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Looking Beyond the Fed: Do Central Banks Cause Information Effects?

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Abstract:
The importance of central bank information effects is the subject of an ongoing debate. Most work in this area focuses on the limited number of monetary policy events at the Federal Reserve. I assess the degree to which nine other central banks cause information effects. This analysis yields a much larger panel of primarily novel events. Following a surprise monetary tightening, economic forecasts improve in line with information effects. However, I find this outcome is driven by the predictability of monetary policy surprises and not information effects. My results support the view that central bank information effects may be overstated.

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1 Introduction

It is vital that central banks understand the economic impact of their decisions. Standard theory suggests that a surprise monetary policy tightening should cause economic forecasts to worsen. However, many papers document the opposite outcome (Romer and Romer 2000, Campbell et al. 2012, Nakamura and Steinsson 2018, Lunsford 2020). Their findings have been taken as evidence of the importance of central bank information effects. This theory holds that central banks have private information about the economy. By tightening policy, they convey a signal about their positive view of the economy to market participants, leading to forecasts of improved economic conditions (Berkelmans 2011, Tang 2015, Melosi 2017, Frankel and Kartik 2018, Andrade et al. 2019). Based on this theory, many papers attempt to decompose monetary policy surprises into their information component and the pure policy shock (Jarociński and Karadi 2020, Andrade and Ferroni 2021, Miranda-Agrippino and Ricco 2021, Nunes, Ozdagli, and Tang 2022). However, some papers argue against the existence of central bank information effects (Faust, Swanson, and Wright 2004, Bauer and Swanson 2020, Sastry 2021).

The debate on central bank information effects has intensified in recent years, but it has focused primarily on the Federal Reserve. Indeed, this is why central bank information effects are synonymous with the "Fed Information Effect." However, there is only a limited number of Federal Reserve monetary policy events to study. For example, Nakamura and Steinsson (2018) look at 120 events.[1] With so few events, sample and specification decisions have led to large differences in results. Romer and Romer (2000) find information effects on inflation forecasts; Campbell et al. (2012) find information effects on unemployment but not on inflation forecasts; and Nakamura and Steinsson (2018) find information effects on GDP but not on inflation or unemployment forecasts. Therefore, it is crucial to expand our ability to study the extent of information effects.

In this paper, I set out to identify the degree to which nine developed-economy central banks other than the Federal Reserve cause information effects through their monetary policies. There is no theoretical reason to focus on just the Federal Reserve when studying whether information effects exist—a rise in interest rates at any central bank could convey information regarding that bank's private beliefs about the economy and lead to forecasts of improved domestic economic conditions. The primary reason for the focus on the Fed appears to be due to data limitations; that is, it is difficult to obtain high-frequency data on interest rates, dates and times of monetary policy meetings, and the changes in forecasts around those meetings. However, I was able to compile these data for central banks in Australia, Canada, the eurozone, Japan, New Zealand, Norway, Sweden, Switzerland, and the United Kingdom. These data allow me to examine central bank information effects from as many as 1,450 largely novel monetary policy events. Therefore, I obtain a measure of precision that is an order of magnitude greater than that of existing papers. I use this precision to assess the degree to which central bank information effects exist.

I show that monetary policy surprises from non-US central bank meetings are associated with improvements in economic forecasts around those meetings. I look at regressions of the changes in domestic forecasts for GDP growth, CPI inflation, and unemployment around monetary policy meetings on the surprises from those meetings to interest rates measured at different maturities. The direction of the coefficients lines up exactly with what information effects would suggest. For example, a 1 basis point surprise increase to six-month interest

[1] The authors consider the January 1995–March 2014 period excluding unscheduled FOMC announcements and the July 2008–June 2009 period.

rates is associated with a 0.73 basis point rise in forecast domestic GDP growth, which is significant at the 0.1 percent level. I also look at separate regressions for each central bank and each of the three forecast variables. I find that six of the regressions show significant results in the direction predicted by central bank information effects, while none shows significant results in the direction predicted by standard monetary theory. Therefore, I initially find strong evidence in favor of the existence of information effects.

However, I also find evidence that monetary policy surprises are predictable and correlate with the broader economic environment before monetary policy meetings. I demonstrate that changes in US economic forecasts predict the monetary policy surprises at subsequent central bank meetings in other developed countries/zones. A 1 percentage point rise in forecast US GDP growth is associated with a 1.6 basis point higher than expected increase to six-month interest rates at non-US central bank meetings, and this increase is significant at the 0.1 percent level. I find similar results for inflation and unemployment forecasts and other maturities, with similar levels of significance. Therefore, central banks are likely to tighten (loosen) monetary policy by more than expected when the economy is doing well (poorly). This finding implies that the coefficients in the regressions of economic forecasts on monetary policy surprises are likely biased in support of central bank information effects.

