balances at the Federal Reserve to other depository institutions overnight.

Table 2: Type of Forward-looking Communication

Indirect Signal	Direct Signal	
	Direct Qualitative Signal	Direct Quantitative Signal
e.g. Price or Inflation Forecast (Information other than future path of policy rates)	e.g. Release of information about path of future policy rates	

Table 3: Pros and Cons of Forward Guidance

Pros of Forward Guidance	Cons of Forward Guidance
<ol style="list-style-type: none"> 1. Enhance the central bank's ability to steer market expectations; thereby; 2. Facilitate the transmission of monetary policy 3. Improvement of accountability of policy decisions 4. Public's better understanding and anticipation of central banks' policy decisions with respond to newly developed market information 5. Greater influence over the short-term interest rate that have more direct impact on consumption and investment decision, and; 6. An increased ability of central banks to steer market expectation which bears better economic outcome as a result. 	<ol style="list-style-type: none"> 1. Central banks typically do not know very much about future policy interest rates and so they have little information to communicate 2. Misperception of conditionality as promise or commitment; thus it could indirectly influence the central banks not to deviate too much from its projection and settle on suboptimal monetary policy decision 3. Potential credibility loss problem 4. Feasibility or difficulty of adding another layer of decision making process under forward guidance.

Table 4: Monetary Policy Decision and Projection Publication Calendar

	New Zealand		Norway		Sweden		United States	
	Publication of Policy Rate Forecast		Projection Update			Committee Meeting / Policy Rate Decision		
Jan.								01.29~30.2013
Feb.						* 02.15.2012		
Mar.		03.14.2013		03.14.2013				03.19~20.2013
Apr.		04.24.2013				* 04.17.2012		04.30~05.01.13
May				05.08.2013				
Jun.		06.13.2013		06.20.2013				06.18~19.2013
Jul.		07.25.2013				* 07.03.2012		07.30~31.2013
Aug.								
Sep.		09.12.2013		09.19.2013		* 09.05.2012		09.17~18.2013
Oct.		10.31.2013		10.24.2013		* 10.25.2012		10.29~30.2013
Nov.								
Dec.		12.21.2013		12.05.2013		* 12.18.2012		12.17~18.2013

Table 5: Frequency and Type of Forward-looking Publication

Country	New Zealand	Norway	Sweden	United States
Publication	Monetary Policy Statement (MPS)	Monetary Policy Report (MPR)	Monetary Policy Report (MPR)	Summary of Economic Projection (SEP)
Frequency of Publication related to Projection	* The report is published quarterly, normally in March, June, September and December.	* The report was published three times a year, normally in March, June and October/November from 2001 to 2012.	* The report was published six times a year (three full projection + three update, if there is any change in economic condition.	* The FOMC holds 8 regularly scheduled meetings annually. 5 projections in 2012 & 4 scheduled in 2013.
	Yes	Yes	Yes	Yes (Since Nov. 2007)
Press Conference	Announcements are made at 9.00am on the day of monetary policy meeting and are posted to the website shortly after.	The monetary policy decision is published in a press release and announced at a press conference at 2pm on the day of the meeting.	The interest rate decision is presented in a press release at 9.30 a.m. on the day following the monetary policy meeting.	
Meeting Minutes		* No detailed minutes or voting records from Board meetings, but a brief summary of the Board's assessments	Minutes of the Executive Board's monetary policy meetings . Two weeks after the meeting	* The minutes of regularly scheduled meetings are released three weeks after the date of the policy decision.

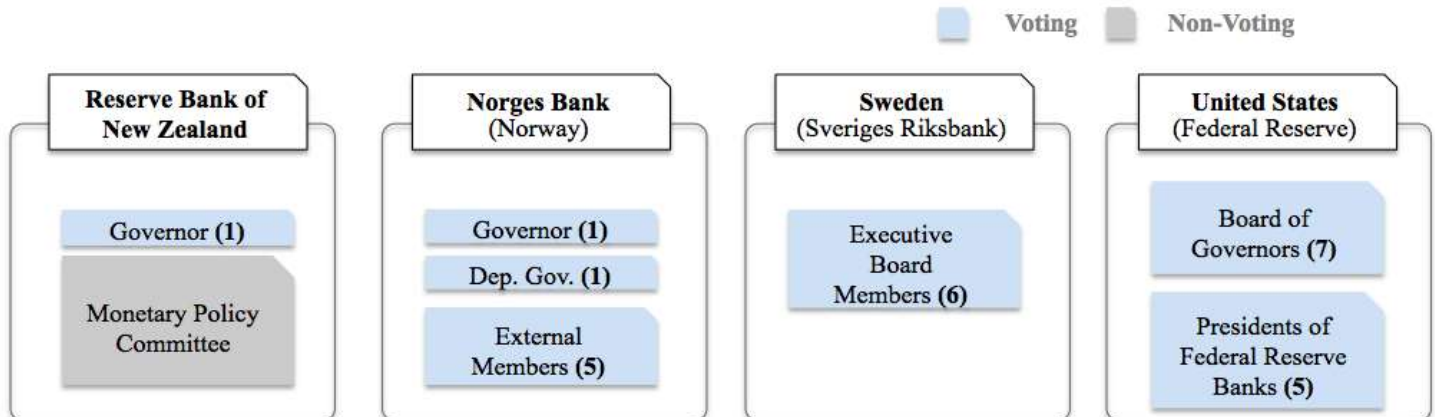
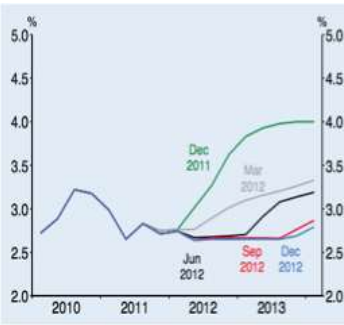
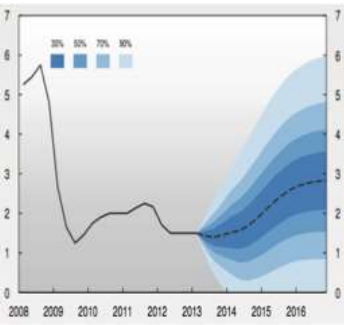
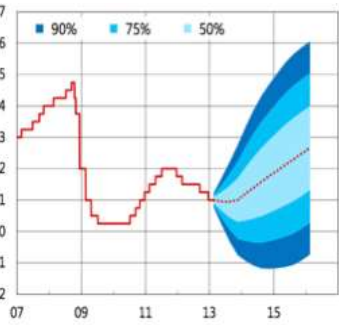
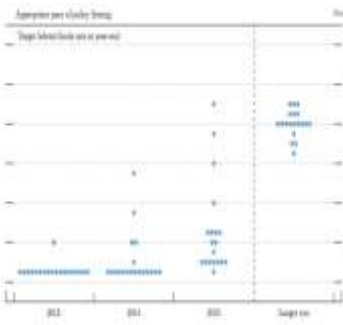
Table 6: Governance—Monetary Decision Making Voting Structure

Table 7: Policy Rate Projection Charts Comparison

New Zealand	Norway	Sweden	United States
Monetary Policy Statement <i>(Published Quarterly)</i>	Monetary Policy Report <i>(Published Quarterly)</i>	Monetary Policy Report <i>(Published Three Times/Year)</i>	Summary of Economic Projection <i>(Published Quarterly)</i>
90-day IR Projection 	Sight Rate Projection 	Repo Rate Projection 	Appropriate pace of policy firming 
<i>Based on DSGE-KITT Model</i>	<i>Based on DSGE-NEMO Model</i>	<i>Based on DSGE-Ramses Model</i>	<i>Based on Survey</i>
<i>No Uncertainty Band</i>	<i>Uncertainty Band (Fan Chart) based Probability Distribution (Historical Disturbance)</i>		<i>No Uncertainty Band</i>

Appendix II (Corresponding to CH2—RBNZ)

Timeline 2: RBNZ—Major Changes that Impacted Communication over Time

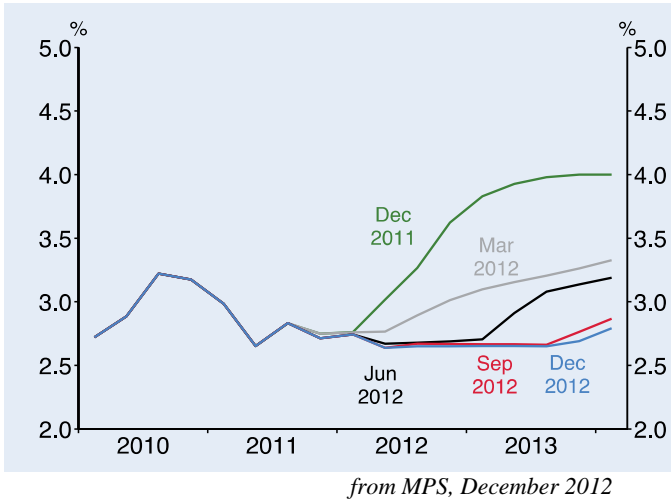


Chart 1: RBNZ—Organizational Structure

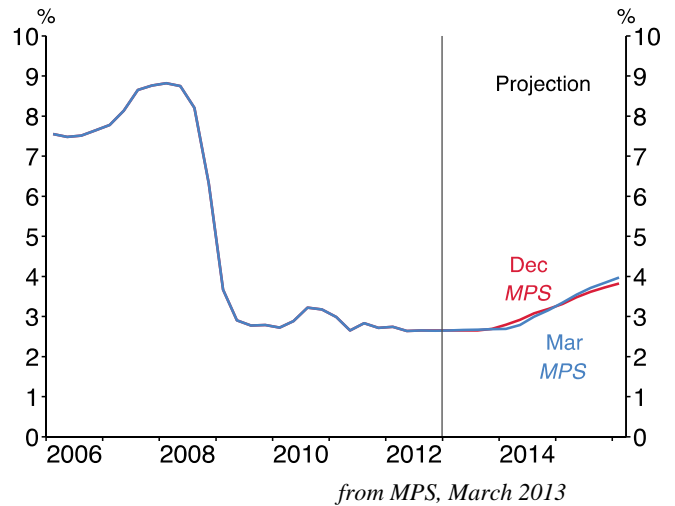
Governors	Department/Heads	Functions	Internal services
Assistant Governor/ Head of Economics <i>John McDermott</i>	Economics	Monetary policy formulation	
	Deputy Governor/ Head of Financial Stability <i>Grant Spencer</i>	Financial markets <i>Vacant*</i>	Domestic market operations Foreign reserves management Macro-financial stability
	Prudential supervision <i>Toby Fiennes</i>	Financial system surveillance and policy	
Governor <i>Alan Bollard</i>	Currency, Property and Security <i>Alan Boaden</i>	Currency operations	Property management Security
	Financial services <i>Mike Wolyncewicz</i>	Settlement services	Accounting services Treasury services
	Knowledge services <i>Tanya Harris</i>		Library services Technology services Project management Web publishing
	Assistant Governor/ Head of Operations <i>Don Abel</i>	Human resources <i>Lindsay Jenkin</i>	Human resources strategy and services
	Communications/ Board secretary <i>Mike Hannah</i>		Communications strategy and services Reputation management Board secretariat
	Risk assessment and assurance <i>Steve Gordon</i>		Risk assessment and assurance Audit services Legal services

Chart 2: RBNZ—Policy Rate Forecast Chart Dec. 2012 vs. Mar. 2013

Successive Reserve Bank 90-day Interest Rate Projections



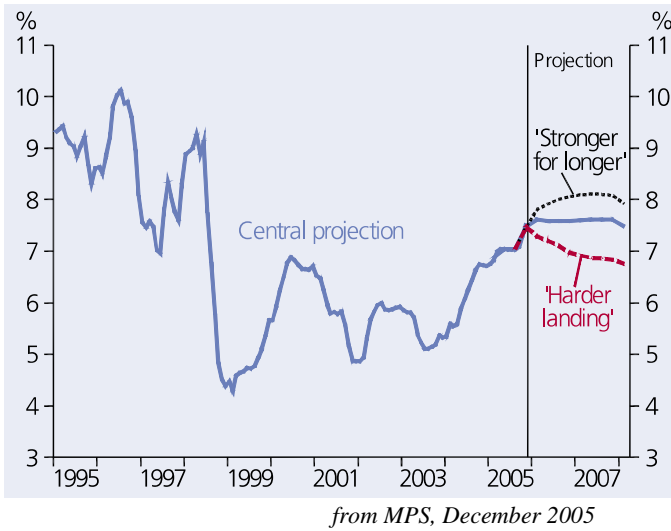
90-day Interest Rate



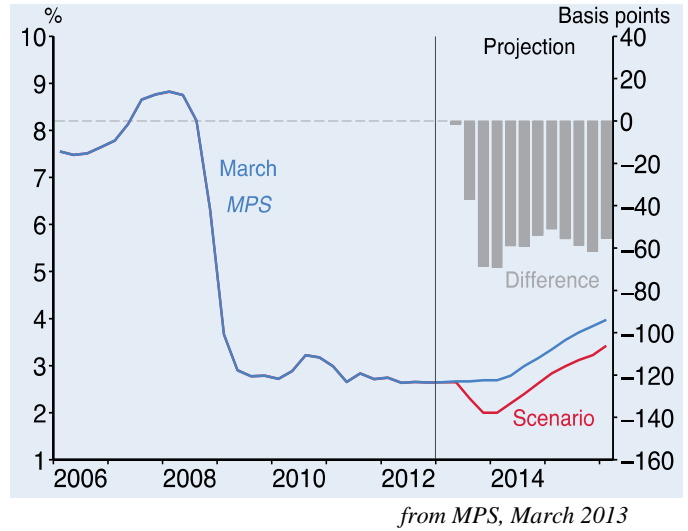
Source: RBNZ Estimates

Chart 3: RBNZ—Policy Rate Forecast Chart Dec. 2005 vs. Mar. 2013

90 Day Interest Rates Under Alternative Scenario

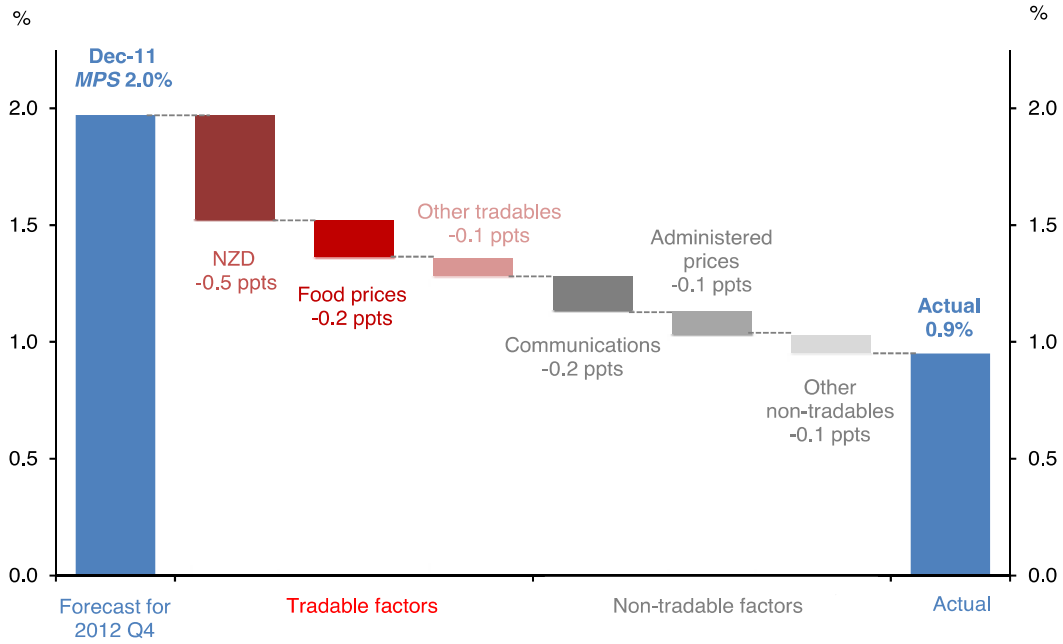


90-day Interest Rate



Source: RBNZ Estimates

Chart 4: RBNZ—Decomposition of 2012 Inflation Forecast Error, (from MPS, Mar. 2013)



Note: This chart shows that factors that contributed to the Bank’s December 2001 forecast error for inflation in 2012. Figures are rounded to 1 decimal place, so do not sum exactly

Source: Monetary Policy Statement March, 2013, Statistics New Zealand, RBNZ Estimates

