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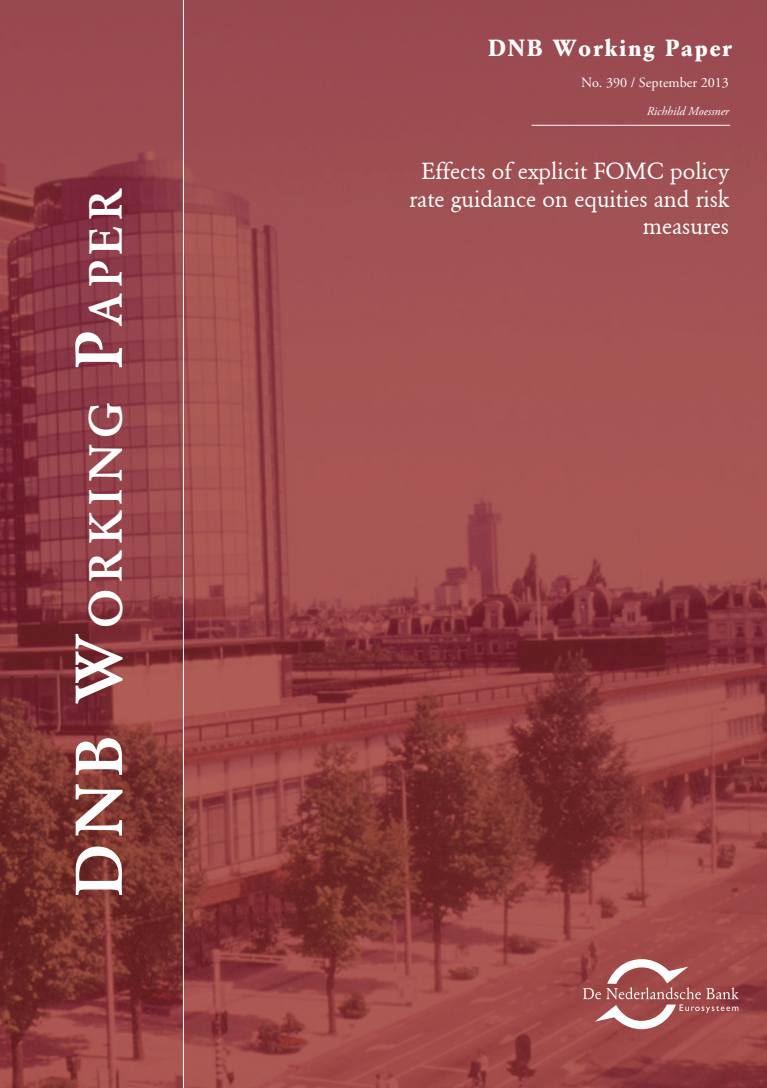

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* Views expressed are those of the author and do not necessarily reflect official positions of De Nederlandsche Bank.

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Effects of explicit FOMC policy rate guidance on equities and risk measures*

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Abstract

We quantify the impact of explicit FOMC policy rate guidance used as an unconventional monetary policy tool at the zero lower bound of the policy rate on US equity prices, as well as on the risk indicators of credit and CDS spreads, implied volatilities and US equity index risk reversals. We find that explicit FOMC policy rate guidance announcements at the zero lower bound led to a significant increase in US equity prices, for an aggregate equity index as well as for US commercial bank and US non-financial equities. Moreover, we find that they led to a significant reduction in some credit spreads. They also led to a significant reduction in an implied volatility index for US government bonds, as well as in the absolute value of US equity risk reversals, implying a lower perceived risk attached to a large fall in the equity index.

JEL classification: E58.

Key words: Monetary policy, central bank communication, policy rate guidance.

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1 Introduction

With reaching the zero lower bound on the policy interest rate in the wake of the global financial crisis, explicit policy rate guidance has become an important unconventional monetary policy tool for the FOMC, in addition to large-scale asset purchases. In the words of the Federal Reserve's Vice Chair Janet Yellen, "Of course, many central banks have, in the wake of the crisis, found it challenging to provide appropriate monetary stimulus after their policy interest rate hit the effective lower bound. This is the point where "many instruments" enters the discussion. The main tools for the FOMC have been forward guidance on the future path of the federal funds rate and large-scale asset purchases." (Yellen (2013)). An aim of such forward guidance is to stimulate growth by increasing asset prices. "The objective of forward guidance is to affect expectations about how long the highly accommodative stance of the policy interest rate will be maintained as conditions improve. By lowering private-sector expectations of the future path of short-term rates, this guidance can reduce longer-term interest rates and also raise asset prices, in turn, stimulating aggregate demand." (Yellen (2013)). The European Central Bank introduced explicit policy rate guidance in July 2013 (Draghi (2013)). The ECB's President Draghi commented on this introduction in the question & answer session following the press conference as follows, "The Governing Council has taken the unprecedented step of giving forward guidance in a rather more specific way than it ever has done in the past. In my statement, I said "The Governing Council expects the key…" – i.e. all interest rates – "…ECB interest rates to remain at present or lower levels for an extended period of time." It is the first time that the Governing Council has said something like this." (Draghi (2013)). The Bank of England introduced explicit policy rate guidance in August 2013, including in its news release "In particular, the MPC intends not to raise Bank Rate from its current level of 0.5% at least until the Labour Force Survey headline measure of the unemployment rate has fallen to a threshold of 7%, subject to the conditions below." (Bank of England (2013a, 2013b)).