I adjust for the predictability of monetary policy surprises and repeat the analysis, looking for evidence of monetary policy surprises. To do this, I examine how monetary policy surprises affect non-US domestic economic forecasts relative to US forecasts. Central banks set monetary policy in light of their country's/zone's domestic economic conditions, so monetary policy surprises should convey much more information about domestic economic conditions than about US economic conditions. Therefore, if information effects are driving the results, I should still find that non-US domestic economic forecasts improve relative to US forecasts following a surprise monetary policy tightening. Instead, I find that the results reverse to match standard monetary theory. After this adjustment, a larger than expected surprise increase in short-term interest rates is associated with worsening economic forecasts, that is, a fall in forecast CPI inflation and in forecast GDP growth and a rise in forecast unemployment. I also look at separate regressions for each central bank for each of the three forecast variables. Following the adjustment, I find that four of the regressions show significant results in the direction predicted by standard monetary theory, while none shows significant results in the direction predicted by central bank information effects. Therefore, once I adjust for the predictability of monetary policy surprises that biases the coefficients in favor of information effects, I find no evidence in support of central bank information effects.

A wide range of papers find evidence of information effects. Romer and Romer (2000) were the first to argue for the empirical importance of information effects and found that Federal Reserve monetary policy announcements convey information about future inflation that can be used to predict the path of inflation. Campbell et al. (2012) find that monetary policy tightening lowers unemployment due to information effects and argue that this is a form of "Delphic forward guidance," where forward guidance conveys information about the path of the economy. Nakamura and Steinsson (2018) argue that monetary policy tightening leads to a rise in forecast Blue Chip GDP growth due to information effects. Lunsford (2020) argues that the strength of information effects depends on how information is conveyed to the public, leading to stronger effects in the 2000–2003 period relative to the 2003–2006 period. Several recent papers decompose monetary policy surprises into their information component and pure policy shocks and find evidence in favor of information effects (Jarociński and Karadi (2020), Andrade and Ferroni (2021), Nunes, Ozdagli, and Tang (2022)). There is also a large literature studying the theoretical implications of information effects (Ellingsen and Soderstrom

2001, Berkelmans 2011, Tang 2015, Melosi 2017, Frankel and Kartik 2018, Andrade et al. 2019). This is only a small sample of the papers looking at information effects. The size and breadth of this literature reflect the importance of understanding the strength and role of information effects in monetary policy.

The empirical literature studies information effects using primarily the limited number of monetary policy events at the Federal Reserve. Several papers look at information effects from monetary policy events in the eurozone (Jarociński and Karadi 2020, Jarocinski 2020, Andrade and Ferroni 2021). Cieslak and Schrimpf (2019) decompose monetary policy events at the Federal Reserve, the European Central Bank, the Bank of England, and the Bank of Japan into monetary news and non-monetary news. However, the authors focus on the financial question of how asset prices respond immediately to these different types of news and do not look at the macroeconomic effects. My paper is the first to my knowledge that uses events at a wide range of central banks to look—in the manner of Romer and Romer 2000, Campbell et al. 2012, and Nakamura and Steinsson 2018—at whether information effects from monetary policy surprises affect macroeconomic expectations.

A handful of papers argue against the existence of central bank information effects. In an early critique, Faust, Swanson, and Wright (2004) show that US economic forecasts are not made more accurate by incorporating US monetary policy surprises. Bauer and Swanson (2020) argue that markets do not correctly anticipate US monetary policy surprises based on recent economic releases, and once recent macroeconomic news is controlled for, the Federal Reserve does not cause information effects. They also find little to no evidence for information effects in a survey of forecasters. Sastry (2021) decomposes the factors that cause markets and central banks to hold different beliefs about the current economic situation and how monetary policy will respond. By applying a model to Federal Reserve monetary policy surprises, he finds that the different beliefs are due to markets under-reacting to public signals, with information effects playing almost no role. Each of these critiques measures information effects uniquely from the Federal Reserve. Cieslak (2018) and Schmeling, Schrimpf, and Steffensen (2020) also show that monetary policy surprises may be predictable but focus on the financial implications for asset pricing rather than on the macroeconomic impact.

2 Empirical Approach

I use a high-frequency approach to identify the impact of monetary policy surprises on economic forecasts at nine central banks in developed countries/zones. I focus on the central banks of developed countries/zones because it seems more likely that they have detailed private information that could cause information effects. I require three types of data for each of the nine countries/zones: (1) high-frequency data on interest rates, (2) dates and times of monetary policy events, and (3) regularly updated economic forecasts.