Chart 5: RBNZ —Key Policy Rate and Projection over Time

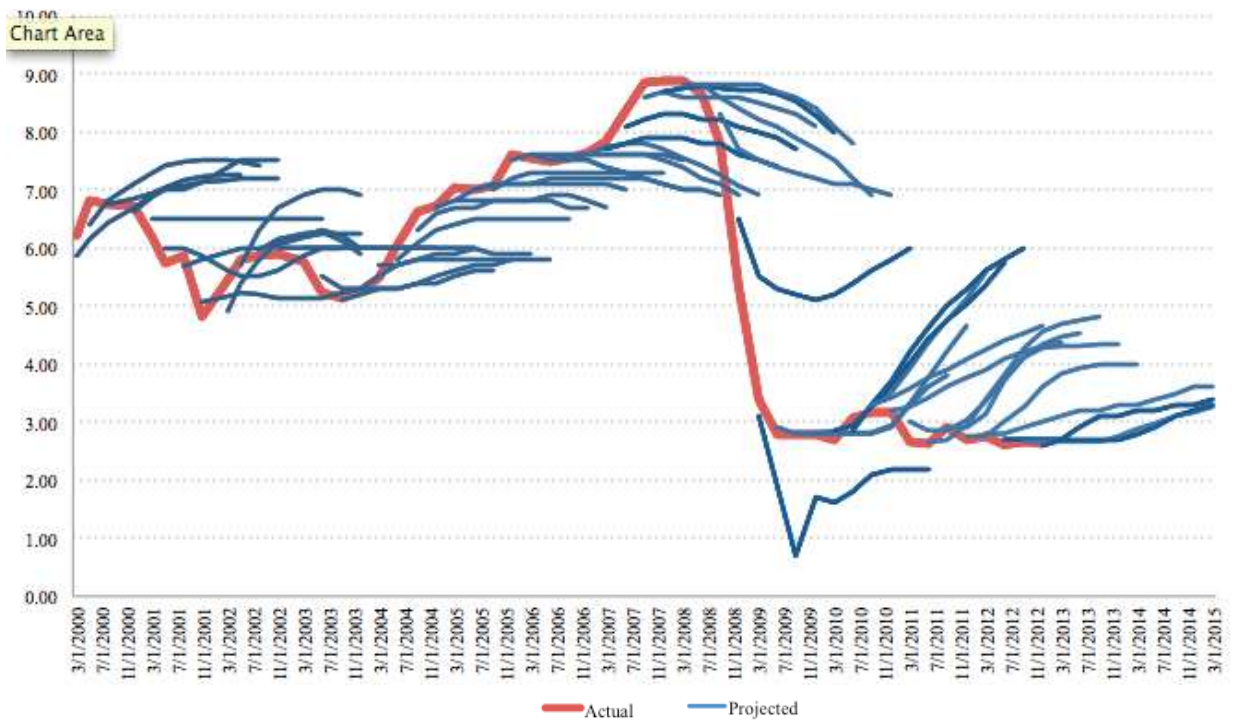


Chart 6: RBNZ—Volatility Chart

Volatility on Forward Guidance Announcement Days
in the 90 Day Bank Bill Interest Rate (RBNZ)

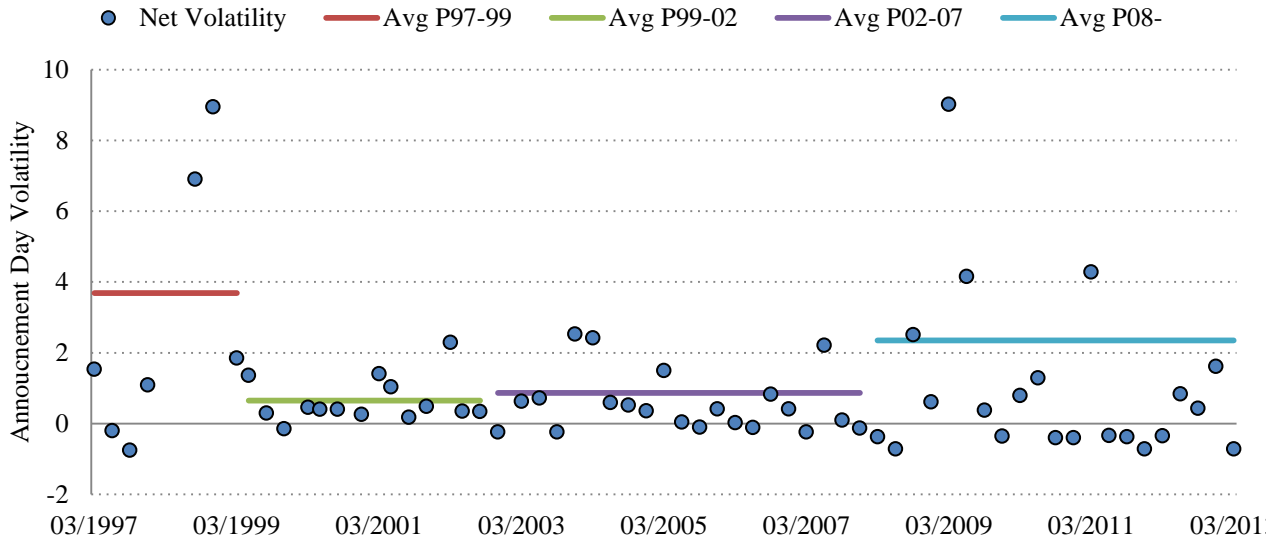


Chart 7: RBNZ— New Zealand: Average Day over Day Volatility by Time Period

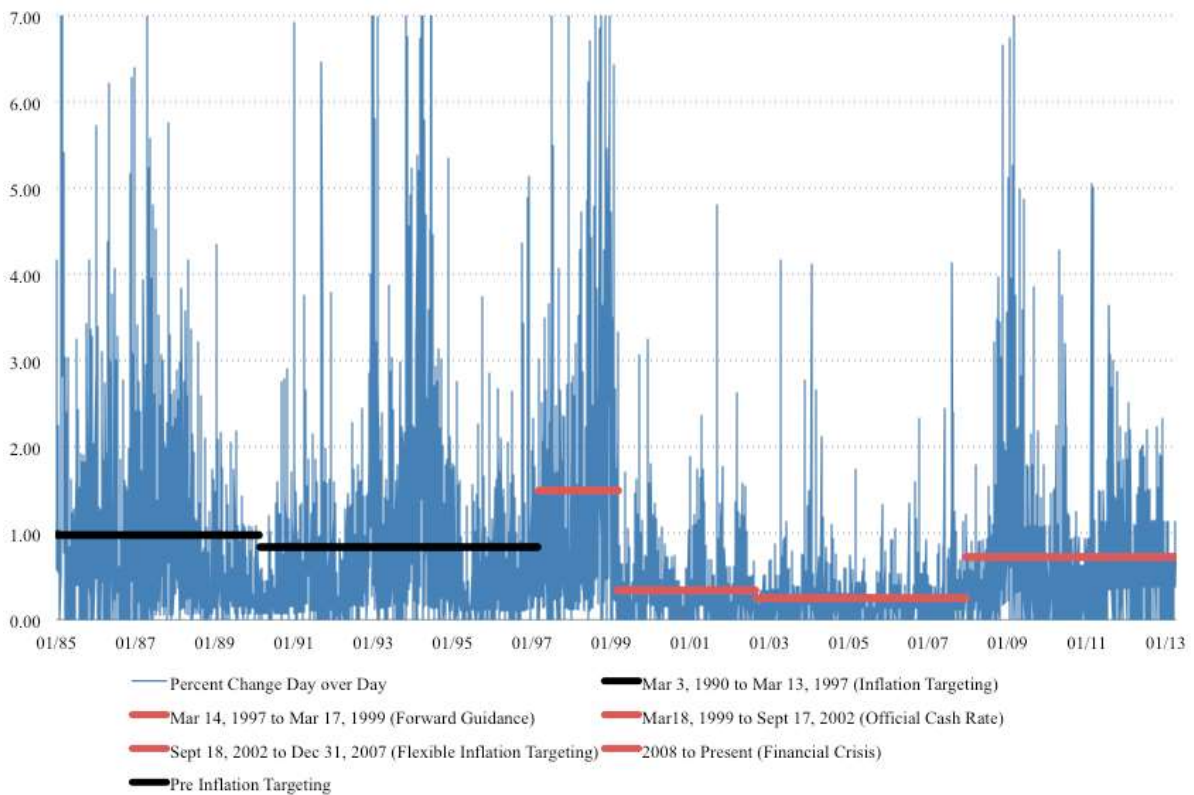
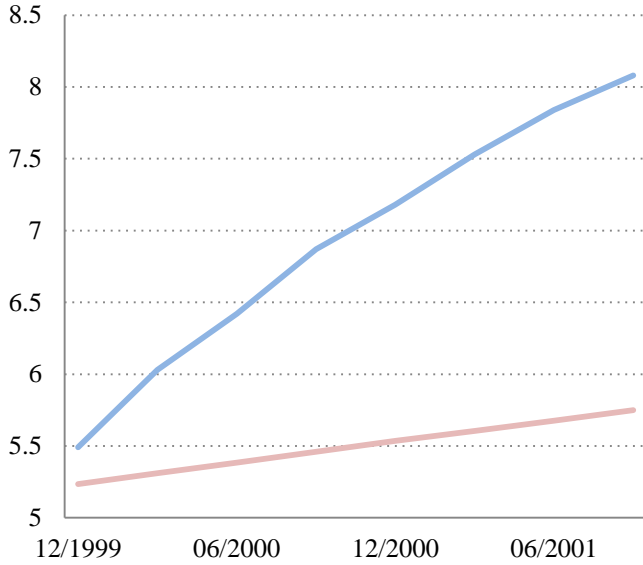
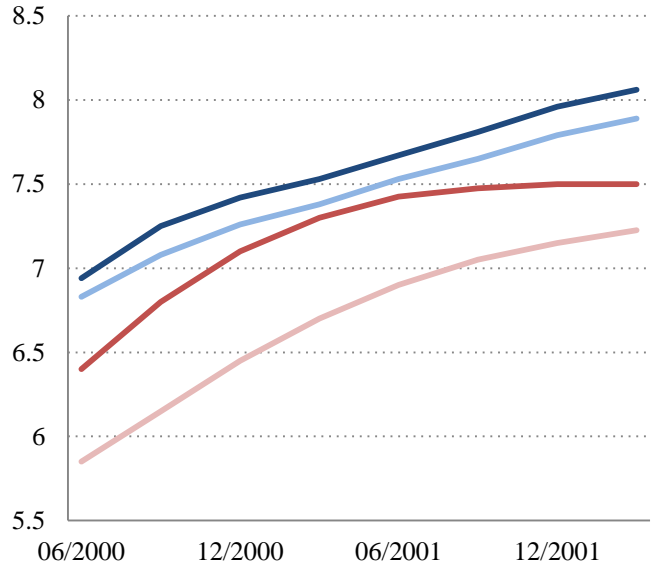
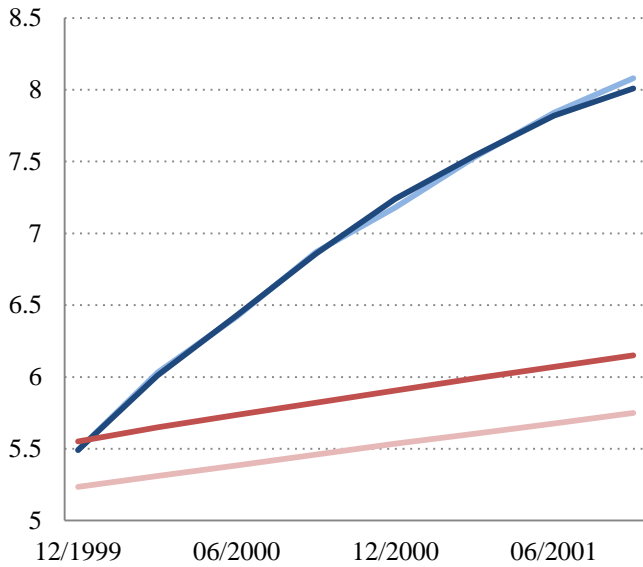
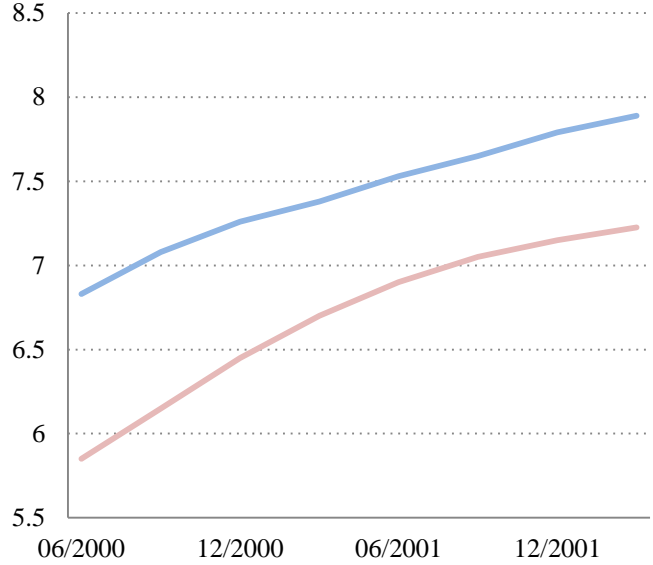


Chart 8: RBNZ—90 Day Bank Bill Interest Rate: Projection vs. Market Futures
[Shock: +.5% OCR Change]

[Announcement Date: November 17, 1999]
 90 Day Interest Rate Yield



[Announcement Date: May 17, 2000]
 90 Day Interest Rate Yield



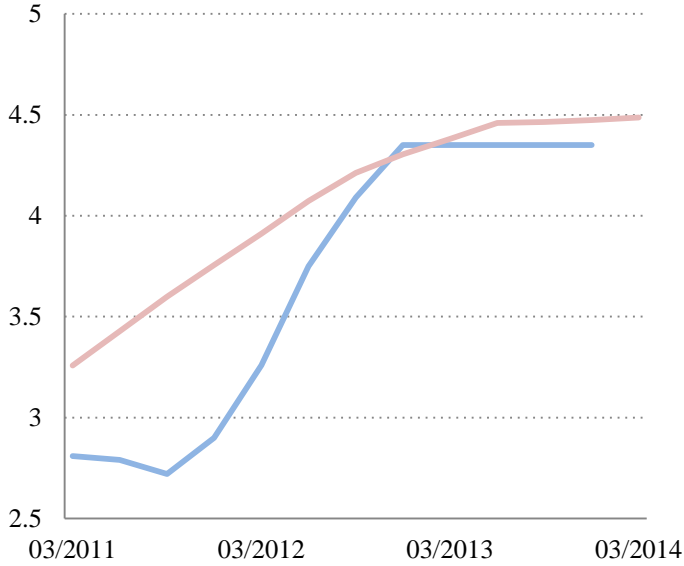
- Market Day Before
- Market Day of Announcement
- RBNZ Previous MPS Projection (Oct. 1998)
- New RBNZ Projection

- Market Day Before
- Market Day of Announcement
- RBNZ Previous MPS Projection (Mar. 2000)
- New RBNZ Projection

Chart 8: Continued

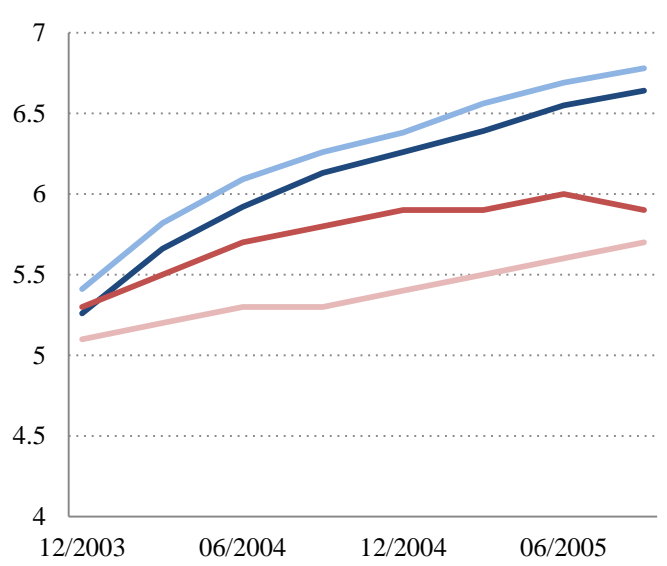
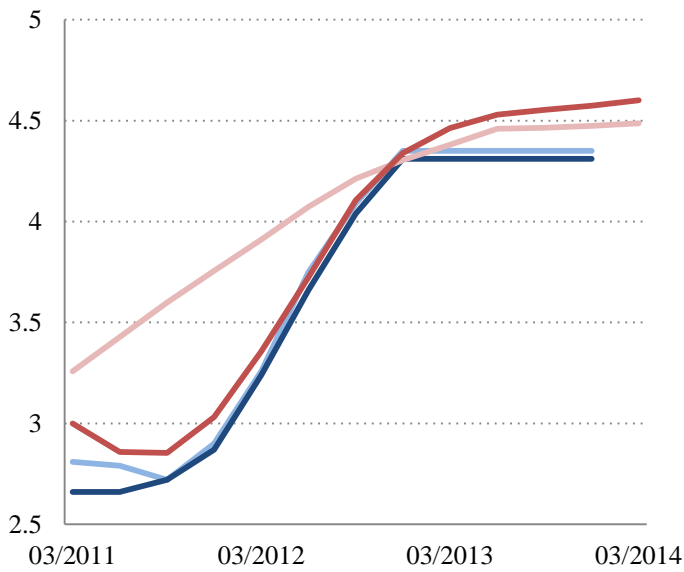
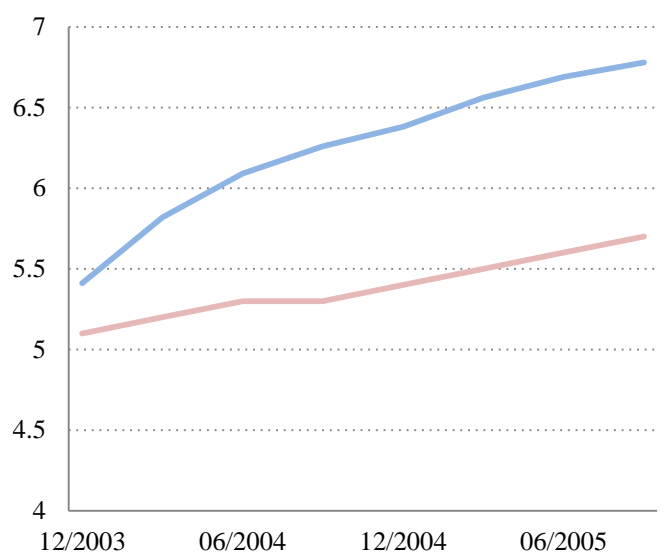
[Shock: +.5% OCR Change)