But little quantitative analysis has been performed focussing on the effects of explicit policy rate guidance by the FOMC. Analysis of unconventional monetary policy at the

zero lower bound has mainly considered large-scale asset purchases (D'Amico et al. (2012), Doh (2010), Gagnon et al. (2011)), Kozicki et al. (2011)). Rosa (2011) finds that the Federal Reserve's Large-Scale Asset Purchases (LSAPs) were successful in boosting US equity prices, considering the S&P 500 equity index, and also presents an overview of the literature on the effects of LSAPs. Neely (2010) finds some evidence that for 4 of 5 LSAP buy announcements considered, equity prices were either clearly up over the window or mixed, also considering the S&P 500 equity index. Gagnon et al. (2011) find that reductions in longer-term interest rates due to LSAPs primarily reflected lower risk premia, including term premia, rather than lower expectations of future short-term interest rates. Krishnamurthy and Vissing-Jorgensen (2011) find for the Federal Reserve's first Quantitative Easing programme (QE1) that a Mortgage-Backed Security (MBS) risk premium channel operated that lowered yields on MBSs; they also find that a default risk or default risk premium channel operated that reduced yields on corporate bonds. Hattori et al. (2013) find that FOMC balance sheet policy announcements led to a significant reduction in the absolute value of risk reversals on the S&P 500 equity index.

Explicit policy rate guidance at the zero lower bound can lead to higher equity prices and lower risk measures by leading to lower long-term real interest rates. Lower long-term real interest rates can lead to higher equity prices due to their use for discounting equity prices, and by increasing expectations of growth and thereby of corporate earnings. They can also lead to higher equity prices since in a search for yield, fixed income investors with given nominal return goals may move into riskier equities (Rajan (2013)). Lower long-term real interest rates can also lead to lower risk measures, such as lower credit spreads on advanced economy high-yield bonds or emerging market bonds, by improving mean growth expectations, as well as by affecting the lower tail of the expected distribution of growth expectations, reducing some perceived downside risks. Moreover, in their search for yield fixed income investors may also move to riskier instruments such as junk bonds or emerging market bonds (Rajan (2013)). Easy availability of borrowing at low interest rates can reduce risk perceptions and risk measures, such as the VIX volatility index, by increasing asset prices, increasing bank capitalisation and reducing perceived leverage (Rajan (2013)).

Galati and Moessner (2011) review the literature on the related risk-taking channel of monetary policy, on which the following is based. Borio and Zhu (2008) view the risk taking channel as a family of possible mechanisms through which monetary policy decisions can influence risk perceptions or risk-tolerance, or the price of risk, which in turn influence the degree of risk in portfolios, the pricing of assets, and the price and conditions of the supply of funding. Changes in interest rates can influence the price of risk indirectly through the impact of interest rates on valuations, incomes and cash flows, via a search for yield effect (Rajan (2005)), and via the impact of central bank communication policies and of perceptions of the central bank's reaction function on risk-taking. Central banks could be perceived to behave asymmetrically, not responding directly to signs of the build-up of risk but just to the emergence of stress, and thereby providing a sort of ex ante insurance (Diamond and Rajan (2009), Farhi and Tirole (2010)). Dubecq et al. (2009) provide a theoretical model of how a risk taking channel may emerge in the form of underestimation of risk on the part of investors, where underestimation of risk is larger the lower the level of the risk-free real interest rate. Disyatat (2010) proposes a reformulation of the bank lending channel which operates via the effect of monetary policy on risk perception and on the strength of banks' balance sheets. Empirical studies of the risk taking-channel of monetary policy include Adrian and Shin (2009), who find that short-term interest rates are important in influencing the size of financial intermediary balance sheets. Ioannidou et al. (2008) and Jimenez et al. (2009) find support for the hypothesis that lower interest rates have induced banks to take higher risk, with lower interest rates leading to an increase in credit supply to riskier borrowers. Altunbas et al. (2009) find that unusually low interest rates over an extended period of time cause an increase in banks' risk taking, by leading to a reduction in the perceived risk of default by banks (see also Gambacorta (2009)).

