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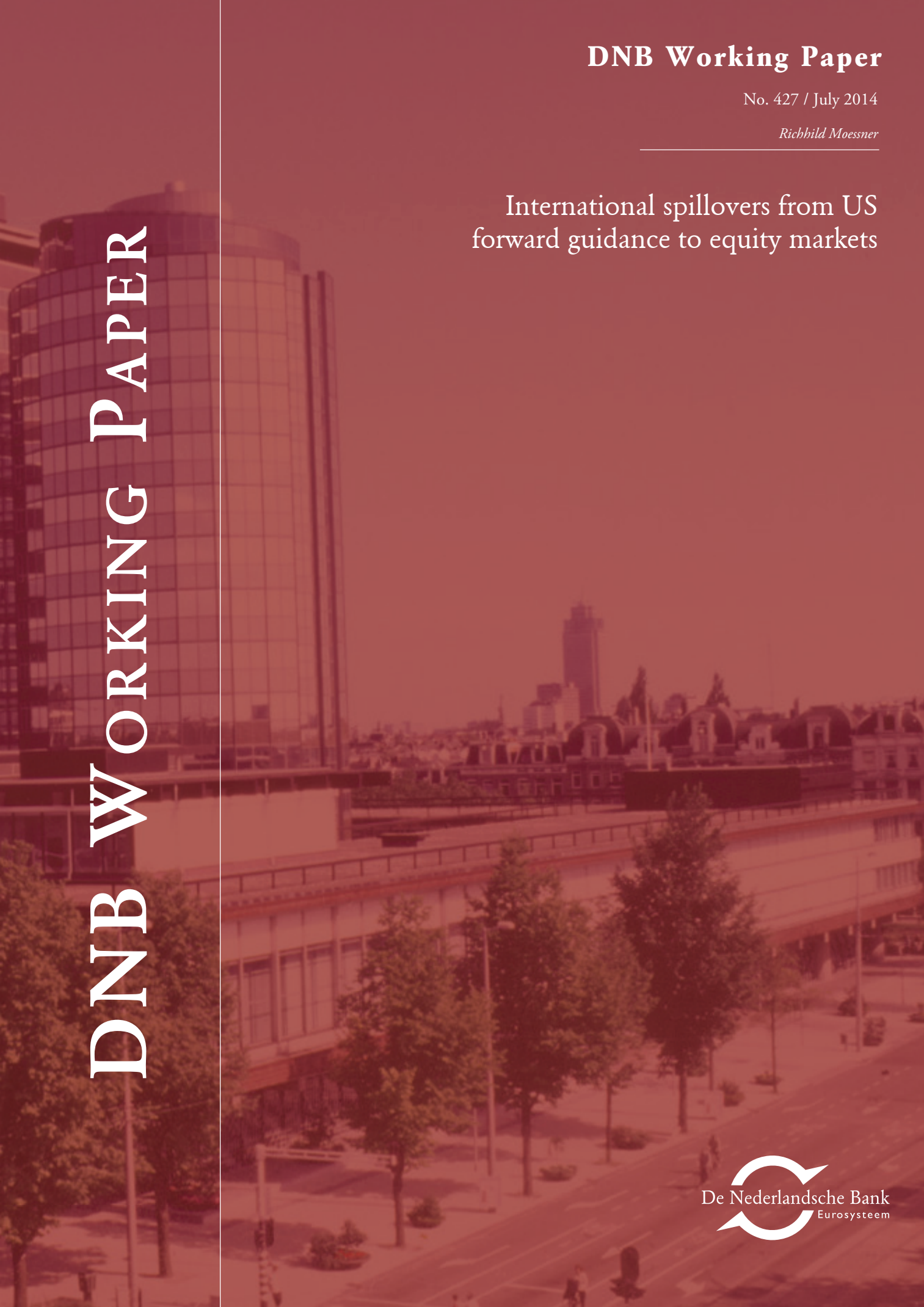

De Nederlandsche Bank
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* Views expressed are those of the author and do not necessarily reflect official positions of De Nederlandsche Bank.