[Announcement Date: March 10, 2011]
90 Day Interest Rate Yield



[Shock: Forward Guidance)
No Rate Change

[Market Reaction To MPS: December 4, 2003]
90 Day Interest Rate Yield

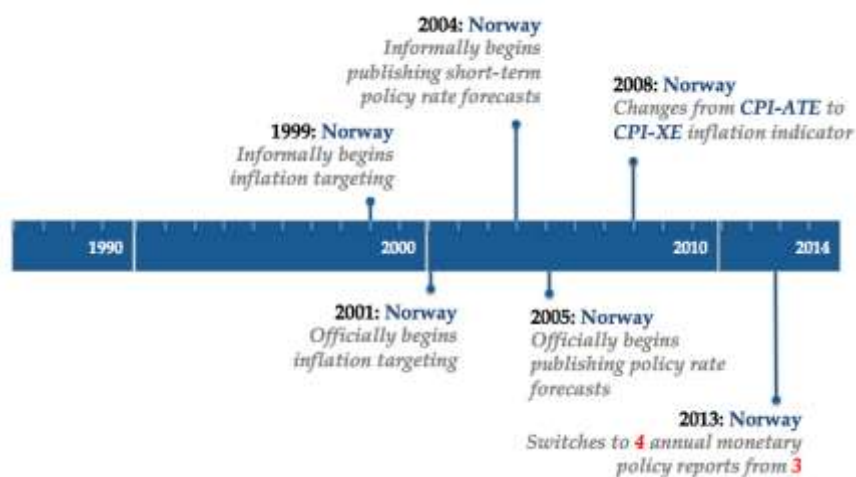


- Market Day Before
- Market Day of Announcement
- RBNZ Previous MPS Projection (Dec. 2010)
- New RBNZ Projection

- Market: Day Before Monetary Policy Statement
- Market: Day of Monetary Policy Statement
- RBNZ: Interest Rate Projection (Previous MPS)
- RBNZ: Interest Rate Projection (New)

Appendix III (Corresponding to CH3—Norges Bank)

Timeline 3: Norges Bank—Major Changes that Impacted Communication over Time

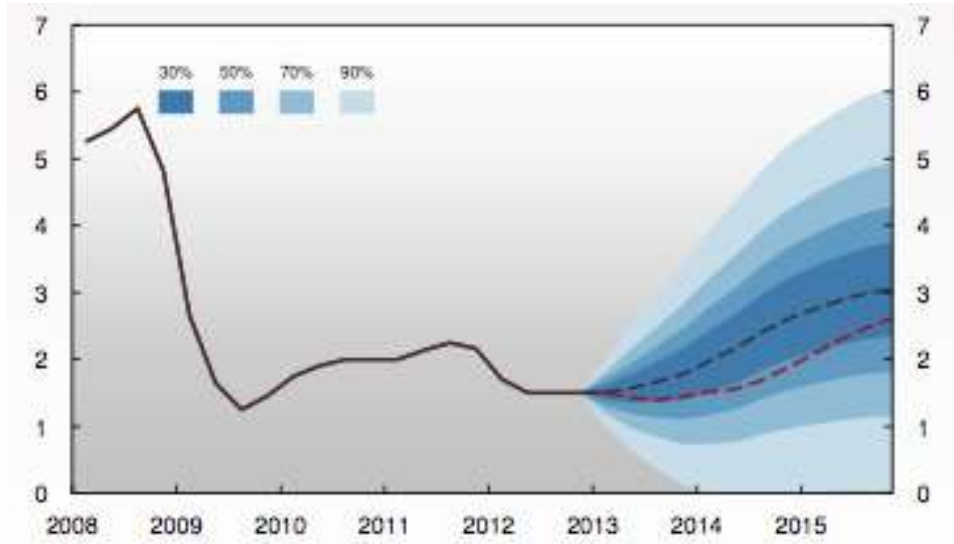


Equation 1: Norges Bank—Objective Function

$$L_t = \underbrace{(\pi_t - \pi^*)^2}_{\text{Criteria 1}} + \underbrace{\lambda(y_t - y_t^*)^2}_{\text{Criteria 2}} + \underbrace{\gamma(i_t - i_{t-1})^2 + \tau(i_t - i_t^*)^2}_{\text{Criteria 3}}$$

Chart 9: Norges Bank—Fan Chart

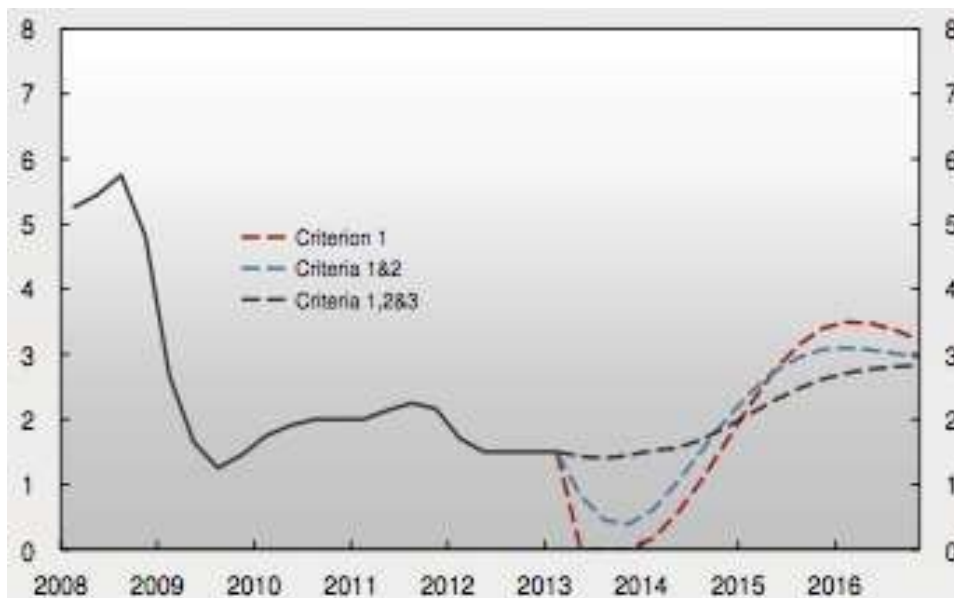
Chart 1.23 from MPS: Key policy rate in the baseline scenario in MPR 3/12 with probability distribution and key policy rate in the baseline scenario in MPR 1/13 (red line). Percent. 2008 Q1—2015 Q4



Source: Monetary Policy Statement, Norges Bank

Chart 10: Norges Bank—Key Policy Rate Projection according to loss function

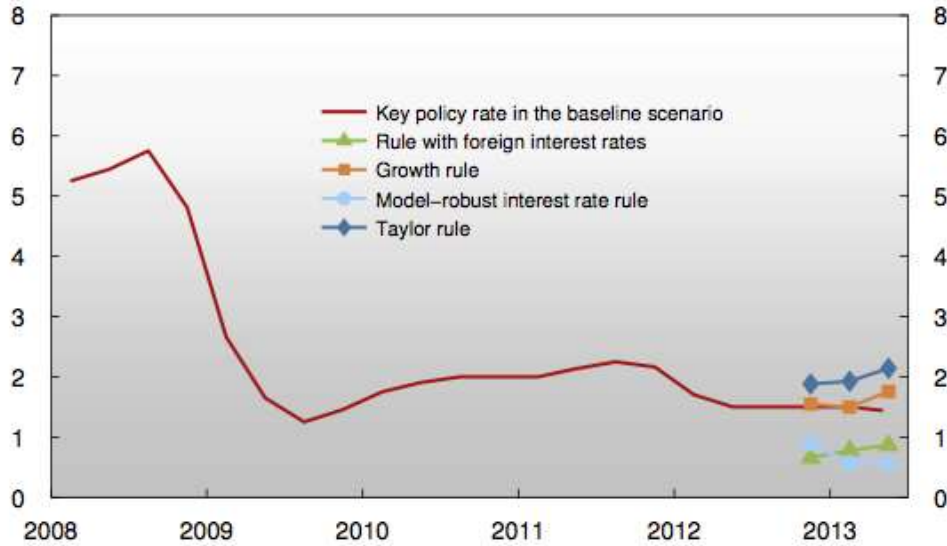
Chart 1.21a from MPS: Key Policy Rate. Percent. 2008 Q1—2016 Q4



Source: Monetary Policy Statement, Norges Bank

Chart 11: Norges Bank—Key Policy Rate Projection based on Various Monetary policy Rules

Chart 1.19 from MPS: Policy Rate and Calculation based on Simple Monetary Policy Rules. 1) Percent. 2008 Q1—2013 Q2

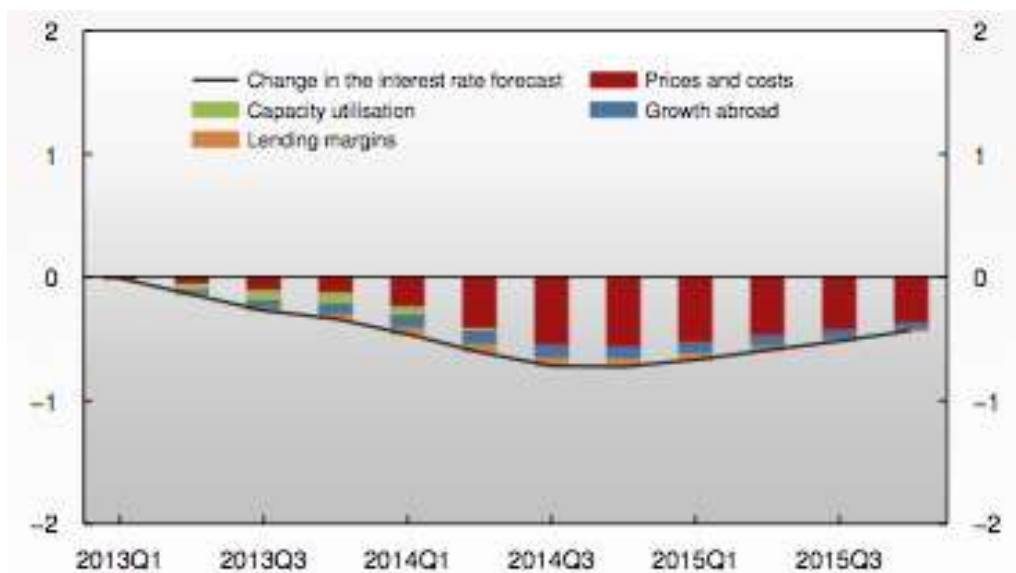


1) The calculations are based on Norges Bank’s projections for the output gap, growth gap, consumer prices and 3-month money market rates among trading partners. To ensure comparability with the key policy rate, the simple rules are adjusted for risk premiums in 3-month money market rates.

Source: Monetary Policy Statement, Norges Bank

Chart 12: Norges Bank—Factors behind Projection

Chart 1.24 from MPS: Factors behind changes in the interest rate forecast since MPR 3/12. Accumulated Contribution. Percentage Points. 2013 Q1—2015 Q4



Source: Monetary Policy Statement, Norges Bank

Chart 13: Norges Bank—Key Policy Rate and Projection over Time (2008-2013)

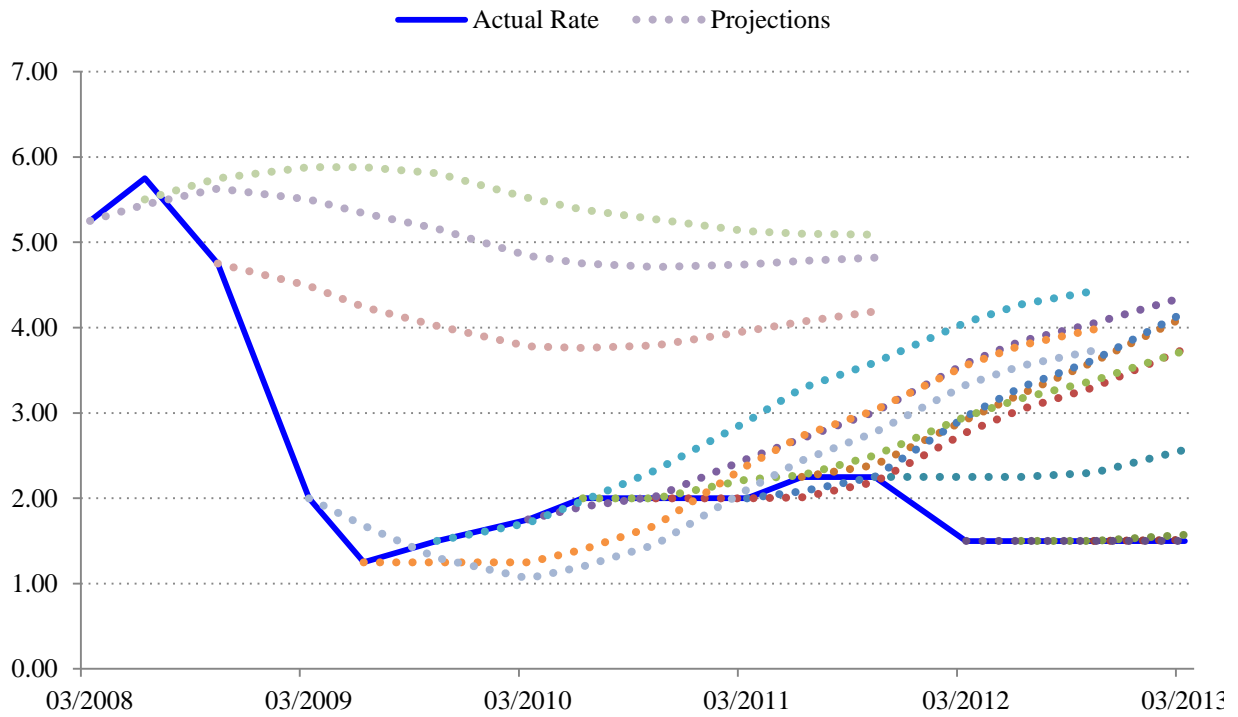
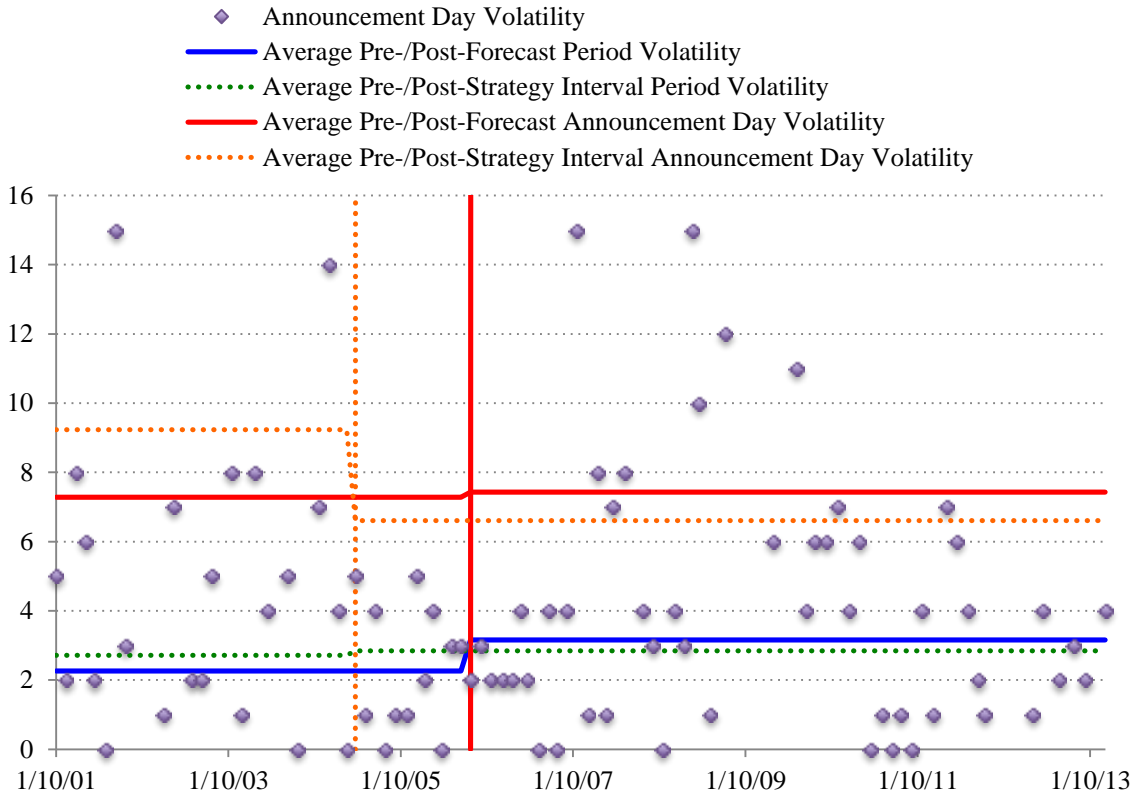


Chart 14: Norges Bank—Volatility and 3-month NIBOR Rates

(Measured in basis points)



(Measured in basis points)