Chehal and Trehan (2009) and He (2010) studied the effect of explicit policy rate guidance in Canada. Campbell et al. (2012) studied the effect of FOMC policy rate guidance more generally, including explicit policy rate guidance, on US Treasury yields. Woodford (2012) discusses explicit FOMC policy rate guidance and illustrates the effect on OIS rates. Swanson and Williams (2012) study the effect of the zero lower bound on

medium- and longer-term interest rates in the United States by looking at changes in their sensitivity to macroeconomic news. Raskin (2013) also studies changes in the sensitivity of short-term interest rate expectations to economic news, but using probability distributions of interest rate expectations derived from interest rate options, and finds that the introduction of the FOMC's date-based guidance in August 2011 led to a significant reduction in the sensitivity of the risk-neutral percentiles to economic surprises. International Monetary Fund (2013) study the effect of "MP-plus" announcements, in which they include announcements related to credit easing, quantitative easing and explicit policy rate guidance, on bank equity prices and financial sector bond-government bond spreads for the United States. An overview of the literature on central bank communication more generally is provided in Blinder et al. (2008), and Knütter et al. (2011) provide a recent survey on the effects of central bank communication on financial asset prices.

The analysis in this paper builds on Moessner (2013), who quantified the effects of explicit FOMC policy rate guidance on short- to long-term market interest rates, and found that it led to a significant reduction in interest rates implied by Eurodollar futures at horizons of 1 to 5 years ahead, and in forward interest rates implied by US Treasuries at horizons of 1 to 7 years ahead.

In this paper we quantify the impact of explicit FOMC policy rate guidance used as an unconventional monetary policy tool at the zero lower bound of the policy rate on equity prices, as well as on the risk indicators of credit and CDS spreads, implied volatilities and equity index risk reversals. We find that explicit FOMC policy rate guidance announcements led to a significant increase in US equity prices, for an aggregate equity index as well as for US bank and US non-financial equities. Moreover, we find that they led to a significant reduction in some credit spreads. They also led to a significant reduction in an implied volatility index for US government bonds, as well as in US equity risk reversals.

The outline of the paper is as follows. Section 2 presents the data, section 3 presents the method and section 4 the results. Finally, section 5 concludes.

2 Data

In this section we present the asset prices on which we study the effect of FOMC policy rate guidance. For US equity prices, we consider the S&P 500 equity index, as well as bank equity prices (a simple average across the major US banks Bank of America, Citigroup, Goldman Sachs, JPMorgan, Morgan Stanley, Wells Fargo) and non-financial equity prices (Figure 1).

[Figure 1 about here]

We consider both credit spreads and CDS spreads. North American high-yield, North American investment grade, European investment-grade and Emerging market credit spreads are shown in Figure 2. US sovereign CDS spreads and US bank CDS spreads, calculated as a simple average across leading US banks, are shown in Figure 3.

[Figures 2 and 3 about here]

We study the following forward-looking volatility measures. MOVE (Merrill Option Volatility Expectations Index) is a weighted index of implied volatility on one-month options on US Treasury securities with maturities of two, five, ten and 30 years. VIX (Chicago Board Options Exchange Volatility Index) is a measure of implied volatility on the S&P 500 index, calculated from the implied volatilities of 2-month options on the S&P 500 index. VStoxx is a measure of implied volatility on the DJ Euro Stoxx 50. We also consider implied volatility measures on G7 currencies and on Emerging Market currencies. These implied volatility measures are shown in Figure 4.

[Figure 4 about here]

In addition to symmetric risk measures in the form of implied volatilities, related to the second moment of the implied probability distribution, we also consider an asymmetric risk measure related to the third moment of the implied probability distibution, namely risk reversals. We consider the absolute value of the 25-delta risk reversal of 2-month options on the S&P 500 index, as used in Hattori et al. (2013). It reflects the perceived risk of a strong fall in the equity index. A higher absolute value of the risk reversal reflects a greater perceived risk of a large fall in the index.

[Figure 5 about here]

As in Moessner (2013), we control for the effect of macroeconomic news by including surprises in 11 US macroeconomic indicators in the regressions. We use the same macroeconomic indicators as those included in Table 2 of Moessner and Nelson (2008), namely changes in CPI inflation, GDP (advance), hourly earnings, housing starts, industrial production, the ISM manufacturing index, nonfarm payrolls, PPI inflation, retail sales, the trade balance, and the unemployment rate. The surprises of the real-time macroeconomic data releases are calculated relative to Bloomberg median survey expectations and are normalized by their standard deviation.