The interest rate data are from Refinitiv, which offers intraday tick data from 1996 onward. I download data on benchmark bonds (for example, the closest one-, two-, three, five-, or ten-year bond for which the underlying bond changes over time), non-benchmark bonds (for example, a specific bond expiring on a specific day), and interest rate swaps for each country/zone. I measure the interest rate in the eurozone using German data.

I compile dates and times of monetary policy meetings from several sources. My primary source is Bloomberg. I augment and verify this with data directly from national central bank websites and from two other websites that also provide details on the dates of central bank releases.[2] I reconcile the results from the different sources

[2]The websites are `www.investing.com` and `www.centralbanknews.info`.

and adjust appropriately for time zone differences.

I obtain economic forecasts for the countries/zones in my panel from Consensus Economics. Consensus Economics compiles forecasts at the start of each month for key economic indicators for the current year and subsequent year. The forecast for the current year is likely to respond more to monetary policy surprises that occur earlier in the year versus later in the year because the earlier surprises have more of the year remaining to have an effect. Therefore, I focus on the forecast for the closest year that has at least six months remaining; for January through June, I look at the change in the forecast for the current year, for July through December, I look at the change in the forecast for the subsequent year. I focus on GDP growth, CPI inflation, and unemployment forecasts. GDP growth and inflation forecasts are available for all of the countries/zones in my panel, while unemployment forecasts are available for all of the countries/zones except Norway, Sweden, and Switzerland. Forecasters are asked to complete the survey each month on a specific date, which is a Monday toward the start of the month. The survey date is the same across all countries/zones. The forecasters receive the survey the preceding Friday. There are a couple of minor issues with this approach: Survey dates can conflict with monetary policy events in my sample, and some forecasters might complete the survey slightly before or after a survey date.[3] Therefore, I look at the two-month change in forecasts around the monetary policy events to ensure that I measure the change in forecasts from before to after the monetary policy meetings. However, using a one-month window yields similar results.[4]

I assess how monetary policy surprises from a central bank meeting affect the change in domestic economic forecasts around that meeting. My primary specification is given in equation 1. I regress the change in an economic forecast for the current/next year $y(t)$ for variable V in country/zone z from one month before to one month after the monetary policy meeting in country/zone z on the interest rate surprise at that meeting for a given maturity m. I exclude all of 2020 due to the large forecast revisions in the first year of the COVID-19 pandemic.

$$\mathbb{E}_{t+1m}[V_{z,y(t)}] - \mathbb{E}_{t-1m}[V_{z,y(t)}] = \alpha + \beta \Delta I_{z,m,t} + \epsilon_{z,t} \tag{1}$$

I use a high-frequency approach to determine the monetary policy surprise, $\Delta I_{z,m,t}$. I examine interest rates as early as one hour before and as late as 10 minutes before the meeting, taking the earliest interest rate available. I look at interest rates as late as one hour after and as early as 10 minutes after the meeting, taking the latest interest rate available. I measure the monetary policy surprise, $\Delta I_{z,m,t}$, by looking at the average change in interest rates in a narrow window around the maturity of interest. I focus on three maturities: six-month interest rates that are measured with bonds and swaps with a maturity of one year or less, two-year interest rates measured with bonds and swaps with a maturity of one to three years, and ten-year interest rates measured with bonds and swaps with a maturity of seven to thirteen years. I consider only bonds and swaps for which I have data both before and after a monetary policy event so that I do not compare distinct bonds that could have different rates for other reasons. I provide more details in table 3.

[3] Thank you to Vaishali Garga, who shared details of her conversations with Consensus Economics on this subject. According to those conversations, most respondents do complete the survey on the survey date, but a limited number complete it a little early or a little late.

[4] To measure the two-month change, I look at the country/zone's first forecast after the monetary policy event that is at least three days after the official survey date (to allow for forecasts from late respondents) and compare this to the forecast in the survey two months prior.

Table 1: Central Bank Information Effects

	Δ Domestic Forecast			Δ Domestic F. – Δ US F.		
	CPI	GDP	Unemp.	CPI	GDP	Unemp.
	Panel A: Short-Term Rates					
Δ 6-Month Rate	0.237	0.730***	-0.267	-0.394*	-0.144	0.300
	(0.147)	(0.211)	(0.145)	(0.161)	(0.212)	(0.168)
N	1015	1015	801	1012	1012	798
	Panel B: Medium-Term Rates					
Δ 2-Year Rate	0.258*	0.430*	-0.076	-0.313*	0.017	0.164
	(0.126)	(0.187)	(0.133)	(0.141)	(0.190)	(0.152)
N	1414	1414	1137	1410	1410	1133
	Panel C: Long-Term Rates					
Δ 10-Year Rate	0.482*	0.481	-0.222	-0.207	0.159	-0.054
	(0.200)	(0.289)	(0.201)	(0.224)	(0.297)	(0.233)
N	1450	1450	1142	1445	1445	1137

The first three columns in this table correspond to the specification in equation 1. The latter three columns in this table correspond to the specification in equation 2. *, **, and *** correspond to a significance level of 5 percent , 1 percent , and 0.1 percent, respectively. The brackets represent the standard error. Sources: Bloomberg, Consensus Economics, Refinitiv.