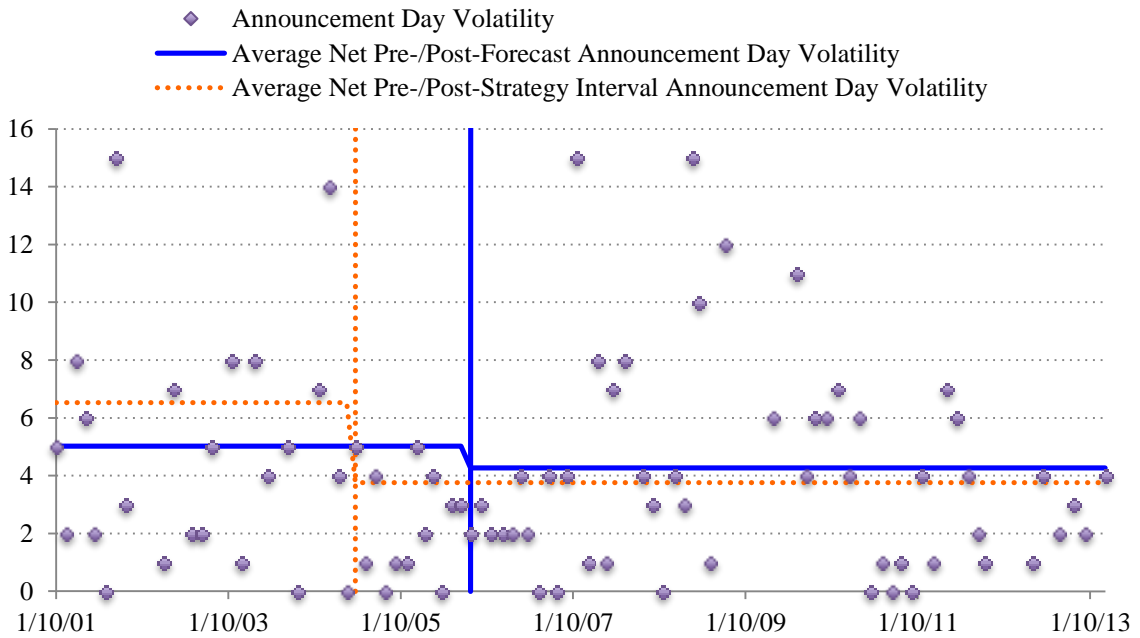
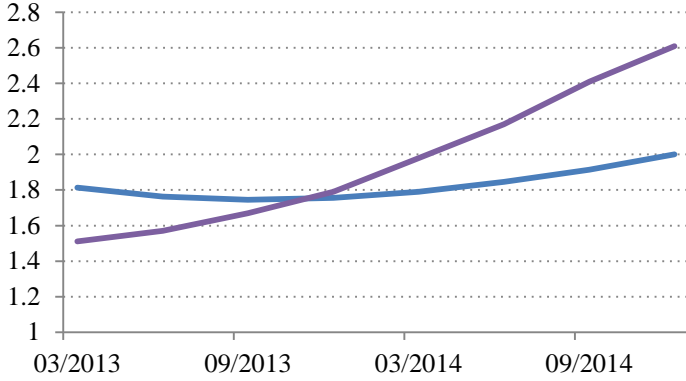


Chart 15: Norges Bank—Projection vs. Market

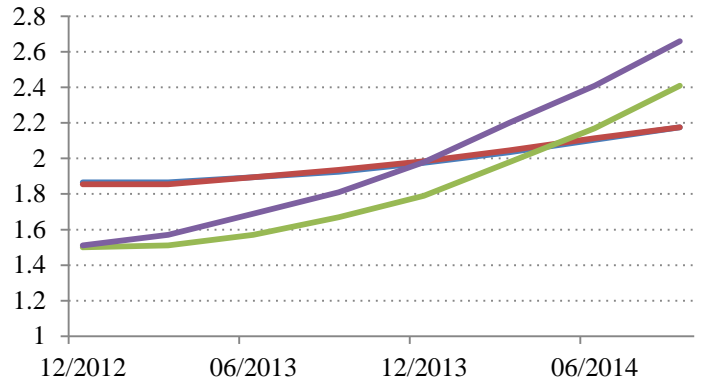
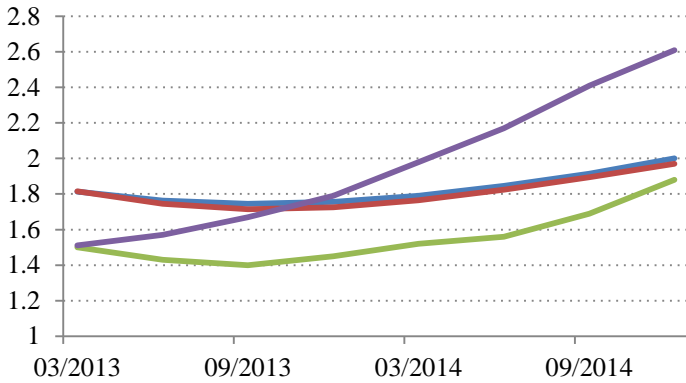
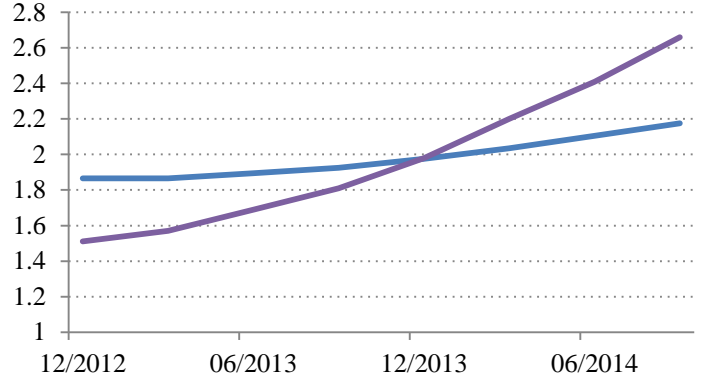
[Announcement Date: 03/14/2013]

No change in Sight Rate



[Announcement Date: 12/19/2012]

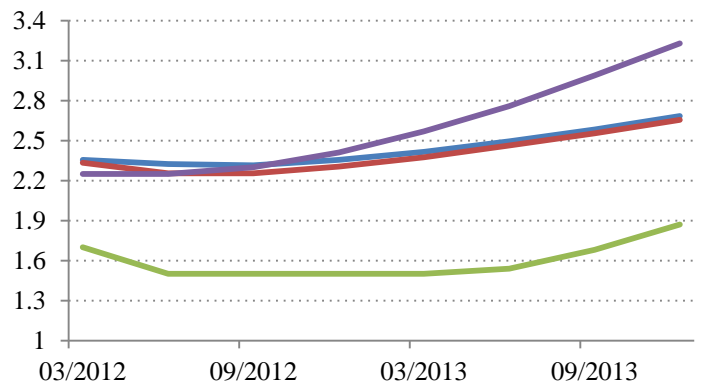
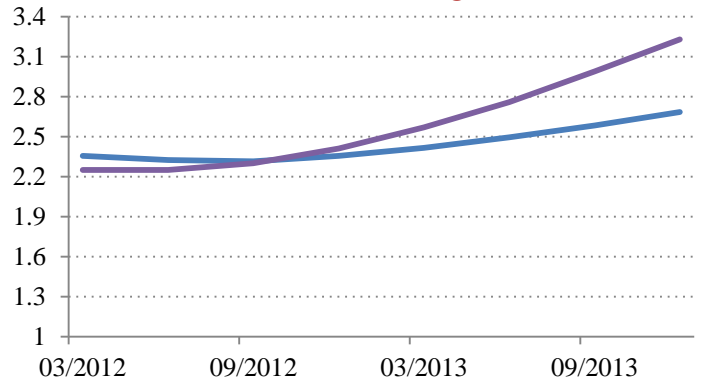
No change in Sight Rate



- Market Day Of Announcement
- Market Day After
- New Bank Projection
- Bank Projection Previous

[Announcement Date: 3/14/2012]

0.25 % Reduction in Sight Rate



Appendix IV (Corresponding to CH4—Riksbank)

Timeline 4: Riksbank—Major Changes that Impacted Communication over Time

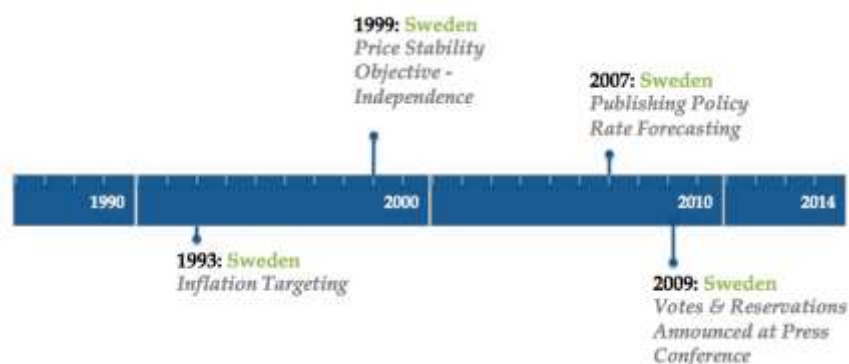


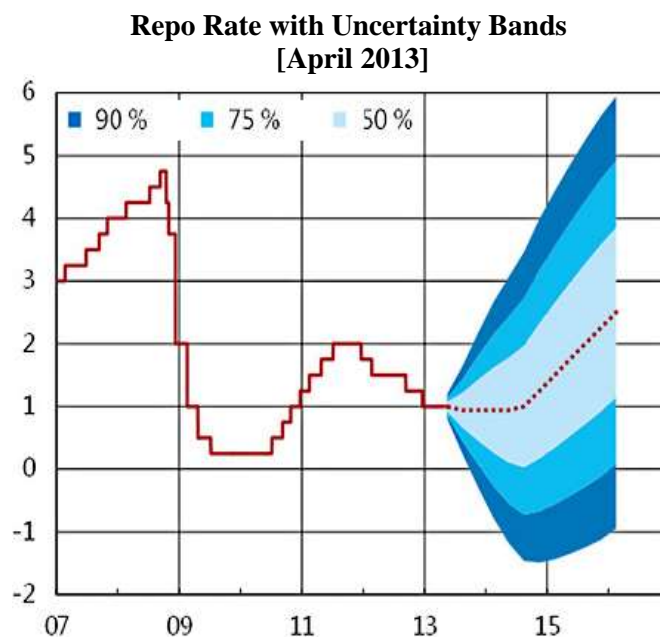
Table 8: Riksbank—Major Events in Riksbank Communication History

Table mostly adopted from: Lars E. O. Svensson, “[Policy Expectations and Policy Evaluations: The Role of Transparency and Communication](#),” Sveriges Riksbank Economic Review 2010:1, 43-83

Date	Explanation
Jan. 1993	Announcement of Inflation Target of 2 percent, effective from 1995.
Oct. 1993	Start publishing Inflation and Inflation Expectations in Sweden Report.
Jun. 1995	Start publishing approximate Inflation Forecast under assumption of constant repo rate in the Reports.
Mar. 1996	The Report renamed as Inflation Report.
Dec. 1997	Published Inflation Forecasts become more precise.
Jan. 1999	Adoption of Price Stability Objective and Executive Board announced that the minutes of MPM’s shall be published.
Feb. 1999	Clarification of the monetary policy framework.
Mar. 2005	Start publishing an alternative forecast under the assumption of a repo rate given by implied market forward rates. Forecast horizon is lengthened to three years.
Oct. 2005	Start publishing a main scenario in Inflation Reports.
May 2006	Monetary Policy in Sweden document replaced the clarification of Feb. 1999.
Feb. 2007	Start publishing future repo rate path, Inflation Report is renamed as Monetary Policy Report that includes extensive explanation of monetary policy decisions and alternative scenarios for the path.
May 2007	Announced press conferences will be held after each MPM’s.
Sep. 2007	Announced starting from Dec. 2007 repo rate paths will be published after each of the six MPM’s, not only after the three at which MPR is published.
May 2008	Updated communication policy for all Riksbank activities. Public comments on data and outcome or on policy trade off before MPM’s may be now given without indication of the coming repo rate decision.
Apr. 2009	Start publishing individual member votes and brief explanation of dissenting views at the same time with the monetary policy decision during press conference, detailed explanations still in the minutes. This makes it immediately apparent whether the decision was unanimous or not.
Apr. 2012	Communication policy updated for financial stability

Table 9: Riksbank—Decision Making Process that Result in a MPR

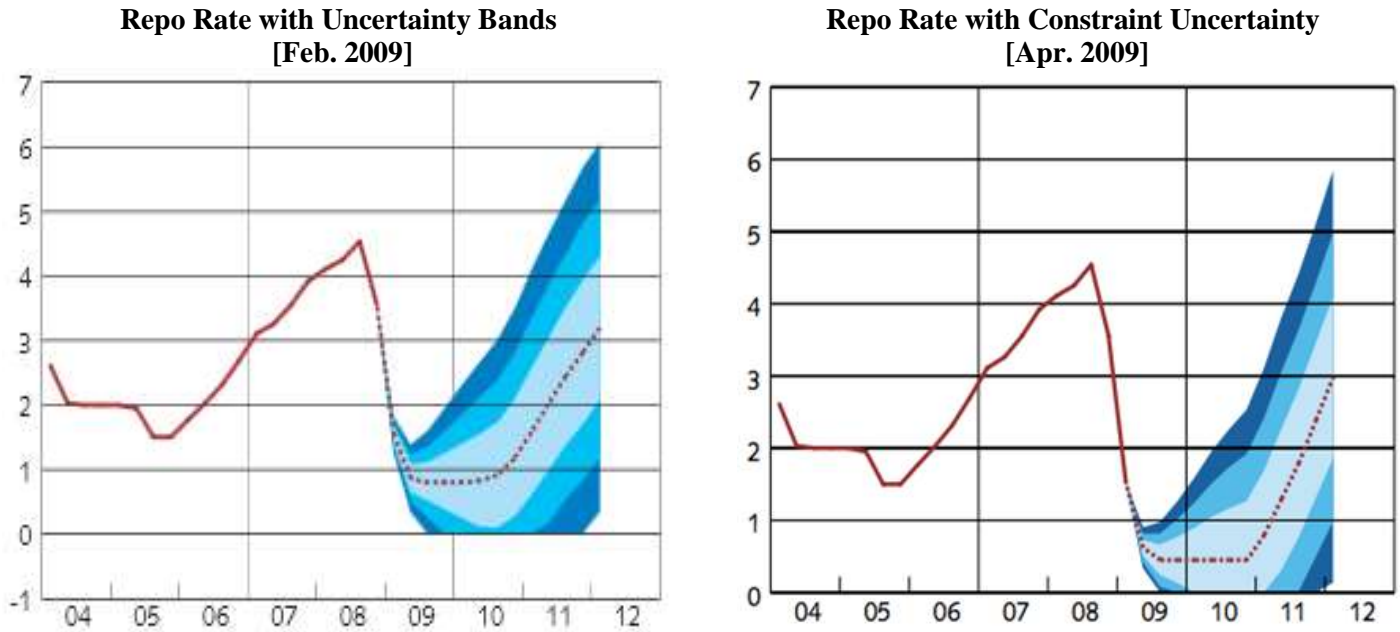
Time	Description of Decision
Week 1	Discussion of risks; Meetings on financial markets, international outlook and current status.
Week 2	Macroeconomic forecast; writing of texts for the Report begins
Week 3	Detailed forecast produced and the two monetary policy group meetings held
Week 4	Executive Board meeting on the Forecast
Week 5	Executive Board meeting on the text of the Report
Week 6	Monetary policy meeting, publication of Monetary Policy report and press release/conference

Chart 16: Riksbank—Repo Rate with Uncertainty Bands, April. 2013

Source: Monetary Policy Report, Riksbank

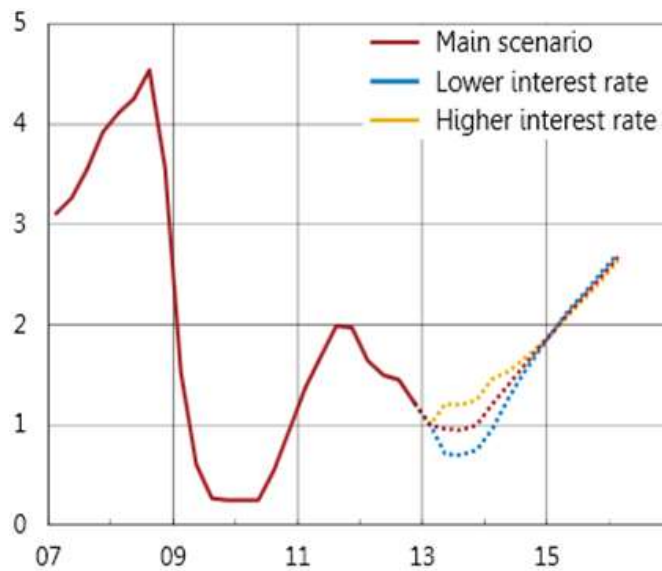
Chart 17: Riksbank—Repo Rate with Constraint Uncertainty Banks

Feb. 2009 vs. Apr. 2009



Source: Monetary Policy Report, Riksbank

Chart 18: Riksbank—Policy Alternatives in MPR February 2013 (without uncertainty bands)

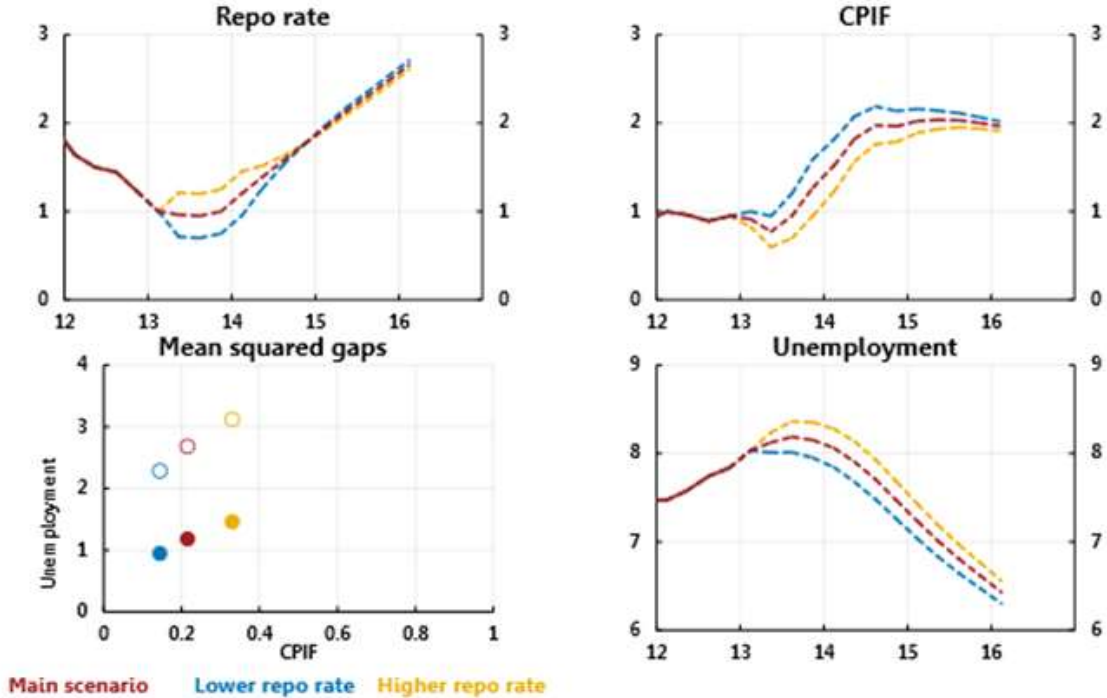


Source: Monetary Policy Report (Feb. 2013), Riksbank

Chart 19: Riksbank—Detailed Reasons for Dissent Explained in Minutes

Monetary Policy Alternative around the Main Scenario

Effects according to **RAMSES**, partly expected monetary policy shocks. Policy rates abroad according to the main scenario. Long-run sustainable employment 6.25%