The FOMC introduced date-based guidance that the federal funds rate would remain at exceptionally low levels "for some time" on 16 December 2008 , which was altered to "for an extended period" on 18 March 2009, to "at least through mid-2013" on 9 August 2011, to "at least through late 2014" on 25 January 2012, to "at least through mid-2015" on 13 September 2012. On 12 December 2012, threshold-based guidance was introduced (Table 1).[1] After a new wording of the FOMC's explicit policy rate guidance was introduced, for example that the FOMC "anticipates that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period", this or a similar wording was repeated in subsequent FOMC statements, until it was changed for a new wording. To capture the surprise component of the statements, we only consider those dates, given in Table 1, when a new wording was introduced, not those when a previous wording was repeated. As in Moessner (2013), we consider new explicit policy rate guidance from the time after the zero lower bound on policy rates had been reached on 16 December 2008, that is when the policy rate remained unchanged, so that we avoid confusion with the effect from an actual change in the fed funds target rate. We therefore exclude the new guidance associated with the establishment of the target range for the federal funds rate of 0-0.25% on 16 December 2008, since it was associated with a reduction of the target for the federal funds rate from its previous value of 1%.

[Table 1 about here]

[1] See FOMC statements on the dates specified.

3 Method

We regress daily changes in asset prices, $\Delta y(t)$, on a dummy variable for the announcements of explicit FOMC policy rate guidance, $d_{PRG}(t)$, and on the surprise components of 11 US macroeconomic data releases, $surprise_j(t)$, $j = 1, ..., 11$, to control for the effects of economic data, following the approach of Moessner (2013) who studied the effect of explicit FOMC policy rate guidance on interest rate expectations. The daily change can be defined as either the difference $\Delta y(t) = \Delta_a y(t) = y(t) - y(t-1)$, or as the percentage change $\Delta_r y(t) = (y(t) - y(t-1))/y(t-1) * 100$, depending on the asset price considered. The regression equation takes the form

$$\Delta y(t) = c + a * d_{PRG}(t) + \sum_{j=1}^{11} (b_j * surprise_j(t)) + \varepsilon_t \tag{1}$$

where $d_{PRG}(t)$ takes the value of 1 on days when the FOMC provided new explicit policy rate guidance after the zero lower bound on the policy rate had been reached, as listed in Table 1, and zero otherwise.[2] We use Newey-West adjusted standard errors.

On some dates the FOMC's explicit policy rate guidance coincided with the FOMC's announcements regarding asset purchases as part of the first Large-Scale Asset Purchase Programme (LSAP1), LSAP2, the Maturity Extension Program (MEP) and LSAP3 (see Hofmann and Zhu (2013)). We therefore also estimate the effect of explicit policy rate guidance separately for those announcements where it was not associated with asset purchase announcements, $d^{nap}_{PRG}(t)$, and those where it was associated with asset purchase announcements, $d^{wap}_{PRG}(t)$,

$$\Delta y(t) = c + a_1 * d^{nap}_{PRG}(t) + a_2 * d^{wap}_{PRG}(t) + \sum_{j=1}^{11} (b_j * surprise_j(t)) + \varepsilon_t \tag{2}$$

The dummy variable $d^{nap}_{PRG}(t)$ takes the value of 1 on dates when the FOMC provided new explicit policy rate guidance but did not make announcements on asset purchases (9

[2] The Federal Reserve Board started publishing target federal funds rate projections by Federal Reserve Board members and Federal Reserve Bank presidents on 25 January 2012, without assigning individual projections by name. Since this group contains non-voting members and is larger than the decision-making body of the FOMC, we do not study these projections in this paper, which considers explicit guidance by the FOMC on policy rates.

August 2011 and 25 January 2012), and zero otherwise. The dummy variable $d^{wap}_{PRG}(t)$ takes the value of 1 on dates when the FOMC provided new explicit policy rate guidance and also made announcements on asset purchases (18 March 2009, 13 September 2012 and 12 December 2012), and zero otherwise, with $d_{PRG}(t) = d^{nap}_{PRG}(t) + d^{wap}_{PRG}(t)$. The dates of asset purchase announcements are those identifed in Hofmann and Zhu (2013).

4 Results

In this section we present results for the effects of explicit FOMC policy rate guidance on US equity prices, on credit spreads and CDS spreads, on uncertainty/risk measures in the form of implied volatilities, and on risk indicators in the form of US equity index risk reversals.