3 Results

In table 1, I present results on the association between monetary policy surprises and changes in domestic economic forecasts for all events in my panel. The first three columns show the basic estimates for CPI inflation, GDP growth, and unemployment forecasts, respectively, relating to equation 1. Panel A, Panel B, and Panel C show results for monetary policy surprises measured through short-term (six-month), medium-term (two-year), and long-term (ten-year) interest rates, respectively. A 1 basis point rise in short-term interest rates is associated with a 0.73 basis point rise in forecast GDP growth, which is significant at the 0.1 percent level. This result fits the story of central bank information effects; that is, markets interpret the rise in interest rates as a signal that central banks have more positive information about the health of the economy, and therefore the markets raise their forecasts. And this result runs counter to standard monetary theory in which a rise in interest rates would lead to a contraction in economic growth and therefore lower forecast GDP growth. The results for medium-term and long-term interest rates are also positive, and the medium-term coefficient is significant at the 5 percent level. Surprise interest rate rises are associated with increases in forecast inflation and decreases in forecast unemployment at each interest rate maturity. The results for inflation forecasts are significant at the 5 percent level for the medium-term and long-term interest rate surprises. These results again appear to support the existence of central bank information effects and contradict standard monetary theory.[5]

In table 2, I present results on how short-term interest rates affect domestic economic forecasts for each central bank in my sample. Each cell in the table represents a single regression of the change in the economic forecast in the column on the monetary policy surprise to short-term interest rates for the country/zone in the row. The first three columns present the impact on domestic CPI inflation, GDP growth, and unemployment forecasts, respectively. For example, the first row/column for Australia/CPI implies that a 1 basis point increase in short-term interest rates due to a monetary policy surprise at the Australian central bank is associated with a 0.17 basis point fall in forecast CPI inflation for Australia. The two numbers in the brackets under each coefficient

[5] I show in table B.2 that the results are similar if I consider a one-month forecast window rather than the default two-month forecast window.

Table 2: Central Bank Information Effects Aggregated

Dependent	Δ Domestic Forecast CPI	GDP	Unemp.	Δ Domestic F. – Δ US F. CPI	GDP	Unemp.
Independent	ΔI_{6m}			ΔI_{6m}		
Australia	-0.17	0.35	0.06	-0.11	-1.21*	1.07***
	(0.28,125)	(0.43,125)	(0.26,125)	(0.41,123)	(0.46,123)	(0.29,123)
Canada	0.29	1.35*	-0.45	0.16	0.10	0.32
	(0.43,102)	(0.64,102)	(0.31,102)	(0.42,102)	(0.46,102)	(0.34,102)
Eurozone	0.15	0.44	-0.41	0.30	-0.55	1.05
	(0.61,179)	(0.89,179)	(0.54,179)	(0.63,179)	(0.96,179)	(0.59,179)
Japan	6.50*	4.37	-2.34	-7.72*	-0.37	1.95
	(2.65,83)	(8.14,83)	(1.43,83)	(3.42,83)	(6.79,83)	(2.58,83)
New Zealand	0.20	0.81*	-0.21	-0.19	0.38	0.06
	(0.35,125)	(0.38,125)	(0.27,125)	(0.39,124)	(0.48,124)	(0.33,124)
Norway	-0.67	0.70		-0.73	0.18	
	(0.35,106)	(0.37,106)		(0.51,106)	(0.54,106)	
Sweden	1.52*	-0.22		0.06	-0.88	
	(0.68,49)	(0.98,49)		(0.65,49)	(0.84,49)	
Switzerland	0.93*	1.83**		-2.09***	-0.30	
	(0.39,59)	(0.53,59)		(0.59,59)	(0.53,59)	
United Kingdom	0.34	0.44	-0.66	-0.05	0.32	-0.59
	(0.46,187)	(0.40,187)	(0.40,187)	(0.36,187)	(0.52,187)	(0.44,187)

The first three columns in this table correspond to the specification in equation 1. The latter three columns in this table correspond to the specification in equation 2. Each row looks at a single regression restricted to monetary policy events for the country/zone in the row. *, **, and *** correspond to a significance level of 5 percent , 1 percent , and 0.1 percent, respectively. The brackets represent the standard error and the number of observations in the regression. Unemployment data are not available for Norway, Sweden, and Switzerland, which is why there are gaps for those values. Sources: Bloomberg, Consensus Economics, Refinitiv.

represent the standard error and number of observations for the regression, respectively. A rise in short-term interest rates is associated with a significantly positive rise in forecast CPI inflation for three countries (Japan, Sweden, and Switzerland) and a significantly positive rise in forecast GDP growth for three countries (Canada, New Zealand, and Switzerland).[6] [7] All of the significant coefficients are in line with the direction implied by central bank information effects. Therefore, the estimates at the individual central bank level also support the existence of central bank information effects.