Note: Empty circle indicate mean quested gaps calculated with long-run sustainable employment of 5.5%

Source: Monetary Policy Report (Feb. 2013), Statistics Sweden and the Riksbank

Chart 20: Riksbank—February and July 2009 alternative scenarios

February 2009

July 2009

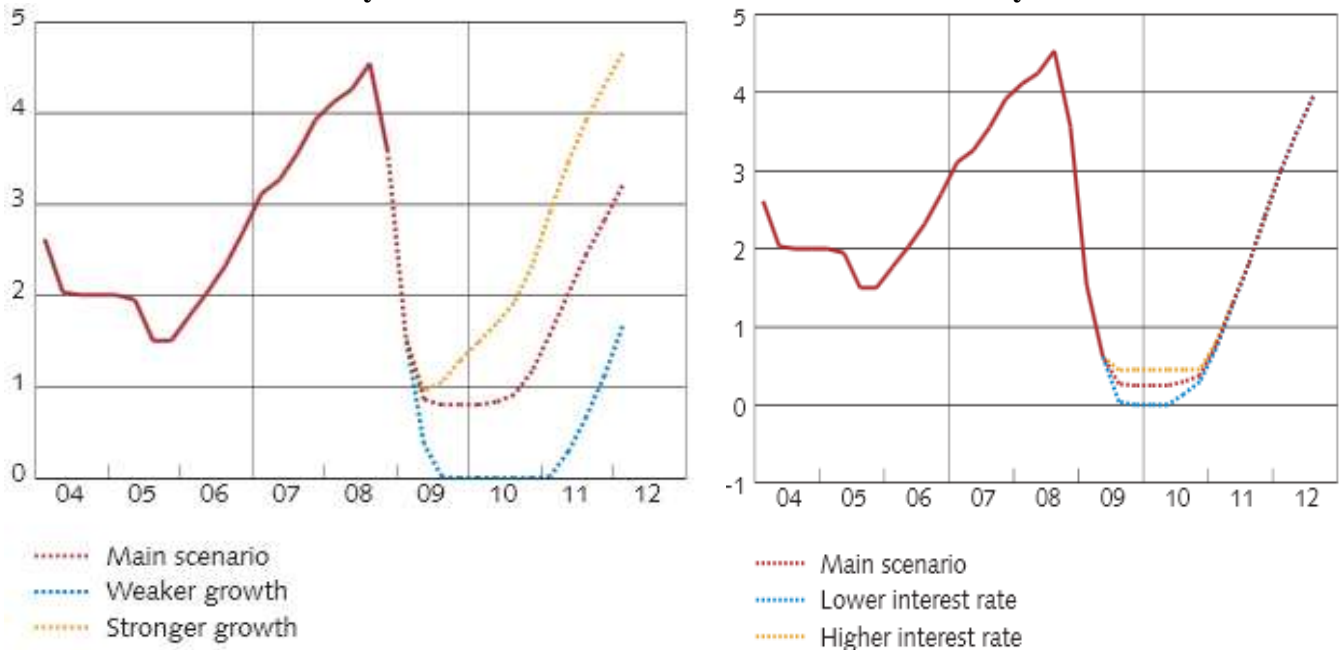


Chart 21: Riksbank—Key Policy Rate and Projection over Time (2006-2016)

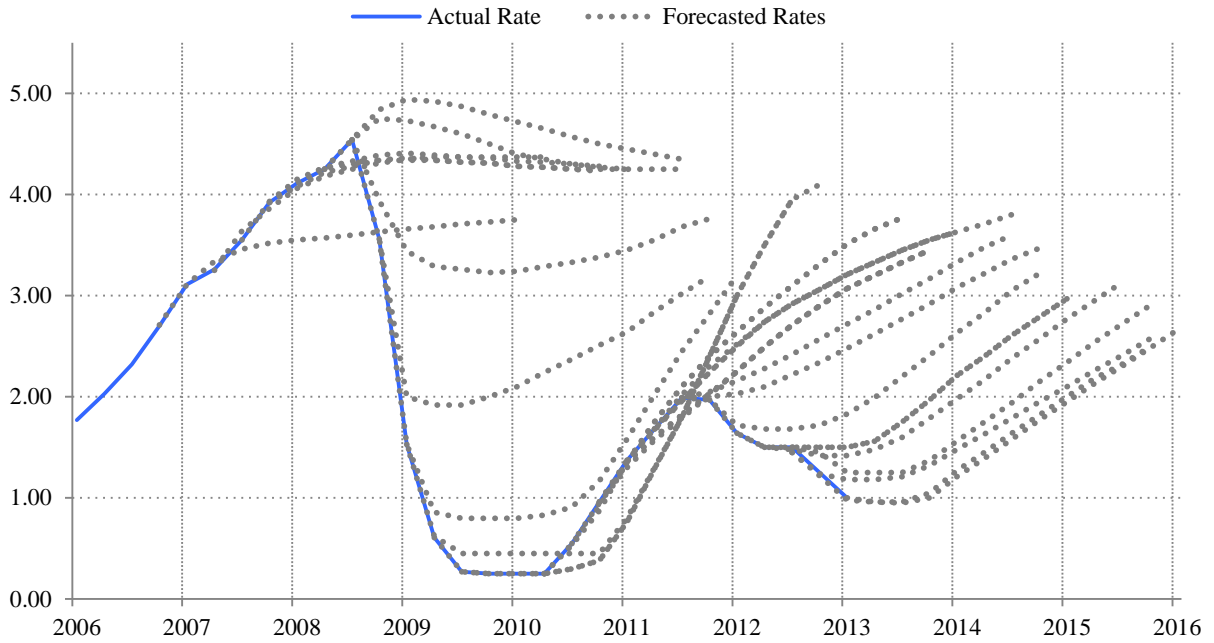


Chart 22: Riksbank—Volatility, Avg. absolute change in STIBOR rates after announcements

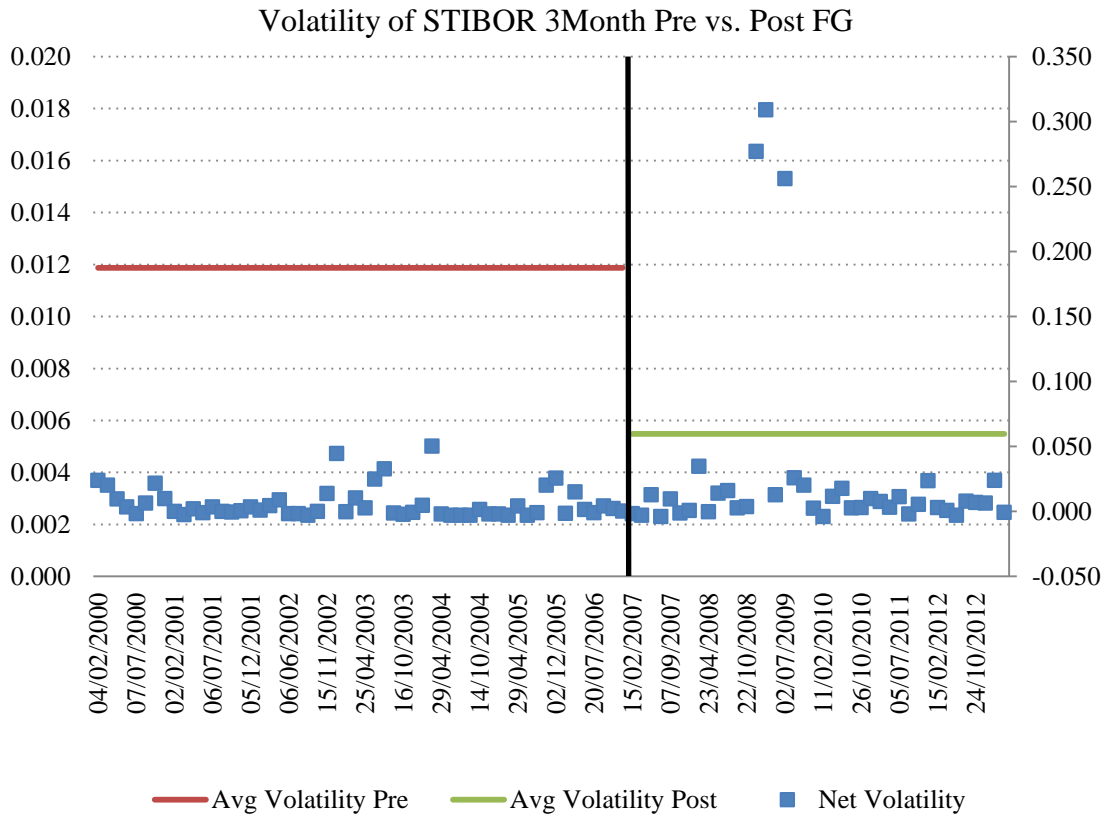


Chart 23: Riksbank— Riksbank’s repo rate path and market expectations April 2009
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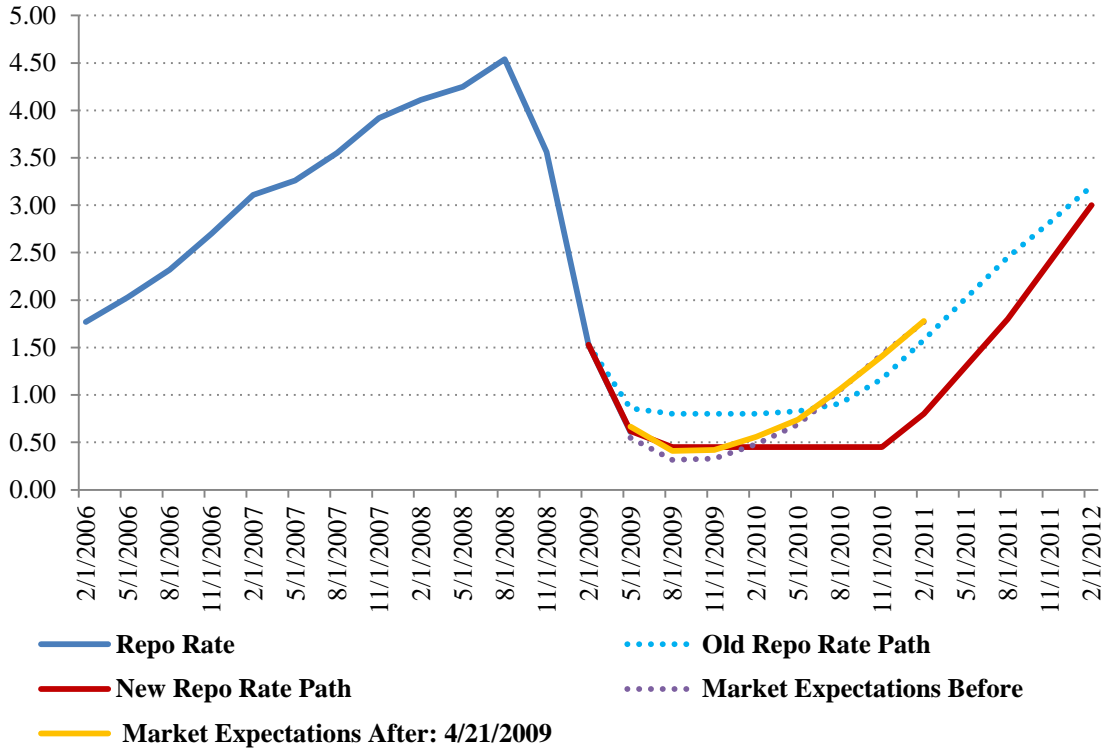
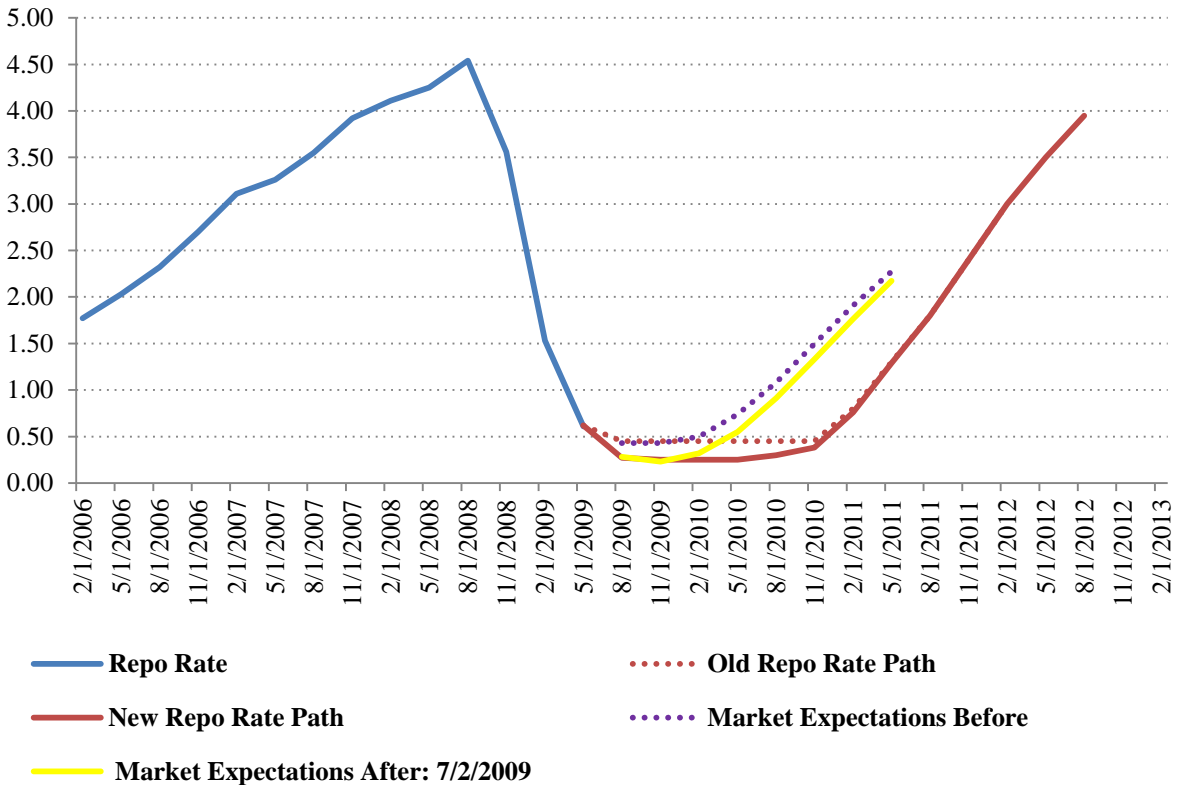


Chart 24: Riksbank—Repo rate path and market expectations July 2009
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Appendix V (Corresponding to CH5—Federal Reserve)

Timeline 5: Federal Reserve—Major Changes that Impacted Communication over Time



Chart 25: Federal Reserve—Economic Projections of FOMC Members

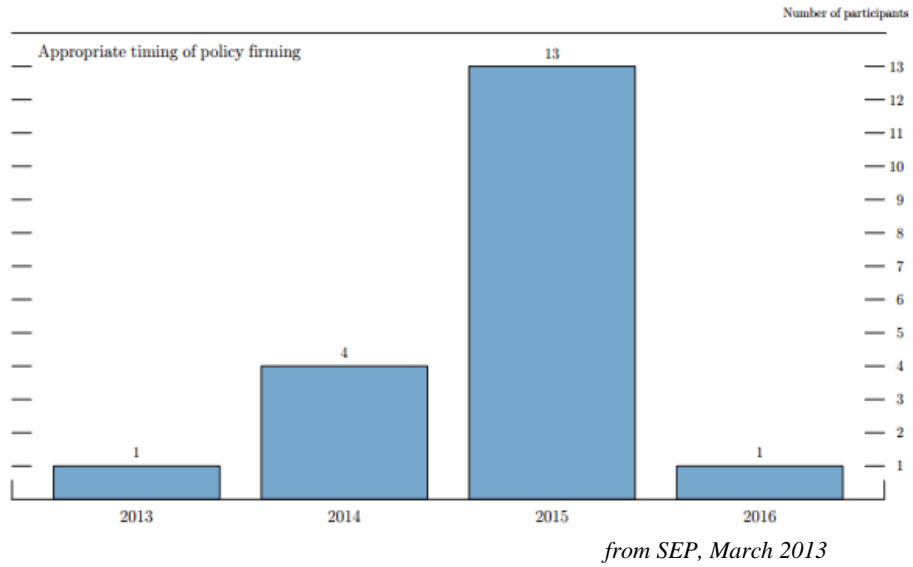
(Economic Projections of Federal Reserve Board Members and Federal Reserve Bank Presidents)