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International spillovers from US forward guidance to equity markets*

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Abstract

We quantify the international spillovers of explicit FOMC policy rate guidance used as an unconventional monetary policy tool at the zero lower bound of the policy rate on international equity markets, considering equity indices of both advanced and emerging economies. We find that explicit FOMC policy rate guidance announcements at the zero lower bound led to higher equity prices in a number of advanced and emerging economies. Moreover, we find that equity indices of economies with lower sovereign ratings rose by more, consistent with the risk-taking channel of monetary policy.

JEL classification: E52, E58.

Key words: Monetary policy, forward guidance, equity prices, international spillovers.

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1 Introduction

Forward policy rate guidance has become an important unconventional monetary policy tool since the zero lower bound was reached in the United States, and it is hoped that by affecting long-term interest rates, it can affect aggregate demand. Forward policy rate guidance has been used as an alternative unconventional monetary policy tool, in addition to large-scale asset purchases. In the words of the Chair of the Board of Governors of the Federal Reserve System, 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. 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). Other major central banks introduced forward guidance at the zero lower bound in the wake of the global financial crisis, including the European Central Bank in July 2013 and the Bank of England in August 2013.

US monetary policy announcements can have important effects on foreign asset prices as well as domestic asset prices. But little quantitative analysis has been performed on the international spillover effects of forward policy rate guidance by the FOMC. Most of the literature so far has focussed on the international spillover effects from conventional monetary policy, and from unconventional monetary policy in the form of large-scale asset purchases, rather than on the international spillover effects from forward guidance about policy rates. It is therefore important to investigate whether US forward guidance about policy rates, an important monetary policy tool employed by the FOMC at the zero lower bound of the policy rate in the wake of the financial crisis, has affected foreign asset prices.

Explicit FOMC policy rate guidance at the zero lower bound can lead to higher foreign equity prices by leading to lower long-term US dollar real interest rates, which could

in turn lead to lower long-term real interest rates in other currencies, including via an international signalling channel. Lower long-term foreign currency real interest rates can lead to higher equity prices in foreign countries due to their use for discounting equity prices, and by increasing expectations of growth and thereby of corporate earnings. Lower long-term foreign currency real interest rates can also lead to higher equity prices in foreign countries since in a search for yield, fixed income investors with given nominal return goals may move into riskier equities (Rajan, 2013), as part of the risk-taking channel of monetary policy (Borio and Zhu, 2012). Moreover, lower long-term US dollar real interest rates can also lead to higher foreign equity prices since in a search for yield, fixed income investors with given nominal return goals may move into riskier foreign equities, especially those of emerging economies, via US capital outflows. Bruno and Shin (2012) present a model of how low funding rates due to low policy rates in advanced economies can increase cross-border banking sector capital flows to emerging economies, where the initial shock is amplified via the risk-taking channel of monetary policy: greater risk-taking due to low funding costs interacts with lower measured risks that are driven by currency appreciation to create a feedback loop. Increased capital flows into emerging economies could in turn lead to higher equity prices in those economies.

Chinn (2013) provides an overview of global spillover effects from US conventional and unconventional monetary policy. Using firm-level equity prices, Ammer et al. (2010) find that equity prices of foreign firms on average are roughly as sensitive to FOMC monetary policy announcements as those of US firms. They suggest that this result is partly due to a foreign interest rate channel, as well as to US credit and demand channels. Wongswan (2009) finds that US monetary policy surprises affect foreign equity indices, and provides some indirect evidence suggesting that they do so through their discount rate component. Wongswan (2009) finds that foreign equity indices react to the target surprise of the US monetary policy announcements. He also presents evidence that some foreign equity indices react to the path surprise of the US monetary policy announcements. This suggests that surprises in FOMC policy rate guidance at the zero lower bound, which directly influence expectations about the path of future interest rates, can also affect foreign equity prices. Ehrmann and Fratzscher (2009) and Hausman and

Wongswan (2011) find a significant reaction of foreign equity prices to US monetary policy announcements.