Some papers document that monetary policy surprises may be partly a result of markets incorrectly anticipating central bank actions (Cieslak 2018, Schmeling, Schrimpf, and Steffensen 2020). One concern then is that the association between monetary policy surprises and economic forecasts may come from central banks responding differently to the economic environment from the way markets expected. In particular, if, when the economy is doing well (poorly), central banks tighten (loosen) monetary policy more on average than markets expect, this would lead to a relatively positive association between monetary policy surprises and domestic economic forecasts. I conduct a simple test of this idea in table 3. I look at whether changes in US economic forecasts in the two months before monetary policy meetings at other developed-country/zone central banks predict monetary policy surprises at those meetings (equation 3).[8] The past change in US

[6]Unemployment does not respond significantly for any country/zone.

[7]Japan shows larger coefficients than other countries/zones perhaps because monetary policy surprises to its short-term rates were relatively small since it was at the zero lower bound; therefore the surprises are associated with correspondingly larger effects. I show in table B.3 that excluding Japan does not substantively change the aggregated results.

[8]More precisely, I look at the change in the closest US forecast with an official survey date that takes place at least three days before the monetary policy meeting (in case respondents fill in the survey late) from the forecast two months prior. I use a two-month difference to match the two-month forecast difference I consider in the main specification. However, as I show in table B.5, the results are similar if I

Table 3: Predicting Monetary Policy Surprises with US GDP

	ΔI_{6m}	ΔI_{2y}	ΔI_{10y}
		Panel A	
Δ USA CPI Forecast Before Meeting	0.010*	0.009*	0.006*
	(0.005)	(0.004)	(0.002)
N	1023	1500	1536
		Panel B	
Δ USA GDP Forecast Before Meeting	0.016***	0.010**	0.006***
	(0.004)	(0.003)	(0.002)
N	1023	1500	1536
		Panel C	
Δ USA Unemp. Forecast Before Meeting	-0.032***	-0.019**	-0.010**
	(0.007)	(0.006)	(0.004)
N	1023	1500	1536

The regressions in this table correspond to the specification in equation 3. *, **, and *** correspond to a significance level of 5 percent , 1 percent , and 0.1 percent, respectively. The brackets represent the standard error. Sources: Bloomberg, Consensus Economics, Refinitiv.

economic forecasts is known before the central bank meetings. Therefore, if markets correctly anticipate how central banks are going to respond to current economic conditions, then past changes in US forecasts should have no impact on monetary policy surprises. In the three panels, I consider how US forecasts of CPI inflation, GDP growth, and unemployment are associated with monetary policy surprises in other developed countries/zones, respectively. The columns show the association with short-term, medium-term, and long-term interest rates, respectively. Improvements in US economic forecasts (rises in forecast CPI inflation or forecast GDP growth or falls in forecast unemployment) are all associated with positive monetary policy surprises. In other words, when the global economy is doing well (poorly), the central banks of non-US developed countries/zones are more likely to have a surprise tightening (expansion) of their monetary policy. For example, a 1 percentage point rise in the forecast US GDP growth around another developed country's central bank meeting is associated with a 1.6 basis point higher surprise increase to short-term rates from that meeting, which is significant at the 0.1 percent level. The results for forecast GDP growth, inflation, and unemployment are also significant at every maturity I consider. [9] [10]

$$\Delta I_{z,t} = \alpha + \beta(\mathbb{E}_{t-\epsilon}[V_{US,y(t)}] - \mathbb{E}_{t-2m-\epsilon}[V_{US,y(t)}]) + \epsilon_{z,t} \tag{3}$$

In table 4, I additionally look at how past changes to US economic forecasts predict monetary policy surprises to short-term interest rates separately for each non-US central bank in my panel. Therefore, I again look at the specification in equation 3 but by country/zone. Each cell in the table represents a single regression of the surprise to short-term interest rates from a monetary policy meeting at a non-US central bank on the change in the US economic forecast before the meeting in the column for the events in the country/zone row. The three

use a one-month difference.