4.1 Effect on equity prices

We first present the results for estimating equation (1) for daily percentage changes in equity prices, for the S&P 500 equity index, as well as for financial and non-financial equity indices. We can see from Table 2 that the coefficient on the dummy variable for explicit policy rate guidance announcements is significantly positive at the 1% level for the S&P 500, and at the 5% level for US bank equities and non-financial equities. The coefficient is largest for US bank equities at 4.0, that is explicit policy rate guidance announcements lead to equity price changes which are on average 4 percentage points higher than on other days, and smallest for non-financial equities, at 1.6, with the coefficient for the S&P 500 index lying in between these two values, at 1.9.[3]

When we distinguish whether explicit policy rate guidance announcements were associated with asset purchase announcements or not, we find that the dummy variables remain significant and positive in all cases, except for announcements not associated with asset purchase announcements in the case of US bank equities (Table 3).

[Tables 2 and 3 about here]

[3]The constant term in equations (1) and (2) is not significant at the 10% level for any of the equity indices considered, so mean daily changes were not significantly different from zero over the sample period.

We therefore find evidence that explicit FOMC policy rate guidance has raised asset prices, which was one of its aims as suggested by Yellen (2013). These results are consistent with the results of Moessner (2013) that the FOMC's explicit policy rate guidance led to lower government bond yields for a range of maturities. As discussed in section 1, the increase in equity prices could be due to lower long-term interest rates being used to discount equity prices or leading to a search for yield, or due to higher growth expectations.

4.2 Effect on credit spreads and CDS spreads

We next study the effect of explicit FOMC policy rate guidance announcements on credit spreads. We find that they led to a significant reduction in North American high-yield, North American investment-grade and Emerging market credit spreads, at the 1% significance level. By contrast, European high-yield credit spreads even increased slightly (Table 4). The reduction was largest for North American high-yield credit spreads, at 27 basis points, followed by Emerging market credit spreads at 9 basis points, and North American investment-grade credit spreads at 4 basis points. When we distinguish whether explicit policy rate guidance announcements were associated with asset purchase announcements or not, we find that the dummy variables remain significantly negative in both cases for these three spreads, although the significance of the coefficients is reduced in two cases (Table 5). The reduction in credit spreads could be due to lower long-term real rates leading to higher mean growth expectations and a lower probability being assigned to very negative growth outcomes, as well as to a search for yield and reductions in risk perceptions following the policy rate guidance, as discussed in section 1.

[Tables 4 and 5 about here]

We go on to study the effect of explicit FOMC policy rate guidance on US sovereign and bank CDS spreads. Results are shown in Table 6. We find no significant coefficient for the dummy variable when including all announcements. But for policy rate guidance not associated with asset purchase announcements, the coefficient on the dummy variable is significantly negative at 12 basis points for US bank CDS spreads.

[Table 6 about here]

4.3 Effect on implied volatilities

The results for the effect of explicit FOMC policy rate guidance on implied volatilities of equities, bonds and exchange rates are shown in Tables 7 and 8. We find that the coefficient on the dummy variable for all explicit policy rate guidance announcements is significant at the 10% level only for the MOVE volatility index, that is related to government bonds, with policy rate guidance announcements leading to a reduction in implied volatility (Table 7). This could reflect reduced uncertainty about the future path of the policy rate due to the policy rate guidance, as well as reduced risk perceptions. By contrast, it is not significant for the implied volatility indices for equities, G7 currencies and Emerging Market currencies. One might expect the implied volatility of government bond yields to be more affected by forward guidance than that of equities and exchange rates from its effect of reducing uncertainty about future policy rates.

We also find that policy rate guidance announcements not associated with asset purchase announcements led to a significant reduction (at the 1% level) in the implied volatility indices for government bonds (MOVE) and for G7 currencies, but not for the implied volatility indices for equities and Emerging Market currencies (Table 8).

[Tables 7 and 8 about here]

4.4 Effect on equity index risk reversals

We finally study the effect of explicit FOMC policy rate guidance not just on the second moment (volatility) of the implied probability distribution, but also on risk reversals related to the third moment of the implied distribution of expected equity prices. A larger absolute value of the 25-delta risk reversal reflects a greater probability being assigned by market participants to a large fall in the equity index than to a large rise relative to the expected mean. We consider the effect on daily percentage changes of the absolute value of 25-delta risk reversals of the S&P 500 index. Results are shown in Table 9. We find that while the dummy variable for all explicit policy rate guidance announcements is not significant, the dummy variable for explicit policy rate guidance announcements not associated with asset purchase announcements is significant at the 1% level, with

an announcement leading to a reduction of 7% on average of the absolute value of the 25-delta risk reversal, that is reducing the perceived risk attached to a large fall in the equity index. This reduction could be due to lower longer-term real rates leading to higher growth expectations, with a lower probability being assigned by market participants to a large reduction in growth and therefore corporate earnings, as well as due to reduced risk perceptions.