Neely (2010) studies the effect of the Federal Reserve's large-scale asset purchases (LSAPs) on 5 major international equity indices, in addition to the S&P 500 equity index, and finds some evidence that for 4 of 5 LSAP buy announcements considered, equity prices were either clearly up over the window or mixed. Neely (2010) also finds that LSAP announcements substantially reduced international long-term bond yields. Fratzscher et al. (2013) find that the Federal Reserve's second quantitative easing programme (QE2) increased equity prices worldwide, but only had a muted impact on yields across countries. Chen et al. (2012) find that quantitative easing (QE) announcements in the United States had the effect of increasing equity prices and lowering government and corporate bond yields in emerging economies. Eichengreen and Gupta (2014) find that talk by Federal Reserve officials of the possibility of tapering the Federal Reserve's asset purchases had a strong effect on equity prices and exchange rates of emerging markets.

Bauer and Neely (2014) find evidence that LSAPs have reduced international bond yields via an international signalling effect, including for Canadian, Australian and German government bond yields, as well as via portfolio balance effects, including for Australian, German and Japanese government bond yields. Moore et al. (2013) find that a reduction in long-term US Treasury yields due to LSAPs resulted in some reduction in government bond yields in emerging economies. Their results suggest that LSAPs contributed to US capital outflows into emerging economies and marginal reductions in longer-term emerging economy government bond yields. Glick and Leduc (2012) find that on days when information about LSAPs by the Federal Reserve was announced, long-term interest rates fell globally.

Bernanke and Kuttner (2005) discuss the channels through which US monetary policy surprises can affect domestic equity prices. They discuss these channels in the context of changes in the policy rate in normal times, away from the zero lower bound, which also influence expectations of future interest rates. They find that monetary "policy actions affect stock returns *only* to the extent that they alter the expected level of rates in the months ahead". These transmission channels therefore also apply to the effects

of surprises in policy rate guidance at the zero lower bound, which directly influence expectations of future interest rates. Bernanke and Kuttner (2005) discuss three main channels through which unexpected federal funds rate decreases may lead to an increase in domestic equity prices, namely an increase in expected future dividends, a decrease in the future expected real interest rates used to discount those dividends, and a decrease in the equity risk premia associated with holding equities. Empirical studies of the impact of US monetary policy on US equity prices include Thorbecke (1997), Rigobon and Sack (2004), Gürkaynak et al. (2005) and Bernanke and Kuttner (2005), which all find that expansionary US monetary policy leads to increases in US equity prices. Gürkaynak et al. (2005) find that both surprises about the policy rate and about the expected future path of policy rates affect US equity prices. Bernanke and Kuttner (2005) find that most of the effect of surprises in the federal funds rate on equities is due to easier monetary policy lowering equity risk premia.

The effect of FOMC forward guidance more generally on US Treasury yields is studied in Campbell et al. (2012), and Woodford (2012) discusses forward guidance in the United States and a number of other countries. Bank of England (2013) provides an overview of forward guidance. Blinder et al. (2008) give an overview of the literature on central bank communication, and a recent survey on the effects of central bank communication on financial asset prices is given by Knütter et al. (2011).

The analysis in this paper builds on Moessner (2013), who studied the effects of explicit FOMC policy rate guidance on US interest rate expectations, and on Moessner (2014), who studied its effects on US equities and risk measures. In this paper we quantify the international spillovers from FOMC forward policy rate guidance used as an unconventional monetary policy tool at the zero lower bound to foreign equity prices, considering equity indices of both advanced and emerging economies. We find that explicit FOMC policy rate guidance announcements at the zero lower bound led to higher equity prices in a number of advanced and emerging economies. Moreover, we find that equity indices of economies with lower sovereign ratings rose by more, consistent with the risk-taking channel of monetary policy.

The outline of the paper is as follows. Section 2 presents the data, section 3 presents

the method and results, and section 4 concludes.