[9] I also show the results are very similar to the baseline when I use the concurrent change in US economic forecasts; that is, equation 2. I show this in table B.6.

$$\Delta I_{z,t} = \alpha + \beta(\mathbb{E}_{t+1m}[V_{US,y(t)}] - \mathbb{E}_{t-1m}[V_{US,y(t)}]) + \epsilon_{z,t} \tag{2}$$

[10] I also look at the degree to which changes in domestic forecasts prior to a central bank meeting predict monetary policy surprises in table B.7; that is, $\Delta I_{z,t} = \alpha + \beta(\mathbb{E}_{t-\epsilon}[V_{US,y(t)}] - \mathbb{E}_{t-2m-\epsilon}[V_{US,y(t)}]) + \epsilon_{z,t}$. I find similar qualitative effects, but they are less significant. An alternative approach, which is used to study the information effects in the United States by Bauer and Swanson (2020) and Sastry (2021), is to look at the degree to which domestic economic releases predict subsequent monetary policy surprises. However, this is difficult to do across many countries/zones and may not work well here because past changes in US economic forecasts seem to better predict subsequent monetary policy surprises compared with past changes in domestic economic forecasts.

Table 4: Predicting Monetary Policy Surprises with US GDP by Central Bank

Dependent	ΔI_{6m}		
	Δ USA Forecast Before Meeting		
Independent	CPI	GDP	Unemp.
Australia	0.012	-0.009	0.016
	(0.030,125)	(0.019,125)	(0.031,125)
Canada	0.012	0.055***	-0.071*
	(0.026,103)	(0.015,103)	(0.031,103)
Eurozone	-0.006	0.001	-0.001
	(0.009,181)	(0.006,181)	(0.011,181)
Japan	0.005	0.002	-0.017*
	(0.004,83)	(0.001,83)	(0.008,83)
New Zealand	0.030	0.042*	-0.051
	(0.026,125)	(0.021,125)	(0.029,125)
Norway	-0.004	-0.009	
	(0.026,107)	(0.022,107)	
Sweden	0.096**	-0.002	
	(0.029,50)	(0.020,50)	
Switzerland	0.024	0.081**	
	(0.046,60)	(0.027,60)	
United Kingdom	-0.003	0.018	-0.019
	(0.013,189)	(0.015,189)	(0.014,189)

The regressions in this table correspond to equation 3. Each row looks at a single regression restricted to monetary policy events for the country/zone in the row. *, **, and *** correspond to a significance level of 5 percent , 1 percent , and 0.1 percent, respectively. The brackets represent the standard error and the number of observations in the regression. Unemployment data are not available for Norway, Sweden, and Switzerland, which is why there are gaps for those values. Sources: Bloomberg, Consensus Economics, Refinitiv.

columns present the impact of changes in US CPI inflation, GDP growth, and unemployment forecasts before the monetary policy meetings, respectively. For example, the first row/column for Australia/CPI implies that a 1 percentage point rise in forecast US CPI before an Australian central bank meeting is associated with a 1 basis point higher monetary policy surprise to short-term interest rates at that meeting. The two numbers in the brackets underneath each regression represent the standard error and the number of observations in the regression. The countries where changes in US economic forecasts before meetings significantly predict short-term interest rate surprises line up with the countries that show significant coefficients for central bank information effects. More precisely, short-term interest rate surprises are associated with positive significant changes in domestic GDP forecasts for three countries in table 2—Canada, New Zealand, and Switzerland—which suggests information effects. And those are the three countries where changes in US GDP growth forecasts before meetings significantly predict short-term interest rate surprises in column four of table 4.[11] [12] Therefore, improved US economic forecasts are associated with larger monetary policy surprises, and this relationship seems to coincide with the measurement of information effects.

The basic estimates of central bank information effects in the first three columns of table 1 and table 2 are likely to be biased upward. The results in table 3 and table 4 suggest that when the global economy is doing well, as measured by rises in forecast US CPI inflation or forecast US GDP growth or falls in forecast

[11]For CPI forecasts, one country is significant in table 2, Sweden, which is also significant in table 2. However, two additional countries show a significant relationship in table 2: Japan and Switzerland. No country/zone shows a significant relationship for unemployment forecasts in either table.

[12]In table B.8, I look at the relationship with concurrent rather than past changes in US forecasts, that is, equation 2 in footnote 9. The countries/zones with significant relationships in table B.8 perfectly line up with the countries/zones that were significant in table 2 for GDP growth, CPI inflation, and unemployment.