Variable	Central tendency ¹				Range ²			
	2012	2013	2014	Longer run	2012	2013	2014	Longer run
Change in real GDP	1.9 to 2.4	2.2 to 2.8	3.0 to 3.5	2.3 to 2.5	1.6 to 2.5	2.2 to 3.5	2.8 to 4.0	2.2 to 3.0
April projection	2.4 to 2.9	2.7 to 3.1	3.1 to 3.6	2.3 to 2.6	2.1 to 3.0	2.4 to 3.8	2.9 to 4.3	2.2 to 3.0
Unemployment rate	8.0 to 8.2	7.5 to 8.0	7.0 to 7.7	5.2 to 6.0	7.8 to 8.4	7.0 to 8.1	6.3 to 7.7	4.9 to 6.3
April projection	7.8 to 8.0	7.3 to 7.7	6.7 to 7.4	5.2 to 6.0	7.8 to 8.2	7.0 to 8.1	6.3 to 7.7	4.9 to 6.0
PCE inflation	1.2 to 1.7	1.5 to 2.0	1.5 to 2.0	2.0	1.2 to 2.0	1.5 to 2.1	1.5 to 2.2	2.0
April projection	1.9 to 2.0	1.6 to 2.0	1.7 to 2.0	2.0	1.8 to 2.3	1.5 to 2.1	1.5 to 2.2	2.0
Core PCE inflation ³	1.7 to 2.0	1.6 to 2.0	1.6 to 2.0		1.7 to 2.0	1.4 to 2.1	1.5 to 2.2	
April projection	1.8 to 2.0	1.7 to 2.0	1.8 to 2.0		1.7 to 2.0	1.6 to 2.1	1.7 to 2.0	

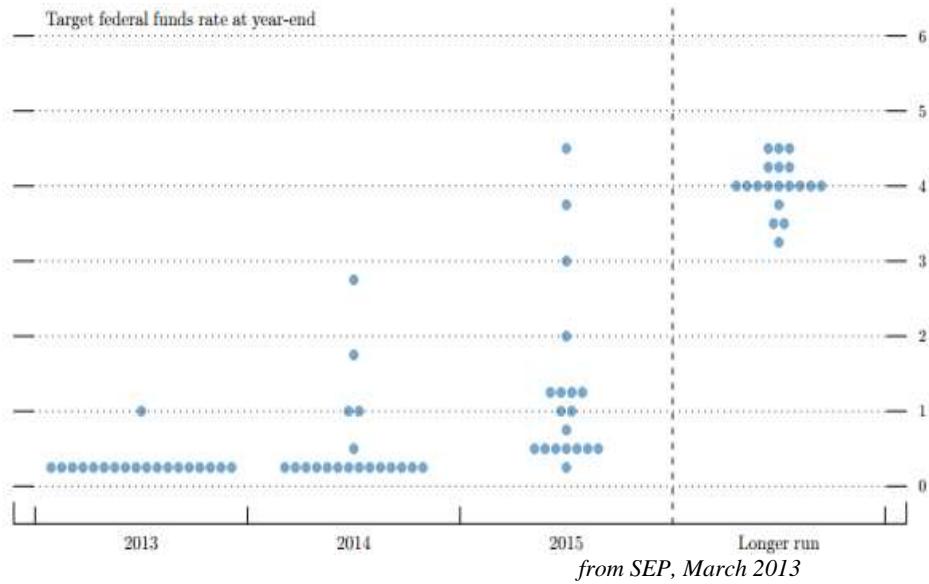
Source: Summary of Economic Projections from June 2012, Federal Reserve

Chart 26: Federal Reserve—Example of Fed Funds Rate Projections Chart

Overview of FOMC participants assessments of appropriate monetary policy



Appropriate pace of policy firming



Source: Fed's Summary of Economic Projections (SEP)

Chart 27: Federal Reserve—Flowchart of the Fed Funds Rate Projections

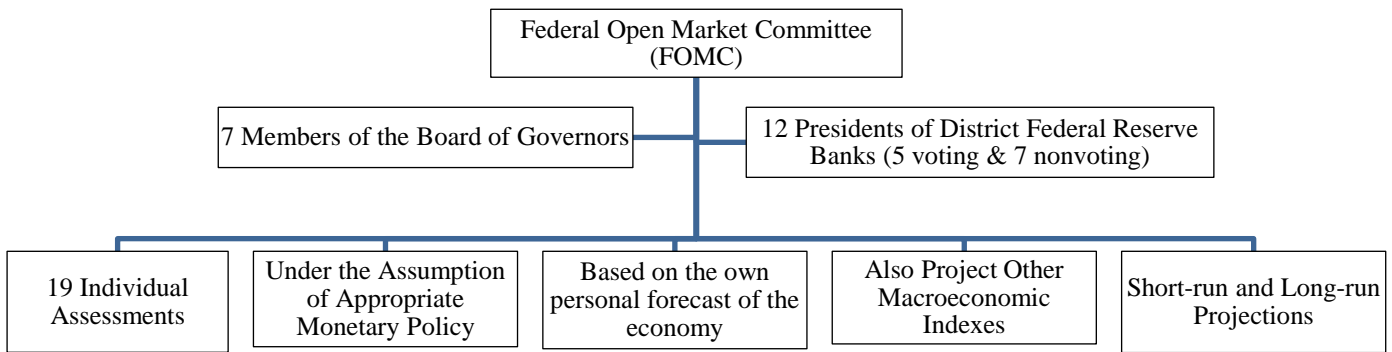


Chart 28: Federal Reserve—Volatility Analysis

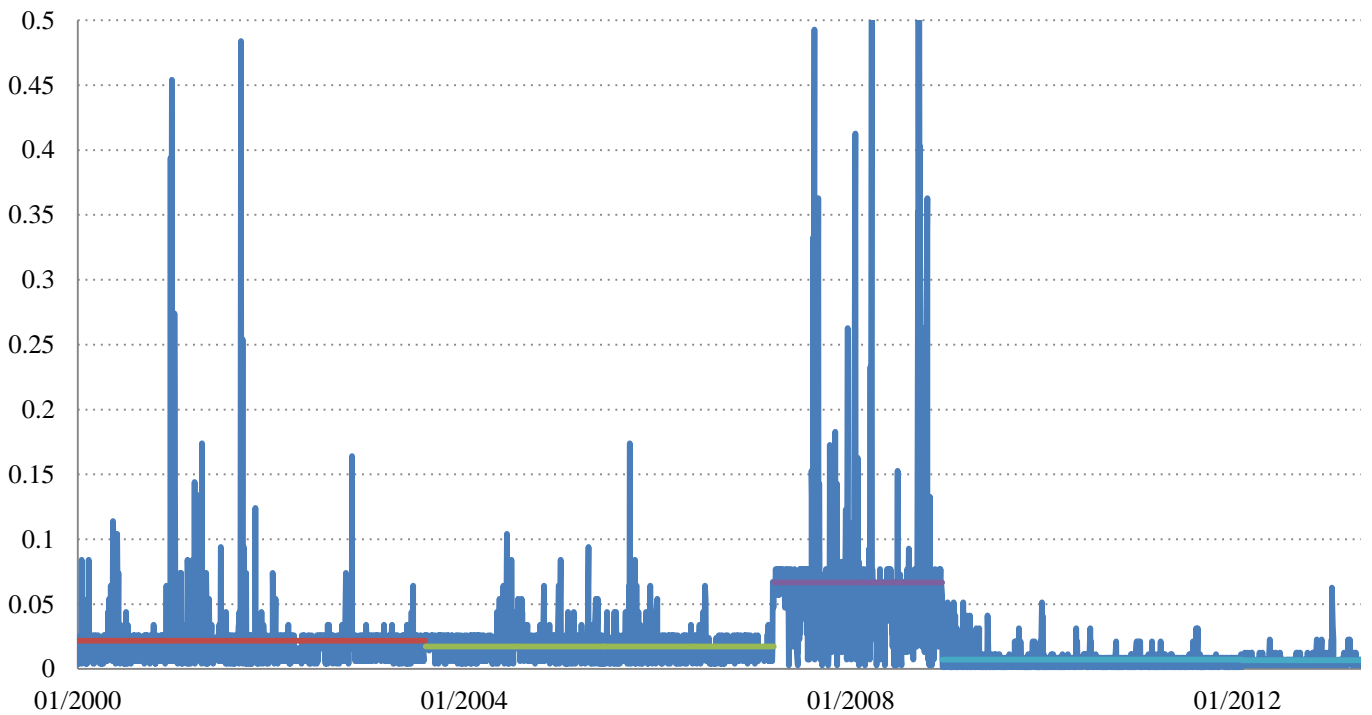
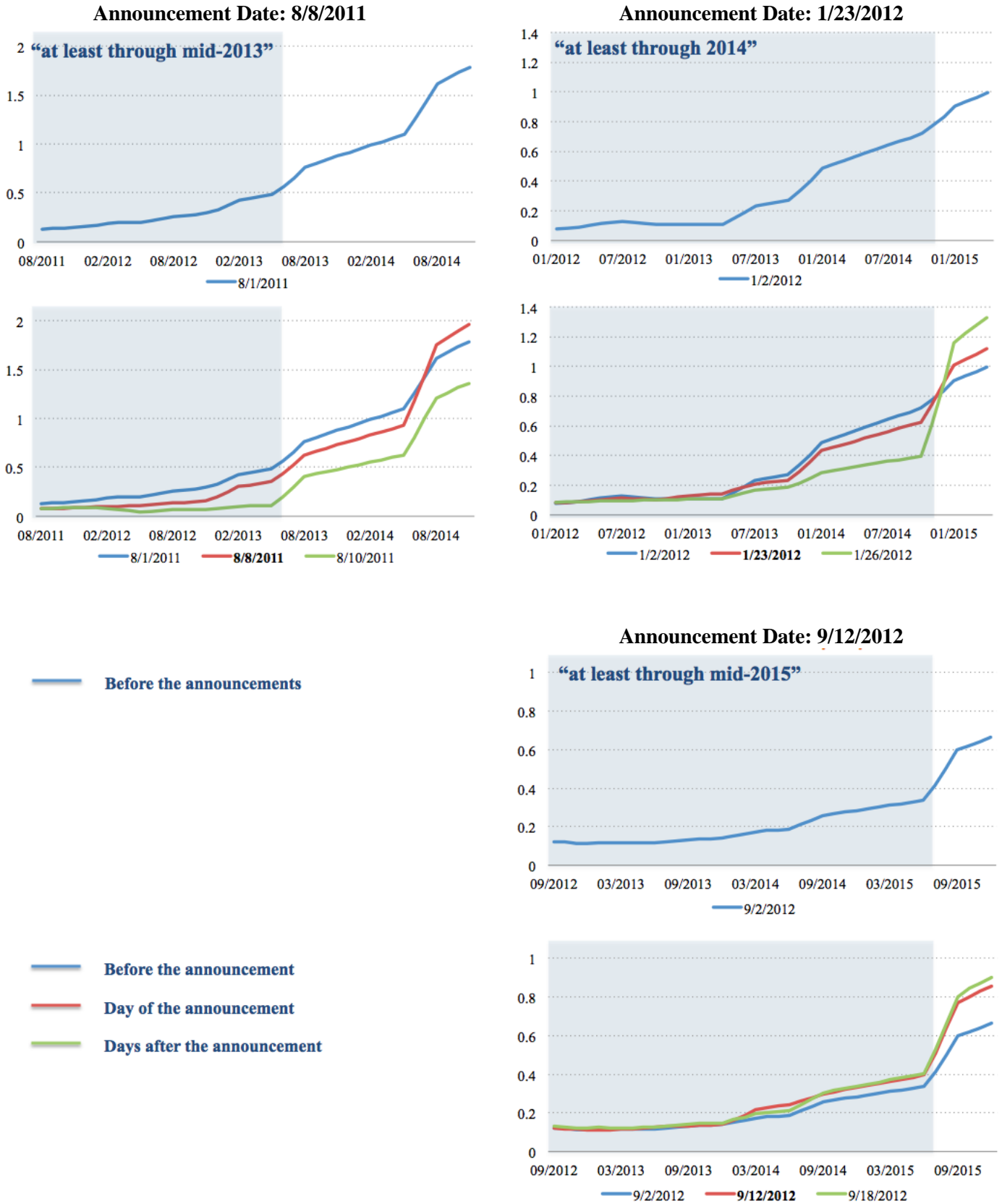


Chart 29: Federal Reserve—Market Expectations Before, On, and After Three Announcement Dates



Appendix VI (Corresponding to CH6—Federal Reserve)

Timeline 6: Federal Reserve—LSAP programs in the US and the UK

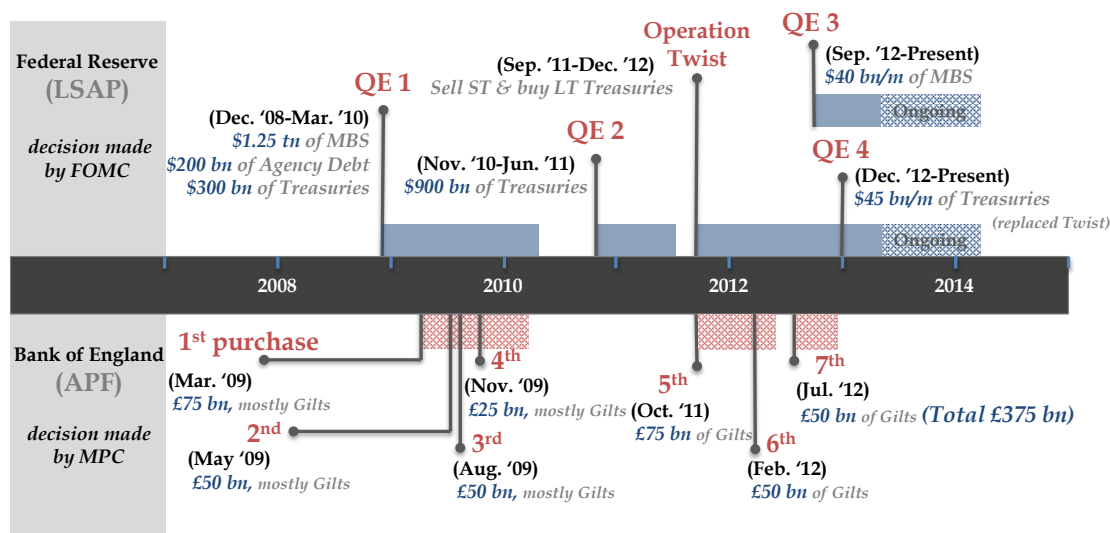


Table 10: Federal Reserve—Important announcements related to the LSAP programs

Program	Date	Communication Tool	Announcement
Quantitative Easing 1	11/25/08	Press Release 1/	The Fed announced the purchase of "up to \$ 100 billion in agency debt" and "up to \$500 billion in mortgage-backed securities."
	12/1/08	Speech 2/	Chairman Bernanke said the Fed "could purchase longer-term Treasury or agency securities [...] in substantial quantities."
	12/16/08	FOMC Statement 3/	The FOMC stated that it "stands ready to expand its purchases of agency debt and mortgage-backed securities... [and] is also evaluating the potential benefits of purchasing longer-term Treasury securities."
	1/28/09	FOMC Statement 4/	The FOMC stated that it "is prepared to purchase longer-term Treasury securities."
	3/18/09	FOMC Statement 5/	The FOMC announced the purchase of "up to an additional \$ 750 billion of agency mortgage-backed securities", "up to \$ 100 billion" in agency debt, and "up to \$ 300 billion of longer-term Treasury securities over the next six months."
	8/12/09	FOMC Statement 6/	The FOMC stated that it "decided to gradually slow the pace" of Treasury purchases.
	9/23/09	FOMC Statement 7/	The FOMC stated that it "will gradually slow the pace of" mortgage-backed securities purchases.
	11/4/09	FOMC Statement 8/	The FOMC announced it "will purchase [...] about \$ 175 billion of agency debt."
Quantitative Easing 2	8/10/10	FOMC Statement 9/	The FOMC announced the reinvestment of "principal payments from agency debt and agency mortgage-backed securities in longer-term Treasury securities."
	8/27/10	Jackson Hole Symposium 10/	Chairman Bernanke said that "additional purchases of longer-term securities [...] would be effective in further easing financial conditions."
	9/21/10	FOMC Statement 11/	The FOMC stated that it "is prepared to provide additional accommodation if needed."
	11/3/10	FOMC Statement 12/	The FOMC stated that it "intends to purchase a further \$ 600 billion of longer-term Treasury securities by the end of the second quarter of 2011, at a pace of about \$ 75 billion per month." This - in addition to the reinvestment of \$300 billion in Treasuries from earlier proceeds from mortgage-backed securities (announcement 8/10/2010) - would result in the purchase of \$ 900 billion of long-term Treasuries.