2 Data

We consider benchmark equity indices for both advanced and emerging economies denominated in local currency, all of which are taken from Datastream. The equity price indices are the S&P/TSX composite index price index (Canada), the FTSE 100 price index (United Kingdom), the EURO STOXX price index (euro area), the Swiss Market price index (SMI) (Switzerland), the OMX Stockholm 30 (OMXS30) price index (Sweden), the Oslo Exchange All Share total return index (Norway), the NIKKEI 225 Stock Average price index (Japan), the S&P/ASX 200 price index (Australia), the Brazil BOVESPA total return index (Brazil), the Mexico IPC price index (BOLSA) (Mexico), the Argentina MERVAL price index (Argentina), the FTSE/JSE All Share price index (South Africa), the Russian MICEX price index (Russia), the Shanghai SE A SHARE price index (China), the KOREA SE composite price index (KOSPI) (Korea), the HANG SENG price index (Hong Kong SAR), the IDX composite price index (Indonesia), the CNX 500 price index (India), the Bangkok S.E.T. price index (Thailand), the FTSE Bursa Malaysia KLCI price index (Malaysia), and the Philppine SE I (PSEi) price index (the Philippines). The sample period is from 1 June 2004 to 15 February 2013, using daily data.

We control for the effects of US macroeconomic news by including surprises in 11 US macroeconomic indicators in the regressions, as in Moessner (2013, 2014). We use macroeconomic indicators based on Moessner and Nelson (2008), namely CPI inflation, GDP, 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. US data releases occurred at 8:30am Eastern Time in the United States for all indicators except the ISM manufacturing index, which was released at 10:00am Eastern Time in the United States.

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). After a new wording of the FOMC's explicit policy rate guidance was introduced, 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, in our main specification. 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, in order to avoid confusion with the effect from an actual change in the fed funds target rate. FOMC statements were released at 2:15pm Eastern Time in the United States.

[Table 1 about here]

3 Method and results

We regress daily percentage changes in international equity prices, $\Delta y(t) = (y(t) - y(t-1))/y(t-1)*100$, 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 US economic news, following the approach of Moessner (2013) who studied the effect of FOMC forward policy rate guidance on interest rate expectations, and Moessner (2014) who studied its effects on US equities and risk measures. For the equity index of each economy, the regression equation takes the form

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

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, that is after 16 December 2008, as listed in Table 1, and zero otherwise. We use Newey-West adjusted

standard errors. We take account of differences in time zones between the releases of the FOMC statements or US data and equity price changes in different economies, by comparing the time of these releases with the time when the closing prices of the equity indices were taken, as provided by Datastream, in the common time zone of Greenwich Mean Time (GMT), and by introducing a lag between the variables for the releases and the equity price changes where required, ie if a release occurred after the closing prices of the equity index were taken.

Our approach in equation (1) to capture the surprise component of the policy rate guidance announcements is to only consider those announcements where a new wording was introduced, and not those where a previous wording was repeated. Ideally, we would like to measure the surprise of policy rate guidance announcements by subtracting the expected announcement from the actual announcement, as we do for the macroeconomic data surprises, for which we have survey expectations available. However, for the policy rate guidance announcements we do not have survey expectations available. We perform a robustness test by also considering those policy rate guidance announcements where a previous wording was repeated, as in Moessner (2014). The dummy variable $d^{rp}_{PRG}(t)$ takes the value of 1 on days when the FOMC provided explicit policy rate guidance after the zero lower bound on the policy rate had been reached, when there was a repetition of a previous wording, and we add $d^{rp}_{PRG}(t)$ as an additional dummy variable in equation (1) to give

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

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, $d^{wap}_{PRG}(t)$,

$$\Delta y(t) = c + a_1 * d^{map}_{PRG}(t) + a_2 * d^{wap}_{PRG}(t) + \sum_{j=1}^{11} (b_j * surprise_j(t)) + \varepsilon_t \qquad (3)$$

The dummy variable $d^{map}_{PRG}(t)$ 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 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 $d_{PRG}(t) = d^{map}_{PRG}(t) + d^{wap}_{PRG}(t)$. The dates of asset purchase announcements are those identifed in Hofmann and Zhu (2013).