US unemployment, non-US central banks tighten monetary policy more, on average, than markets expect. Consequently, a surprise monetary policy tightening is more likely to come during periods when the global economy is doing well and when domestic economic forecasts are improving. To remove this bias, I adjust for changes in US forecasts that may predict monetary policy surprises in the last three columns of table 1. I do this by looking at how a monetary policy surprise affects the change in domestic economic forecasts relative to the change in US economic forecasts as shown in equation 4 (as opposed to the changes in domestic economic forecasts alone).[13] If forecasts do respond to central bank information effects, these effects should still be observable in this alternative specification. This is because central banks set their interest rates based on domestic conditions, so a monetary policy surprise should convey far more information about domestic versus US conditions.[14] [15] However, I find that monetary policy surprises that raise short-term interest rates are associated with worsening economic forecasts, that is, falls in forecast CPI inflation and forecast GDP growth and rises in forecast unemployment.[16] These findings match standard economic theory and do not support the existence of central bank information effects. This reverses the coefficients in the first three columns of table 1, where I did not control for the predictable component of monetary policy surprises and found that a monetary policy surprise that increases short-term interest rates raises forecast inflation and forecast GDP growth and lowers forecast unemployment.

$$(\mathbb{E}_{t+1m}[V_{z,y(t)}] - \mathbb{E}_{t-1m}[V_{z,y(t)}]) - (\mathbb{E}_{t+1m}[V_{US,y(t)}] - \mathbb{E}_{t-1m}[V_{US,y(t)}]) = \alpha + \beta \Delta I_{z,t} + \epsilon_{z,t} \quad (4)$$

Controlling for the predictable component of monetary policy surprises also reverses the results for individual central banks. In the last three columns of table 2, I control for the predictable component of monetary policy surprises using equation 4. The results again contrast dramatically with those shown in the first three columns, where I did not control for the predictable component. In the first three columns, six coefficients are significant at the 5 percent level in the direction predicted by central bank information effects, while none is significant at the 5 percent level in the direction predicted by standard monetary theory.[17] In the last three columns, not a single coefficient is significant at the 5 percent level in the direction predicted by central bank information effects, while four are significant at the 5 percent level in the direction predicted by standard monetary theory.[18] Therefore, after controlling for the predictable component of monetary policy surprises, my results offer no

[13]Note that this is not a perfect control for the broader economic environment. It could be that other factors affect monetary policy surprises. Therefore, if these alternative regressions continued to find that central bank information effects held, one possibility would be that monetary policy tightening could be correlated with other economic factors that were already known at the time of the monetary policy surprise. However, even with these imperfect controls, my results appear to reject the idea that central bank information effects cause economic forecasts to improve in response to monetary policy tightening. Also note that it would be difficult in the case of the nine non–Federal Reserve central banks to control for all relevant news releases, which is why I control for the concurrent change in US economic forecasts instead.

[14]Here I look at the difference between the concurrent change in domestic forecasts relative to the concurrent change in US forecasts, because this is an intuitively simple variable. In table 3 and table 4, I showed that past changes in US forecasts predict monetary policy surprises. Therefore, I also look at an alternative specification in which the dependent variable is the change in domestic forecasts around central bank meetings relative to the change in US forecasts before the meetings; that is, $(\mathbb{E}_{t+1m}[V_{z,y(t)}] - \mathbb{E}_{t-1m}[V_{z,y(t)}]) - (\mathbb{E}_{t-\epsilon}[V_{US,y(t)}] - \mathbb{E}_{t-2m-\epsilon}[V_{US,y(t)}])$. I run this analysis in table B.1 and find similar results.

[15]I demonstrate in table B.4 that looking at economic forecasts relative to a panel of large developed countries/zones—Australia, Canada, the eurozone, the United Kingdom, and the United States—as opposed to just the United States yields similar results. I chose these countries/zones because they are the developed countries/zones in my panel with a population of more than 20 million. I excluded Japan because its economic situation is different from other countries/zones in my panel.

[16]A 1 basis point rise in short-term interest rates is associated with a fall in forecast inflation of 0.39 basis points, a fall in forecast GDP growth of 0.14 basis points, and a rise in forecast unemployment of 0.30 basis points. The coefficient for CPI is significant at the 5 percent level.

[17]The coefficients of the following countries are significant in the direction predicted by central bank information effects: CPI inflation for Japan, Sweden, and Switzerland, and GDP growth for Canada, New Zealand, and Switzerland.

[18]The coefficients of the following countries are significant in the direction predicted by standard monetary theory: CPI inflation for Japan and Switzerland, GDP growth for Australia, and unemployment for Australia.

evidence in support of central bank information effects.[19]

4 Conclusion

It is vital that central banks understand how changing interest rates will affect macroeconomic outcomes. However, there is significant ambiguity around the degree to which central banks convey information effects when setting policy. With large information effects, monetary policy tightening can convey a positive signal about economic conditions, leading to an improvement in macroeconomic forecasts in contrast to the implications of standard monetary theory. A key constraint in answering this question is the small number of Federal Reserve events, which have typically been used to assess information effects. In this paper, I study the importance of information effects using a panel of nine central banks other than the Federal Reserve. This dramatically expands the sample that I am able to look at relative to other studies, allowing me to obtain a degree of significance an order of magnitude higher while using a largely novel pool of events to provide new insights.