Table 10: Continued

Program	Date	Communication Tool	Announcement
Exit Strategy Principles	7/12/11	FOMC Minutes 13/	The FOMC announced the future normalization of the size of its balance sheet according to the following guidelines: "first cease reinvesting some or all payments of principal on the securities holdings in the SOMA [...] thereafter, the Committee will modify its forward guidance on the path of the federal funds rate and will initiate temporary reserve-draining [...] the Committee's next step in the process of policy normalization will be to begin raising its target for the federal funds rate [...] Sales of agency securities from the SOMA will likely commence sometime after the first increase in the target for the federal funds rate. The timing and pace of sales will be communicated to the public in advance; that pace is anticipated to be relatively gradual and steady, but it could be adjusted [...] Once sales begin, the pace of sales is expected to be aimed at eliminating the SOMA's holdings of agency securities over a period of three to five years [...] Sales at this pace would be expected to normalize the size of the SOMA securities portfolio over a period of two to three years."
Maturity Extension Program ("Operation Twist")	9/21/11	FOMC Statement 14/	The FOMC announced it "intends to purchase, by the end of June 2012, \$ 400 billion of Treasury securities with remaining maturities of 6 years to 30 years and to sell an equal amount of Treasury securities with remaining maturities of 3 years or less." Also, it stated that "to help support conditions in mortgage markets, the Committee will now reinvest principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities". Before, given the announcement on 8/10/2010, principal payments from agency debt and agency mortgage-backed securities were reinvested in longer-term Treasury securities. Likewise, it is important to clarify that on 9/21/2011 the FOMC maintained its existing policy of rolling over maturing Treasury securities at auction.
	6/20/12	FOMC Statement 15/	The FOMC stated that it "decided to continue through the end of the year its program to extend the average maturity of its holdings of securities."
	6/20/12	NY Fed Statement 16/	The NY Fed released a supplementary statement, clarifying that the continuation of Operation Twist "will [...] result in the purchase, as well as the sale and redemption, of about \$ 267 billion Treasury securities by the end of 2012." Accordingly, the completion of Operation Twist - which was announced on 9/21/2011 and extended on 6/20/2012 - would entail \$ 667 billion in purchases and sales of long-term Treasuries and short-term Treasuries, respectively. This would lengthen the average maturity of the SOMA Treasury portfolio by more than three years and virtually eliminate its holdings of short-term Treasury securities.
Quantitative Easing 3	9/13/12	FOMC Statement 17/	The FOMC announced an open-ended asset purchase program (QE3) to purchase "additional agency mortgage-backed securities at a pace of \$40 billion per month". Also, it stated that "if the outlook for the labor market does not improve substantially, the Committee will continue its purchases of agency mortgage-backed securities (and) undertake additional asset purchases [...] until such improvement is achieved in a context of price stability. In determining the size, pace, and composition of its asset purchases, the Committee will, as always, take appropriate account of the likely efficacy and costs of such purchases."
Program	Date	Communication tool	Announcement
Quantitative Easing 3 & Quantitative Easing 4	12/12/12	FOMC Statement 18/	The FOMC announced a new open-ended asset purchase program to "purchase longer-term Treasury securities after its program to extend the average maturity of its holdings of Treasury securities is completed at the end of the year, initially at a pace of \$45 billion per month (QE4)." Additionally, it stated that "if the outlook for the labor market does not improve substantially, the Committee will continue its purchases of Treasury and agency mortgage-backed securities (now at a pace of \$ 85 billion/month) [...] until such improvement is achieved in a context of price stability. In determining the size, pace, and composition of its asset purchases, the Committee will, as always, take appropriate account of the likely efficacy and costs of such purchases."
	2/20/13	FOMC Minutes 19/	The FOMC provided a detailed explanation of the possible benefits and costs of additional asset purchases.
	2/26/13	Testimony before Congress 20/	Chairman Bernanke explained his outlook on the potential costs of the LSAP program.

Source: Federal Reserve. And Michael Woodford, "[Methods of Policy Accommodation at the Interest-Rate Lower Bound](#)", Columbia University, September 16, 2012, pages 96-98.

Table 11: Important announcements related to the Bank of England's APF programs

Program	Date	Communication Tool	Announcement
Establishment of the Asset Purchase Facility	1/19/09	Press Release 1/	The Chancellor of the Exchequer announced the creation of the APF by the Bank of England. The BOE issued a press release stating that "the Asset Purchase Facility will provide an important additional tool to improve financing conditions in the economy."
	1/29/09	Exchange of letters between the Chancellor of the Exchequer and the Governor of the BOE 2/	The Governor replied to the Chancellor confirming that a new company is being established to undertake these transactions" (the Bank of England Asset Purchase Facility Fund, a subsidiary of the BOE). The Governor also noted that the APF "will focus initially on purchases of corporate bonds, commercial paper, and paper issued under the CGS" (Credit Guarantee Scheme), and announced the publication of a "quarterly report on the transactions undertaken as part of the facility, shortly after the end of each quarter." It is worth noting that, at this point in time, the purchases of the APF were not considered a monetary policy instrument because they were expected to be financed by the issuance of Treasury bills and the DMO's cash management operations, rather than by the creation of BOE reserves.
Asset Purchase Facility 1	2/11/09	Inflation Report 3/	The inflation report gave signals that the APF would be used for monetary policy purposes (quantitative easing).
	2/11/09	Press Conference (associated to inflation report) 4/	Governor King reinforced the abovementioned signals by answering to a question on asset purchases from the press: "If we were to get to a point and we may well when the Monetary Policy Committee feels that it would like to create Central Bank money to finance purchases of assets, whether it's gilts or whether it's further credit easing operations then a resolution will be put to the Monetary Policy Committee after a discussion and the Monetary Policy Committee would vote on the operations it wanted to carry out."
	2/17/09	Exchange of letters between the Chancellor of the Exchequer and the Governor of the BOE 5/	The Governor replied to the Chancellor "the Monetary Policy Committee (MPC) agreed at its February policy meeting that it would like to be able to use the Asset Purchase Facility for monetary policy purposes. To the extent that the facility could be used to buy gilts on the secondary market financed by central bank money, this would be similar to the current implementation of monetary policy, except that the instrument of policy would shift towards the quantity of money provided rather than its price."
	2/18/09	MPC Minutes 6/	MPC Minutes of the February 4-5, 2009 meeting revealed the reasoning behind the decision the use the APF as a monetary policy instrument.

Table 11: Continued i

Program	Date	Communication Tool	Announcement
Asset Purchase Facility 1	3/5/09	MPC Statement 7/	The MPC launched APF 1, stating that "the Committee agreed that the Bank should, in the first instance, finance £75 billion of asset purchases by the issuance of central bank reserves. The Committee recognised that it might take up to three months to carry out this programme of purchases. Part of that sum would finance the Bank of England's programme of private sector asset purchases through the Asset Purchase Facility, intended to improve the functioning of corporate credit markets [...] It is likely that the majority of the overall purchases by value over the next three months will be of gilts [...] At its future meetings, the Committee will monitor the effectiveness of this purchase programme in boosting the supply of money and credit and in due course raising the rate of growth of nominal spending, adjusting the speed and scale of purchases as appropriate." A supplementary market notice (also published on 3/5/2009) specified that the purchases of gilts was restricted to bonds with residual maturities between 5 and 25 years.
	3/5/09	Televised Interview 8/	Governor King explained in a BBC television interview the nature and purpose of the MPC's decision to launch APF 1.
	5/7/09	MPC Statement 9/	The MPC announced the expansion of APF 1, stating that "the Committee also agreed to continue with its programme of purchases of government and corporate debt financed by the issuance of central bank reserves and to increase its size by £50 billion to a total of £125 billion. The Committee expected that it would take another three months to complete that programme, and it will keep the scale of the programme under review."
	8/6/09	MPC Statement 10/	The MPC announced another expansion of APF 1, stating that "the Committee also agreed that it should extend its programme of purchases of government and corporate debt to a total of £175 billion, financed by the issuance of central bank reserves. The Committee expects the announced programme to take another three months to complete. The scale of the programme will be kept under review." A supplementary market notice (also published on 8/6/2009) specified that the buying range of the APF was to be extended to gilts with a residual maturity greater than 3 years (before, the APF only bought gilts with residual maturities from 5 to 25 years).
	11/5/09	MPC Statement 11/	The MPC announced an additional expansion of APF 1, stating that "the Committee also agreed that it should extend its programme of purchases of government and corporate debt by £25 billion to a total of £200 billion, financed by the issuance of central bank reserves. The Committee expects the announced programme to take three months to complete. The scale of the programme will be kept under review."

Table 11: Continued ii

Program	Date	Communication Tool	Announcement
Asset Purchase Facility 2	8/10/11	Press conference (associated to inflation report) 12/	Governor King left the door open for an expansion of the APF by answering to a question from the press on future asset purchases: "if we need to, we can carry out more asset purchases. There is no difficulty or impediment to doing that, as I said. The Committee will have to decide if it wants to do that, and if so when."
	10/6/11	MPC statement 13/	The MPC launched APF 2, stating that "the deterioration in the outlook has made it more likely that inflation will undershoot the 2% target in the medium term [...] The Committee therefore voted to increase the size of its asset purchase programme, financed by the issuance of central bank reserves, by £75 billion to a total of £275 billion [...] The Committee expects the announced programme of asset purchases to take four months to complete. The scale of the programme will be kept under review."
	10/6/11	Televised interview 14/	Governor King explained in an Independent Television News (ITN) interview the MPC's decision to inject £75 billion directly into the economy through asset purchases.
	2/9/12	MPC statement 15/	The MPC announced the expansion of APF 2, stating that "the Committee therefore voted to increase the size of its programme of asset purchases, financed by the issuance of central bank reserves, by £50 billion to a total of £325 billion [...] The Committee expects the announced programme of asset purchases to take three months to complete. The scale of the programme will be kept under review."
Asset Purchase Facility 3	5/16/12	Press conference (associated to inflation report) 16/	With inflation running above the upper range of the target (2% + 1%), Governor King suggested that a new round of quantitative easing (APF 3) seemed unlikely at that juncture. His words were: "looking ahead two years, our judgement last week (May 9-10 MPC Meeting) was that the risks around the target were evenly balanced. So I think it was a perfectly reasonable decision to do no more (asset purchases)."
	7/5/12	MPC statement 17/	The MPC launched APF 3, stating that "against the background of continuing tight credit conditions and fiscal consolidation, the increased drag from the heightened tensions within the euro area meant that, without additional monetary stimulus, it was more likely than not that inflation would undershoot the target in the medium term. The Committee therefore voted to increase the size of its programme of asset purchases, financed by the issuance of central bank reserves, by £50 billion to a total of £375 billion [...] The Committee expects the announced programme of asset purchases to take four months to complete. The scale of the programme will be kept under review."
	7/12/12	Bank of England website 18/	The Bank of England published "The Distributional Effects of Asset Purchases" as part of an innovative attempt to communicate the distributional impact of the APF across individual groups such as savers, pensioners, among others.
	9/14/12	Bank of England website & YouTube 19/	Spencer Dale - member of the MPC and Chief Economist of the BOE - is featured in a video clarifying misconceptions about the quantitative easing policies. This video is part of a comprehensive effort by the Bank of England to communicate and explain quantitative easing to the population in simple terms.
Program	Date	Communication tool	Announcement
Post Asset Purchase Facility 3	11/9/12	Exchange of letters between the Chancellor of the Exchequer and the Governor of the BOE 20/	In light of an agreement to transfer gilt coupon payments received by the APF - net of interest costs and other expenses - to the Exchequer, the Governor replied to the Chancellor: "The previous arrangement was for these cash flows to accumulate on the APF's balance sheet. Because the APF is indemnified by the Government, any gains or losses it makes are ultimately due to the Exchequer. So the gilt coupons received by the APF amount to payments from one part of the public sector to another. As the scale and likely duration of the APF has increased significantly since its inception, I agree that it now makes sense to normalise the cash management arrangements for the APF [...] While transferring the APF's net income to the Exchequer will result initially in payments from the APF to the Government, it is likely to lead to the need for reverse payments from the Government to the APF in the future as Bank Rate increases and the APF's gilt holdings are unwound by the Monetary Policy Committee (MPC)."

Source: Bank of England. The listed videos and documents were not chosen arbitrarily. In fact, they are listed as "[key resources](#)" and "[key documents & publications](#)" under the quantitative easing tab in the Bank of England's website.

Table 12: Event Studies on the LSAP programs implemented in U.S. and the U.K.*(Yield measures in basis points)*

Authors		Gagon et al. (2010)	Joyce et al. (2011)	Meaning and Zhu (2011)
Authors' affiliation		Federal Reserve	Bank of England	Bank for International Settlements
Scope of analysis		United States	United Kingdom	United States and United Kingdom
LSAP programs analyzed		QE1	APF 1	QE1, QE2, Operation Twist, APF1, and APF2
Portfolio rebalancing channel	Cumulative decline in the yield of 10-year Treasuries due to decline in premium	71 bp ^{1]}	90 bp ^{2]}	QE1: 83 bp ^{3]} QE2: -15 bp OT: 10 bp APF1: 53 bp APF2: -5 bp
Policy signaling channel (communication effect)	Cumulative decline in the yield of 10-year Treasuries due to expectations component	20 bp ^{1]}	10 bp ^{2]}	—
	Cumulative decline in 3-month OIS rate (proxy for expectation component)	—	—	QE1: 35 bp ^{3]} QE2: -3 bp OT: -3 bp APF1: 5 bp APF2: -2 bp
Effect on other assets	Cumulative decline in the yield of agency MBS	113 bp	-	not comparable
	Cumulative decline in the yield of 10-year agency debt	156 bp	-	-
	Cumulative decline in the yield of Baa-rated corporate bonds	67 bp	70 bp	QE1: 63 bp QE2: -10 bp OT: 2 bp APF1: 56 bp APF2: 0 bp

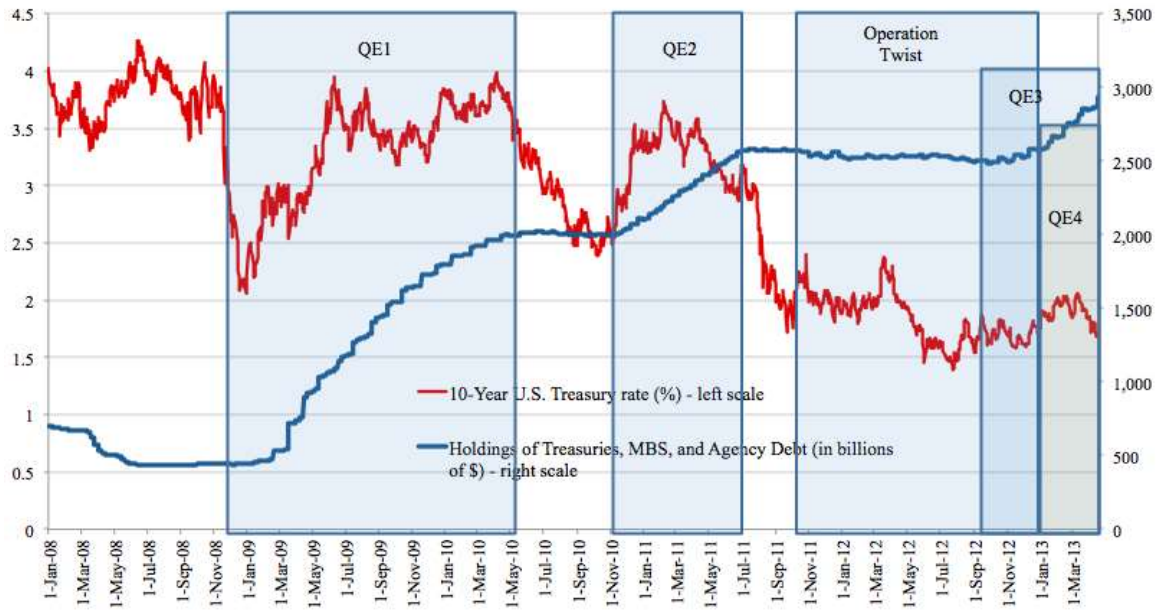
Source: A) Joseph Gagnon, Mathew Raskin, Julie Remache, and Brian Sack, [“Large-Scale Purchases by the Fed: Did they Work?”](#), Federal Reserve Bank of New York, March 2010; B) Michael Joyce, Mathew Tong, and Robert Woods [“The United Kingdom’s quantitative easing policy: design, operation and impact”](#), Bank of England, March 2011; C) Jack Meaning and Feng Zhu, [“The impact of recent central bank asset purchase programmes”](#), BIS Quarterly Review, December 2011.

1] Gagnon et al.’s (2010) results are broken down into portfolio balancing and policy signaling effects in Michael Woodford, [“Methods of Policy Accommodation at the Interest-Rate Lower Bound”](#), Columbia University, September 16, 2012, page 78. This is done using an arbitrage-free dynamic term structure model.

2] Joyce et al. (2011) calculate the effects on UK Treasury yields attributable to portfolio rebalancing and policy signaling using the Gilt-OIS spread.

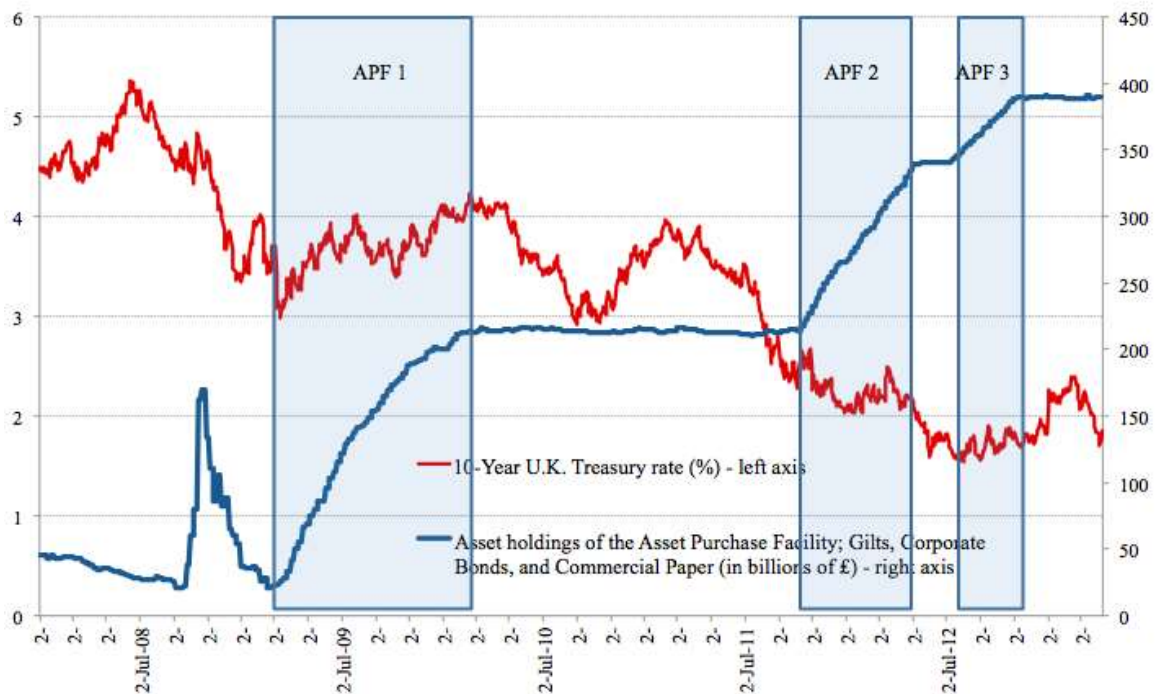
3] Meaning and Zhu (2011) do not provide an estimate of portfolio rebalancing effects. They show the gross effect on 10-year US Treasuries and 10-year UK Treasuries. Also, their estimate of the policy signaling effect uses the 3-month OIS rate as a proxy of expected short-term interest rates.