For robustness, we also present results for a longer 5-day window in the event study regressions, replacing $\Delta y(t)$ with $\Delta^l y(t) = (y(t+4) - y(t-1))/y(t-1) * 100$ in equations (1) to (3). This can show if the reactions are more persistent over the period of a week, and therefore more economically meaningful, and may capture a fuller reaction to the news. The advantage of using daily changes, ie a shorter 1-day window, for the event study regressions, is that the window is so narrow that less other news that could affect equity prices is contained within it. But the disadvantage of such a shorter window is that it may capture reactions that may be reversed later, or that it does not capture the full reaction.

Next, we present results for the effects of explicit FOMC policy rate guidance announcements on international equity prices. Results for the regressions of equation (1) are shown in Table 2. We can see that for the 5-day window forward guidance led to significant increases in the equity indices of 5 of the advanced economies, namely Canada, the euro area, Norway, Japan and Australia, as well as in the equity indices of 10 of the emerging economies, namely Brazil, Mexico, Argentina, South Africa, South Korea, Hong Kong SAR, India, Thailand, Malaysia and the Philippines. For all equity indices where the reaction is significant, the coefficient on the dummy variable for forward guidance announcements is positive, and its magnitude ranges from around 1 to around 5. The reaction is largest for two of the Latin American countries, Brazil and Argentina, with coefficients of 4.4 and 5.1, respectively. For the 1-day window, reactions are also positive

for all equity indices where they are significant, ranging from around 0.4 to around 2.2, with the reactions again largest for Brazil and Argentina, but there are fewer significant reactions (10, compared with 15 for the 5-day window).

[Table 2 about here]

As a robustness check, we next add a dummy variable for forward guidance announcements with repeated wordings to the regression of equation (1). The results for the regression of equation (2) are shown in Table 3. We can see that for the 5-day window, the dummy variable for forward guidance announcements with newly introduced wordings, $d_{PRG}(t)$, is significant for the same 5 advanced and 10 emerging economies as for the main specification reported in Table 2. For all equity indices where the reaction is significant, the coefficient on the dummy variable for forward guidance announcements with newly introduced wordings remains positive, and its magnitude again ranges from around 1 to around 5, as for the main specification of Table 2. Moreover, the strongest increases in equity prices again occur for Brazil and Argentina. By contrast, the dummy variable for forward guidance announcements with repeated wordings, $d^{rp}_{PRG}(t)$, is insignificant for all economies. This provides support for using only forward guidance announcements with newly introduced wordings in our main specification of equation (1), in order to capture the surprise components of the announcements. We can see that for the 1-day window, the dummy variable for forward guidance announcements with newly introduced wordings, $d_{PRG}(t)$, is also significant for the same economies as for the main specification reported in Table 2; the reactions remain positive for all equity indices where they are significant, again ranging from around 0.4 to around 2.2, and with the reactions again largest for Brazil and Argentina.[1]

[Table 3 about here]

As another robustness check, we estimate the effect of explicit policy rate guidance separately for those announcements where it was not associated with asset purchase announcements, and for those where it was, according to equation (3). We can see from Table

[1] The variable $d^{rp}_{PRG}(t)$ is significant in three countries for the 1-day window, including with a negative coefficient in one instance, but of small magnitude.