[Table 9 about here]

5 Conclusions

We quantified the impact of explicit FOMC policy rate guidance used as an unconventional monetary policy tool at the zero lower bound of the policy rate on US equity prices, as well as on the risk indicators of credit and CDS spreads, implied volatilities and US equity index risk reversals. We found that explicit FOMC policy rate guidance announcements at the zero lower bound of the policy rate led to a significant increase in US equity prices, for an aggregate equity index as well as for US bank and US non-financial equities. Moreover, we found that they led to a significant reduction in some credit spreads (namely in North American high-yield and investment grade, and in Emerging Market credit spreads). They also led to a significant reduction in an implied volatility index for US government bonds, as well as a reduction in the absolute value of US equity risk reversals, implying a lower perceived risk attached to a large fall in the equity index.

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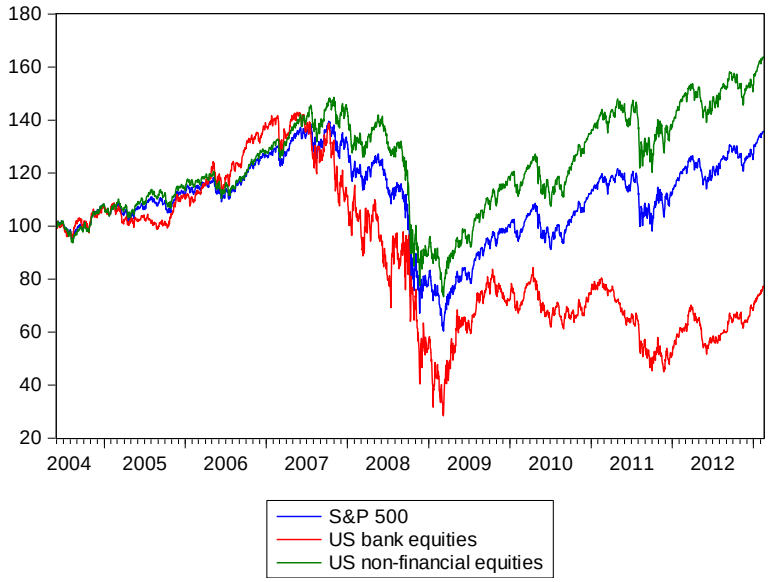
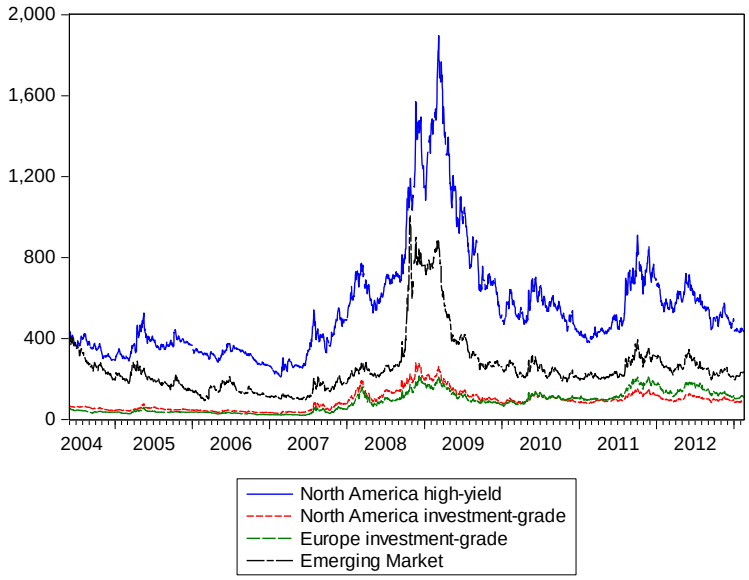
Figure 1: US equity prices (1 June 2004=100)