Chart 30: LSAP Program Size and 10-year Treasury Rates in the United States
(January 1, 2008 – April 10, 2013)



Source: Bloomberg and Federal Reserve Bank of New York

Chart 31: APF Program Size and 10-year Treasury Rates in the United Kingdom
(January 1, 2008 – April 10, 2013)



Source: Bloomberg and Bank of England

Appendix VII (Corresponding to CH7—Cross-Country Comparison)

Chart 32: New Zealand 90 Day Bank Bill Futures Response to Fed’s Announcement:
(FOMC Statement June 20, 2012)

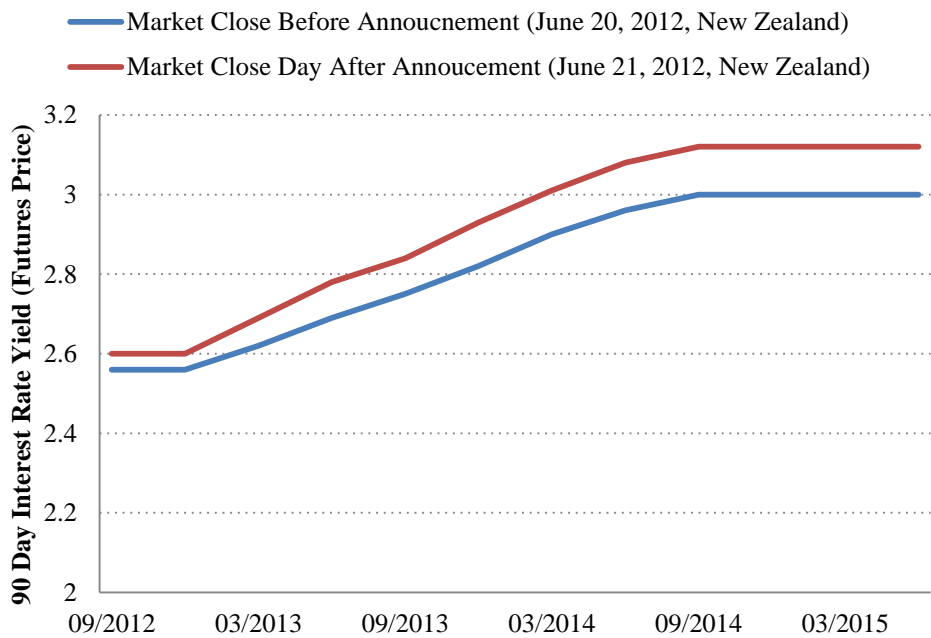
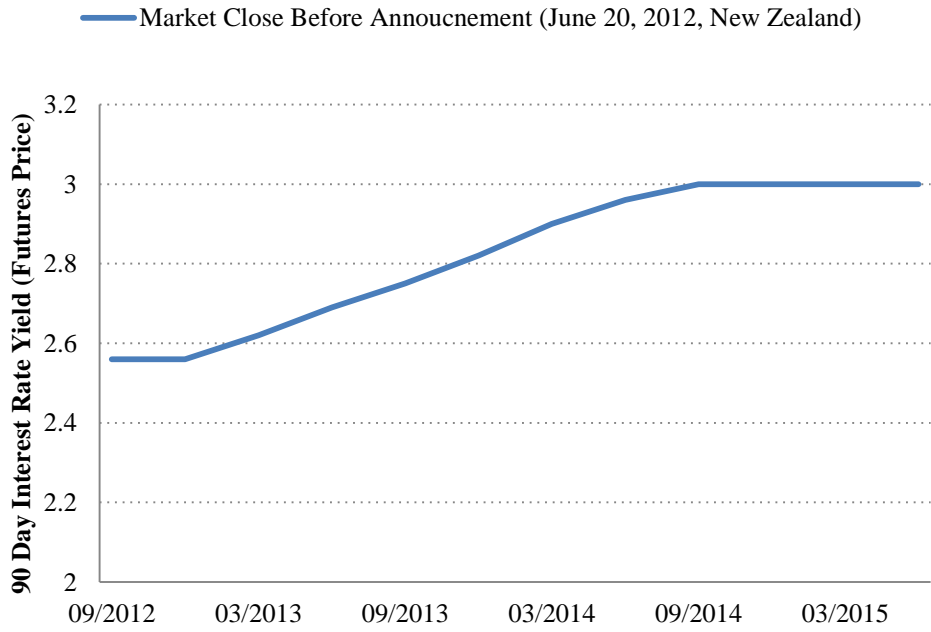


Chart 33: New Zealand 90 Day Bank Bill Futures Response to Fed’s Announcement:
 (FOMC Statement September 13, 2012)

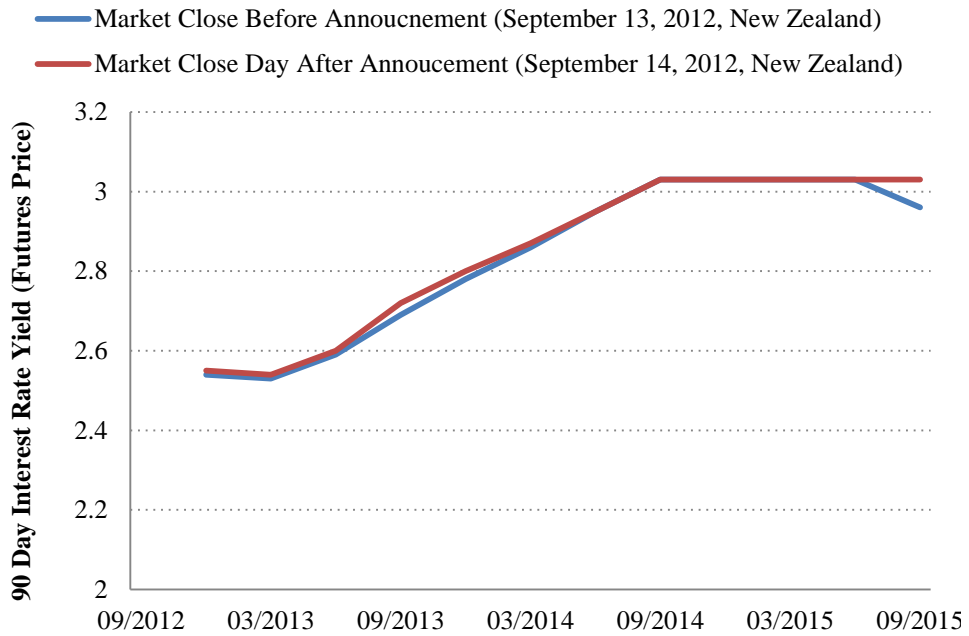
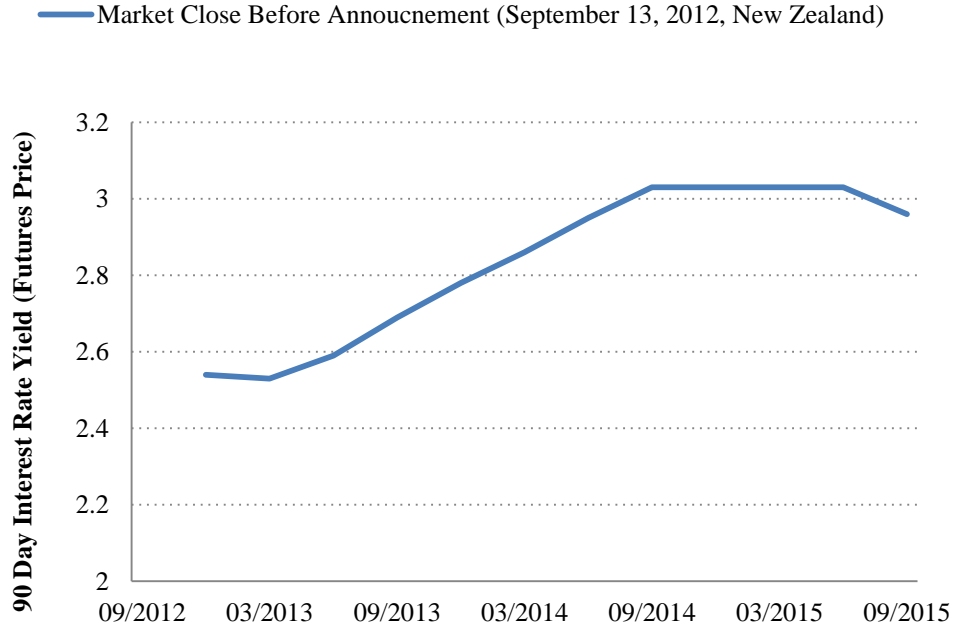


Chart 34: New Zealand 90 Day Bank Bill Futures Response to Fed’s Announcement:
 (FOMC Statement December 12, 2012)

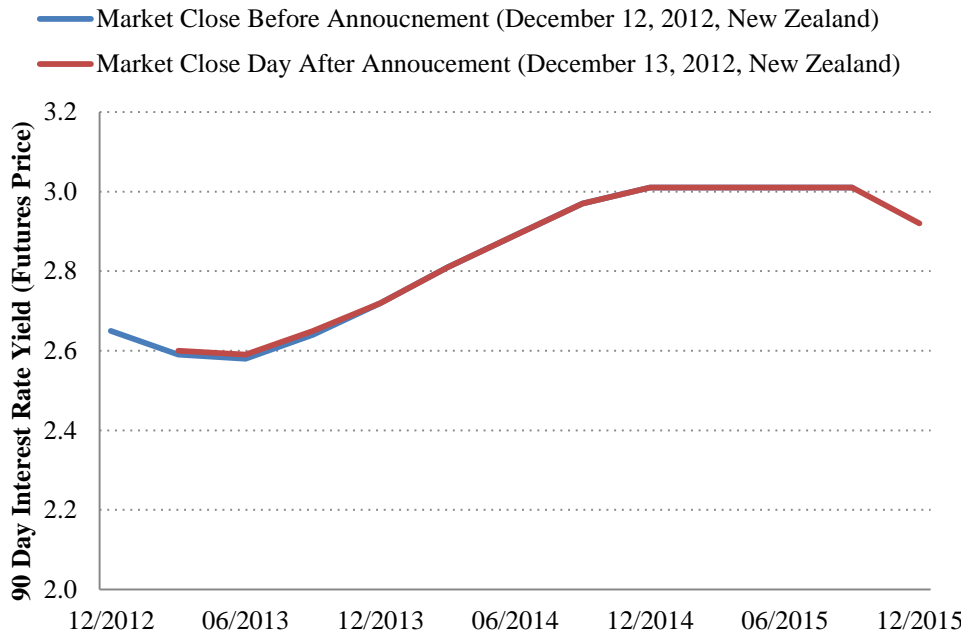
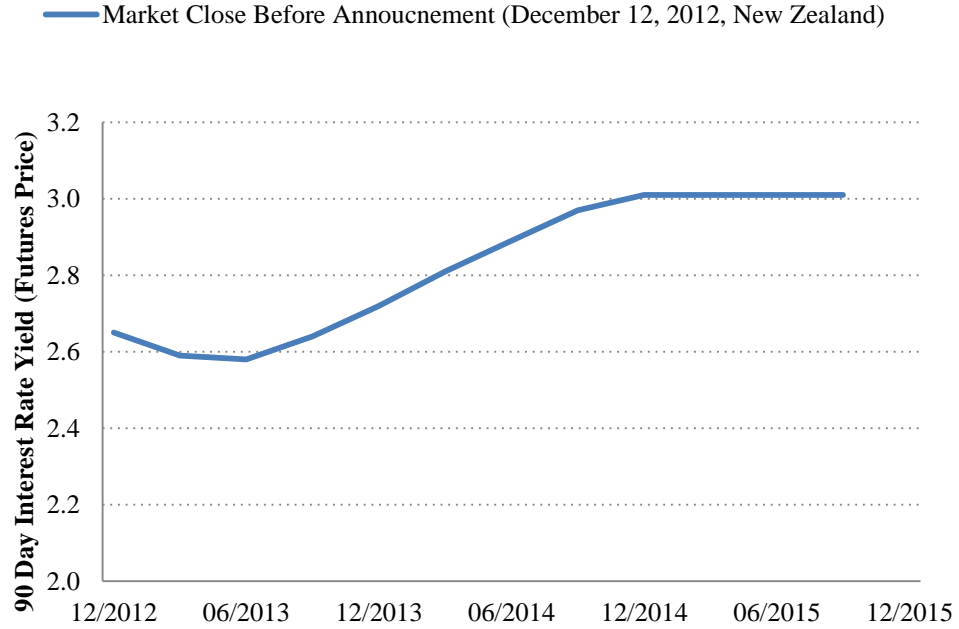


Chart 35: Comparative Analysis of Market Expectations I

(Future Rates: 90-day Interest Rate for New Zealand, 3-month NIBOR for Norway, 3-month STIBOR)

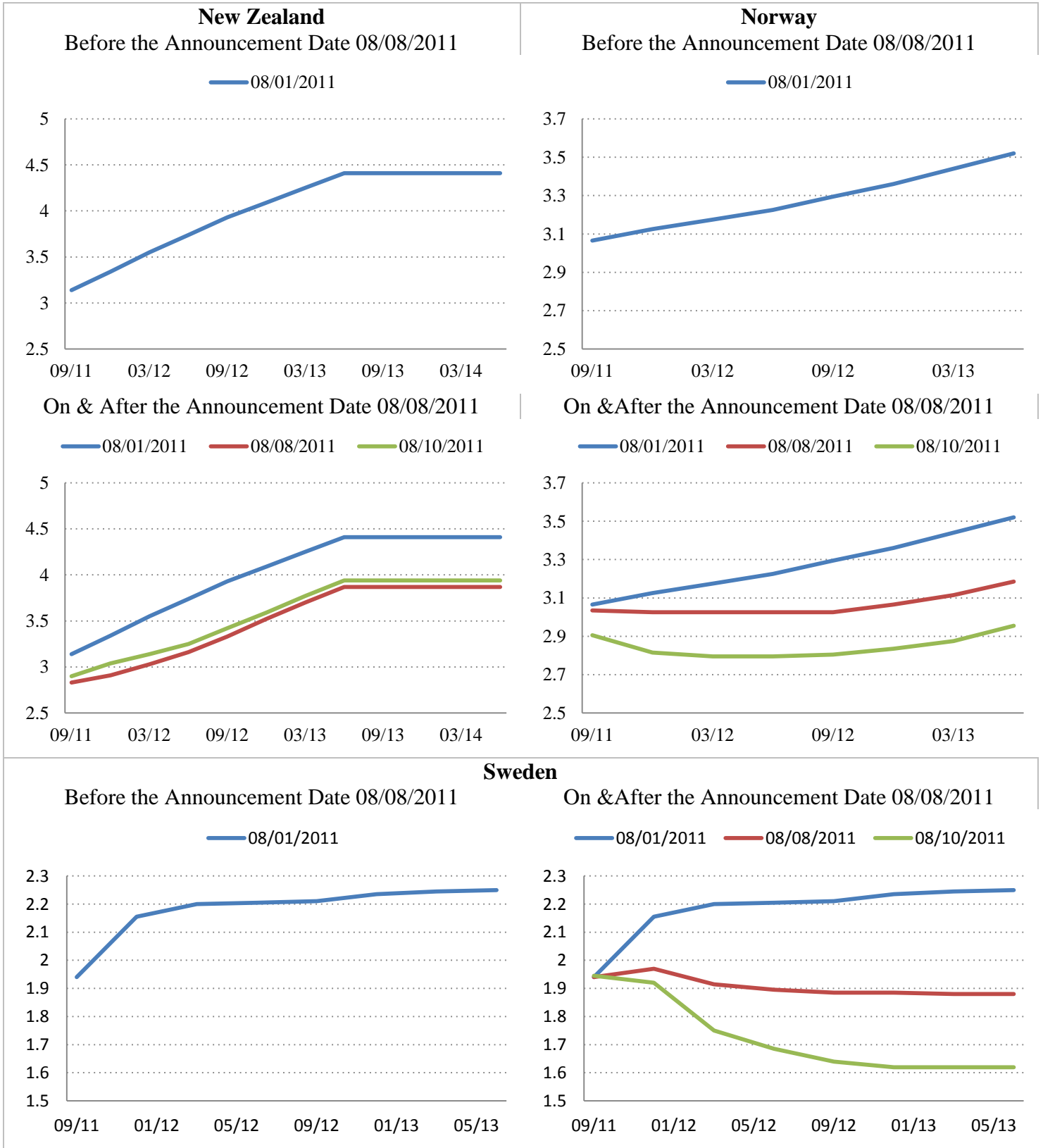


Chart 36: Comparative Analysis of Market Expectations II

(Future Rates: 90-day Interest Rate for New Zealand, 3-month NIBOR for Norway, 3-month STIBOR)