4 that for the 1-day window, the dummy variable for forward guidance announcements not associated with asset purchase announcements, $d^{nap}_{PRG}(t)$, is significant for 9 economies, and many of the same economies as in the case of $d_{PRG}(t)$ in the main specification of equation (1), except for Australia, Brazil and South Korea. The dummy variable for forward guidance announcements associated with asset purchase announcements, $d^{wap}_{PRG}(t)$, shows more differences to the significance of $d_{PRG}(t)$ in the main specification of equation (1), namely for Norway, Russia, Hong Kong SAR, Indonesia and Thailand. Where they are significant, all coefficients are again positive. These results suggest that the significance of forward guidance announcements in equation (1) is not just due to associated asset purchase announcements. But for the 5-day window, $d^{nap}_{PRG}(t)$ is significant for fewer of the same countries as $d_{PRG}(t)$ in the main specification of equation (1) than $d^{wap}_{PRG}(t)$. Where they are significant, all coefficients are again positive.

[Table 4 about here]

Next, we study how the reaction of equity prices to US forward guidance announcements across countries depends on sovereign risk. We do so by performing a cross-country regression of the estimated coefficient a of equation (1) for economy i, a^i, on the average S&P rating for the years 2004-2012 for economy i, $r^i_{S\&P}$, for all the economies included above, namely Canada, the United Kingdom, the euro area, Switzerland, Sweden, Norway, Japan, Australia, Brazil, Mexico, Argentina, South Africa, Russia, China, South Korea, Hong Kong SAR, Indonesia, India, Thailand, Malaysia, and the Philippines,

$$a^i = c + f * r^i_{S\&P} + \varepsilon^i \tag{4}$$

We perform this regression for the reactions over both the 1-day and 5-day windows, using White heteroskedasticity-consistent standard errors. We use the S&P sovereign rating for foreign currency long-term debt. The ratings are collected at year-end, and we take an average over the year-ends of 2004-2012 which are included in our sample. For the euro area, we take a simple average of the ratings for Germany, France, Italy and Spain. The ratings are translated from the letter ratings AAA, AA+ etc. to numerical ratings from 20 to -1 as shown in Table 5, with higher ratings receiving a higher numerical

score. The results for the reactions for both the 1-day and 5-day windows are shown in Table 6. We can see that for both the 1-day and the 5-day windows, the coefficient f in equation (4) is significantly negative, implying that the estimated coefficient for the reactions of the equity indices to US forward guidance announcements tends to be larger the lower the sovereign rating. This effect is more significant for the 1-day window, at the 5% level, compared with at the 10% level for the 5-day window, but it is somewhat larger for the 5-day window. These results are consistent with the risk-taking channel of monetary policy, in that equity indices in economies with greater sovereign risk tend to rise by more in reaction to explicit FOMC policy rate guidance announcements.

[Tables 5 and 6 about here]

4 Conclusions

We quantified the international spillovers of explicit FOMC policy rate guidance used as an unconventional monetary policy tool at the zero lower bound of the policy rate on international equity markets, considering equity indices of both advanced and emerging economies. We found that explicit FOMC policy rate guidance announcements at the zero lower bound led to higher equity prices in a number of advanced and emerging economies. Moreover, we found that equity indices of economies with lower sovereign ratings rose by more, consistent with the risk-taking channel of monetary policy.

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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 international equity prices to explicit FOMC policy rate guidance