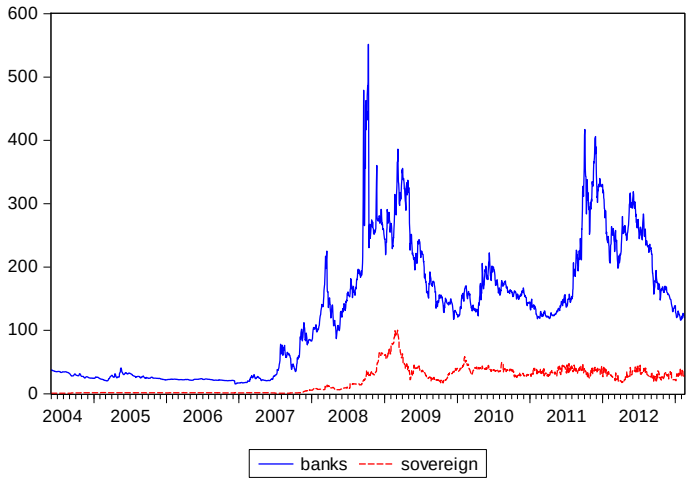
Notes: US banks: simple average across major banks (Bank of America, Citigroup, Goldman Sachs, JPMorgan, Morgan Stanley, Wells Fargo).
Sources: Bloomberg, Datastream, BIS calculations.

Figure 2: Credit spreads (in basis points)



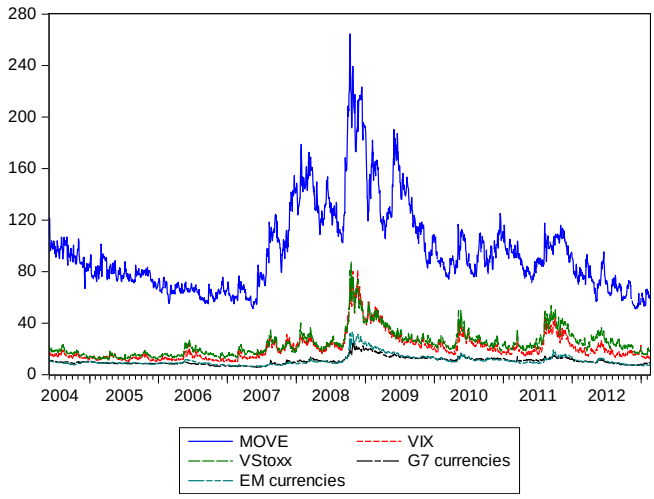
Notes: North America high-yield: DJ CDX.NA.HY; North America investment grade: DJ CDX.NA.IG; Europe investment-grade: iTraxx Europe Main; Emerging markets: CDX.EM 5Y.
Sources: JP Morgan.

Figure 3: US CDS spreads (in basis points)



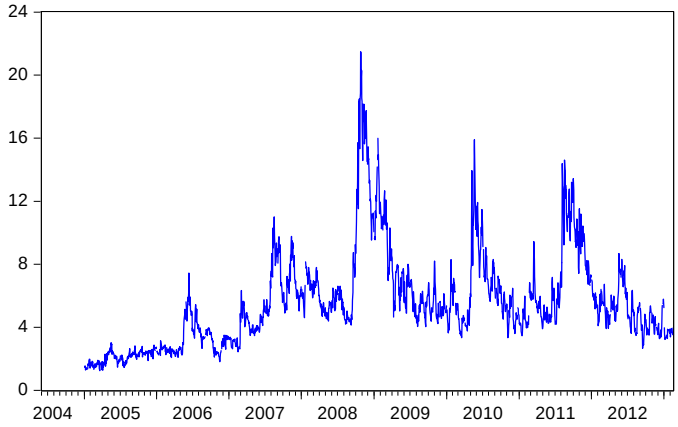
Notes: Five-year on-the-run CDS spreads; US banks: simple average across leading banks.
Source: Markit.

Figure 4: Implied volatilities



Notes: MOVE: weighted index of implied volatility on one-month options on US Treasury securities with maturities of two, five, ten and 30 years; VIX: implied volatility on S&P 500 index; VStoxx: implied volatility on DJ Euro Stoxx 50. EM currencies: Emerging market currencies.
Sources: Bloomberg.

Figure 5: Equity index risk reversal



Notes: 25-delta risk reversal from 2-month options on S&P 500 index, absolute value.
Sources: Bloomberg, BIS calculations.

Table 1: Explicit FOMC policy rate guidance announcements

Date[a]	FOMC statements[b]
16 December 2008	The Federal Open Market Committee decided today to establish a target range for the federal funds rate of 0 to 1/4 percent. […] the Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time […]
18 March 2009	[…] the Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent and anticipates that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period.
9 August 2011	The Committee currently anticipates that economic conditions--including low rates of resource utilization and a subdued outlook for inflation over the medium run--are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013.
25 January 2012	[…] the Committee […] currently anticipates that economic conditions--including low rates of resource utilization and a subdued outlook for inflation over the medium run--are likely to warrant exceptionally low levels for the federal funds rate at least through late 2014.
13 September 2012	[…] the Committee […] currently anticipates that exceptionally low levels for the federal funds rate are likely to be warranted at least through mid-2015.
12 December 2012	[…] the Committee […] 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 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.[…]

[a] Based on FOMC press releases. [b] From FOMC press releases.