	1-day window				5-day window			
Economy	c	d_{PRG}	R^2	No. of obs.	c	d_{PRG}	R^2	No. of obs.
Canada	0.024	1.438***	0.009	2273	-0.052	2.934**	0.004	2273
United Kingdom	0.027	0.196	0.009	2273	-0.064	1.597	0.002	2273
Euro area	0.018	0.085	0.010	2273	-0.112	1.930**	0.003	2273
Switzerland	0.023	-0.187	0.009	2273	-0.083	1.454	0.002	2273
Sweden	0.041	0.308	0.010	2273	-0.002	1.568	0.003	2273
Norway	0.056*	1.390	0.009	2273	0.091	4.234***	0.004	2273
Japan	0.010	0.744	0.009	2273	0.051	2.869**	0.011	2269
Australia	0.021	0.921**	0.011	2273	0.107	2.133*	0.011	2269
Brazil	0.061*	1.916**	0.006	2273	0.131	4.357**	0.004	2273
Mexico	0.075***	1.041***	0.008	2273	0.202	3.096***	0.005	2273
Argentina	0.067	2.246***	0.007	2273	0.188	5.103**	0.006	2273
South Africa	0.067***	1.878**	0.007	2273	0.167	4.180***	0.004	2273
Russia	0.075*	1.075	0.015	2273	0.362*	3.419	0.008	2269
China	0.026	0.465	0.004	2273	0.167	0.638	0.004	2269
South Korea	0.049*	0.770	0.009	2273	0.250*	2.358***	0.008	2269
Hong Kong SAR	0.040	1.273**	0.007	2273	0.200	2.256***	0.007	2269
Indonesia	0.093***	1.331**	0.010	2273	0.467***	2.242	0.007	2269
India	0.070**	0.623	0.006	2273	0.363**	1.636*	0.007	2269
Thailand	0.047	0.813***	0.006	2273	0.235*	2.222***	0.009	2269
Malaysia	0.035**	0.425***	0.010	2273	0.176**	1.090*	0.005	2269
Philippines	0.074***	0.658	0.006	2273	0.371***	2.836*	0.012	2269

***, ** 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 international equity prices to explicit FOMC policy rate guidance, adding announcements with repeated wording

	1-day window					5-day window				
Economy	c	d_{PRG}	$d^{rp}{}_{PRG}$	R^2	No. of obs.	c	d_{PRG}	$d^{rp}{}_{PRG}$	R^2	No. of obs.
Canada	0.022	1.439***	0.117	0.009	2273	-0.057	2.939**	0.365	0.004	2273
United Kingdom	0.024	0.200	0.290	0.010	2273	-0.068	1.601	0.318	0.002	2273
Euro area	0.014	0.089	0.338	0.011	2273	-0.117	1.936**	0.460	0.004	2273
Switzerland	0.023	-0.186	0.044	0.009	2273	-0.083	1.455	0.043	0.002	2273
Sweden	0.034	0.315	0.573**	0.011	2273	-0.010	1.576	0.644	0.003	2273
Norway	0.063*	1.385	-0.536*	0.010	2273	0.087	4.237***	0.337	0.005	2273
Japan	0.001	0.753	0.715**	0.011	2273	0.038	2.882**	1.051	0.013	2269
Australia	0.021	0.921**	-0.018	0.011	2273	0.105	2.135*	0.146	0.011	2269
Brazil	0.060*	1.917**	0.046	0.006	2273	0.133	4.355**	-0.206	0.004	2273
Mexico	0.073***	1.043***	0.189	0.008	2273	0.197	3.101***	0.440	0.005	2273
Argentina	0.066	2.246***	0.063	0.007	2273	0.185	5.106**	0.237	0.006	2273
South Africa	0.070***	1.876**	-0.242	0.007	2273	0.167	4.180***	-0.008	0.004	2273
Russia	0.082*	1.068	-0.551	0.015	2273	0.366*	3.414	-0.377	0.008	2269
China	0.028	0.463	-0.168	0.004	2273	0.167	0.638	-0.030	0.004	2269
South Korea	0.049*	0.770	0.024	0.009	2273	0.253*	2.355***	-0.181	0.008	2269
Hong Kong SAR	0.042	1.271**	-0.154	0.007	2273	0.199	2.257***	0.070	0.007	2269
Indonesia	0.093***	1.331**	-0.043	0.010	2273	0.464***	2.244	0.213	0.007	2269
India	0.072**	0.621	-0.150	0.006	2273	0.365**	1.633*	-0.226	0.007	2269
Thailand	0.049*	0.811***	-0.204	0.006	2273	0.226*	2.231***	0.743	0.009	2269
Malaysia	0.035**	0.425***	0.070	0.011	2273	0.174**	1.092*	0.163	0.005	2269
Philippines	0.075***	0.658	-0.022	0.006	2273	0.374***	2.833*	-0.252	0.012	2269

***, ** 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 international equity prices to explicit FOMC policy rate guidance, distinguishing whether or not associated with asset purchase announcements

	1-day window					5-day window				
Economy	c	d^{nap}_{PRG}	d^{wap}_{PRG}	R^2	No. of obs.	c	d^{nap}_{PRG}	d^{wap}_{PRG}	R^2	No. of obs.
Canada	0.023	2.435***	0.770***	0.010	2273	-0.052	4.620	1.805***	0.004	2273
United Kingdom	0.027	0.668	-0.120	0.009	2273	-0.064	2.231	1.172**	0.002	2273
Euro area	0.018	0.354	-0.095	0.011	2273	-0.112	1.827	2.000*	0.003	2273
Switzerland	0.023	-0.225	-0.161	0.009	2273	-0.083	2.332	0.866	0.002	2273
Sweden	0.041	1.120	-0.237	0.010	2273	-0.002	3.744	0.110	0.003	2273
Norway	0.056*	-0.028	2.361*	0.010	2273	0.091	4.559**	4.011*	0.004	2273
Japan	0.010*	0.324	1.026	0.009	2273	0.051	0.444	4.492***	0.012	2269
Australia	0.021	1.299	0.669**	0.011	2273	0.107	1.993	2.227**	0.011	2269
Brazil	0.061*	2.490	1.532*	0.006	2273	0.131	6.485	2.932***	0.004	2273
Mexico	0.075***	1.462***	0.759**	0.008	2273	0.202	4.015**	2.480***	0.005	2273
Argentina	0.067	2.513*	2.067***	0.007	2273	0.188	2.482	6.859***	0.007	2273
South Africa	0.067***	1.041***	2.451*	0.007	2273	0.167	3.391**	4.720**	0.004	2273
Russia	0.075*	-1.761	2.974*	0.017	2273	0.362*	0.436	5.417	0.009	2269
China	0.026	0.431	0.488	0.004	2273	0.167	0.355	0.828	0.004	2269
South Korea	0.049*	0.214***	1.143	0.009	2273	0.250*	2.109	2.524**	0.008	2269
Hong Kong SAR	0.040	1.949***	0.820	0.007	2273	0.200	2.634**	2.003***	0.007	2269
Indonesia	0.093***	1.877*	0.966	0.010	2273	0.467***	2.471	2.088	0.007	2269
India	0.070**	0.837	0.479	0.006	2273	0.363**	0.127	2.647**	0.008	2269
Thailand	0.047	1.394***	0.424	0.006	2273	0.235*	2.856***	1.798***	0.009	2269
Malaysia	0.035**	0.384***	0.452***	0.010	2273	0.176**	0.761	1.310	0.005	2269
Philippines	0.074***	0.897	0.498	0.006	2273	0.371***	2.707*	2.922	0.012	2269

***, ** 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: Translation of S&P sovereign ratings[a] from letter-based ratings to numerical ratings

Letter-based rating	Numerical rating
AAA	20
AA+	19
AA	18
AA-	17
A+	16
A	15
A-	14
BBB+	13
BBB	12
BBB-	11
BB+	10
BB	9
BB-	8
B+	7
B	6
B-	5
CCC+	4
CCC	3
CCC-	2
CC	1
C	0
SD	-1
D	-1
R	-1

[a] S&P sovereign ratings for foreign currency long-term debt.

Table 6: Cross-country regression of responsiveness of equity indices to forward guidance announcements on S&P sovereign ratings

Window size	c	$r_{S\&P}$	R^2	No. of obs.
1-day window	1.930***	-0.068**	0.251	21
5-day window	4.139***	-0.105*	0.177	21

***, ** and * represent significance at the 1%, 5% and 10% levels, respectively; using White heteroskedasticity-consistent standard errors; economies included are Canada, the United Kingdom, the euro area, Switzerland, Sweden, Norway, Japan, Australia, Brazil, Mexico, Argentina, South Africa, Russia, China, South Korea, Hong Kong SAR, Indonesia, India, Thailand, Malaysia and the Philippines.

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