Table 2: Reactions of equity prices to explicit FOMC policy rate guidance

Dependent variable: Percentage changes in equity indices			
Variable	S&P500 composite	US bank equities	US non-financial equities
c	0.017	0.017	0.024
d_{PRG}	1.876***	4.005**	1.604**
R^2	0.016	0.014	0.015
No. of observations	2273	2273	2273

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 6/02/2004–2/15/2013.

Table 3: Reactions of equity prices to explicit FOMC policy rate guidance, distinguishing whether or not associated with asset purchase announcements

Dependent variable: Percentage changes in equity indices			
Variable	S&P500 composite	US bank equities	US non-financial equities
c	0.017	0.017	0.024
d^{nap}_{PRG}	2.787**	3.385	2.737**
d^{wap}_{PRG}	1.266**	4.420**	0.845**
R^2	0.016	0.014	0.017
No. of observations	2273	2273	2273

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 6/02/2004–2/15/2013.

Table 4: Reactions of credit spreads to explicit FOMC policy rate guidance

Dependent variable: Changes in credit spreads (in basis points)				
Variable	North American high-yield	North American investment grade	Europe high-yield	Emerging markets
c	0.081	0.021	-0.0003	-0.146
d_{PRG}	-26.754***	-4.134***	1.402**	-8.842***
R^2	0.016	0.009	0.005	0.010
No. of observations	2087	2087	2087	2087

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 6/02/2004–2/15/2013.

Table 5: Reactions of credit spreads to explicit FOMC policy rate guidance, distinguishing whether or not associated with asset purchase announcements

Dependent variable: Changes in in credit spreads (in basis points)				
Variable	North American high-yield	North American investment grade	Europe high-yield	Emerging markets
c	0.081	0.021	-0.0003	-0.146
d^{nap}_{PRG}	-42.318***	-3.771***	0.875***	-14.377***
d^{wap}_{PRG}	-16.328**	-4.377**	1.755*	-5.135***
R^2	0.017	0.009	0.005	0.010
No. of observations	2087	2087	2087	2087

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 6/02/2004–2/15/2013.

Table 6: Reactions of CDS spreads to explicit FOMC policy rate guidance

Dependent variable: Changes in CDS spreads (in basis points)				
Variable	US banks Equation (1)	US banks Equation (2)	US sovereign Equation (1)	US sovereign Equation (2)
c	0.036	0.036	0.010	0.010
d_{PRG}	-5.009	-	0.888	-
d^{nap}_{PRG}	-	-11.540*	-	2.532
d^{wap}_{PRG}	-	-0.635	-	-0.213*
R^2	0.004	0.005	0.002	0.002
No. of observations	2273	2273	2273	2273

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 6/02/2004–2/15/2013.

Table 7: Reactions of implied volatilities to explicit FOMC policy rate guidance

Dependent variable: Changes in implied volatility indices					
Variable	MOVE	VIX	VSTOXX	G7 currencies	EM currencies
c	0.004	-0.020	-0.013	-0.001	-0.003
d_{PRG}	-3.630*	-3.152	0.118	0.204	0.103
R^2	0.011	0.014	0.014	0.009	0.004
No. of observations	2205	2115	2243	2273	2271

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 6/02/2004–2/15/2013.

Table 8: Reactions of implied volatilities to explicit FOMC policy rate guidance, distinguishing whether or not associated with asset purchase announcements

Dependent variable: Changes in implied volatility indices					
Variable	MOVE	VIX	VSTOXX	G7 currencies	EM currencies
c	0.004	-0.020	-0.013	-0.001	-0.003
d^{nap}_{PRG}	-7.504***	-6.750	0.533	-0.119***	0.018
d^{wap}_{PRG}	-1.034	-0.742	-0.161	0.420	0.160
R^2	0.012	0.019	0.014	0.011	0.004
No. of observations	2205	2115	2243	2273	2271

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 6/02/2004–2/15/2013.

Table 9: Reactions of equity index risk reversal to explicit FOMC policy rate guidance

Dependent variable: Percentage changes in absolute value of S&P 500 25-delta risk reversal		
Variable	Equation (1)	Equation (2)
c	0.433**	0.433**
d_{PRG}	-6.034	-
d^{nap}_{PRG}	-	-7.103***
d^{wap}_{PRG}	-	-5.318
R^2	0.007	0.007
No. of observations	1970	1970

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. Newey-West adjusted standard errors. Coefficients on surprises in 11 US macroeconomic variables not shown. Sample period: 1/05/2005–2/15/2013.

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