I find that monetary policy tightening is associated with forecast improvements in domestic economic conditions that are significant both across my panel and for the individual central banks, which is in line with the concept of central bank information effects. However, I then document that monetary policy surprises are predictable and are likely to be more positive when the economy is doing well. Once I adjust for this bias in my coefficients, I find no evidence for central bank information effects at either an aggregate or individual central bank level. Therefore, my results suggest that information effects either do not exist or are outweighed by the effects predicted by standard monetary theory. Therefore, when a central bank tightens policy, all else being equal, it should not expect domestic economic forecasts to improve. I hope my analysis will help to encourage the analysis of data relating to central banks other than the Federal Reserve when assessing monetary policy questions.

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[19] This does not rule out the existence of information effects. One other possibility is that the effects predicted by standard monetary theory are larger than central bank information effects, but central bank information effects still exist.

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For Online Publication

Appendices

A Interest Rate Measures

To compute the monetary policy surprises, I need to measure interest rates before and after a monetary policy event. I take several preliminary steps to clean the interest rate data. Crucially, I consider only bonds and swaps for which I have data both before and after the event so that I do not compare distinct bonds that could have different rates for other reasons. The interest rate data are based on indicative quotes submitted by banks. I drop any quote that is the same as a previously submitted quote to avoid the possibility that quotes have not been updated. Note that interest rates are measured very precisely and interest rate quotes are constantly changing, so it is highly unlikely that they would remain exactly the same even if a monetary policy announcement was unsurprising. There are occasional other issues with quotes, including random large rate deviations. Therefore, I include only bond data points that show a change similar to interest rate changes for other bonds around the same monetary policy event.[20]

I apply a nonparametric approach to estimate the change in the interest rate for a given maturity. I compute the rate change for a given maturity by taking the average change in bonds with a maturity in a window close to the desired maturity.[21] For example, to compute the change in the 10-year rate, I compute the average change in prices for bonds and swaps with a maturity longer than 7 years and shorter than 13 years. Figure A.1 shows the estimation of the 10-year rate for Australia on May 7, 2013, when the policy rate fell from 3 percent to 2.75 percent. There are four bonds with data available both before and after the monetary policy event in the 7–13-year window. The dots show the before and after interest rates, while the horizontal lines show the means of these rates. The difference between the blue and red horizontal lines reflects the monetary policy surprise measured at the 10-year maturity for this particular event.

[20]For each monetary policy event and country/zone, I obtain a list of bond interest rates before and after the monetary policy event and their corresponding maturities. For each list, I then go through and remove outliers. I drop any bonds for which the change in the bond price from before to after the meeting is greater than 1 percentage point, that is, when interest rates change by 1 percentage point or more from before to after a meeting, which would be an extremely large monetary policy shock. I drop cases where there's only a single bond available for a specific meeting. For comparison with each bond, I find another bond with similar maturity for that country/zone: I compare the bond with the lowest maturity to the bond with the second-lowest maturity, the bond with the highest maturity to the bond with the second-highest maturity, and other bonds with the mean of the two bonds with the closest lower and higher maturity. I drop the bond if the interest rate of the comparison bond is more than 5 percentage points different either before or after the meeting. If a bond changes by more than 0.2 percentage point and the sign of the change in the comparison bond is different, then I drop it. If a bond changes by more than 0.2 percentage point and the comparison bond changes by less than a quarter of this magnitude, then I drop it. If a bond changes by more than 0.3 percentage point and the comparison bond changes by less than a third of this magnitude, then I drop it. If a bond changes by more than 0.4 percentage point and the comparison bond changes by less than half of this magnitude, then I drop it. I repeat the process of removing outliers until there are no more outliers (in case there happen to be two large bond changes next to each other). I drop any bonds that show a rate of exactly 0 percent, which was an issue occasionally. For non-benchmark bonds with a starting maturity of more than one year, I stop considering such bonds once the bond has a maturity of less than six months, because prices for longer-term bonds become inaccurate close to their maturity.

[21]Another option is to just take the benchmark bond. However, for most monetary policy events, I have obtained data for many bonds, so the nonparametric approach, which looks at the average change in multiple bonds, allows me to obtain a more refined measure of the change in the interest rate and ensure I do not miss events for which data for the benchmark bond are not available.

Figure A.1: 10-Year Rate for Australia on 5/7/2013

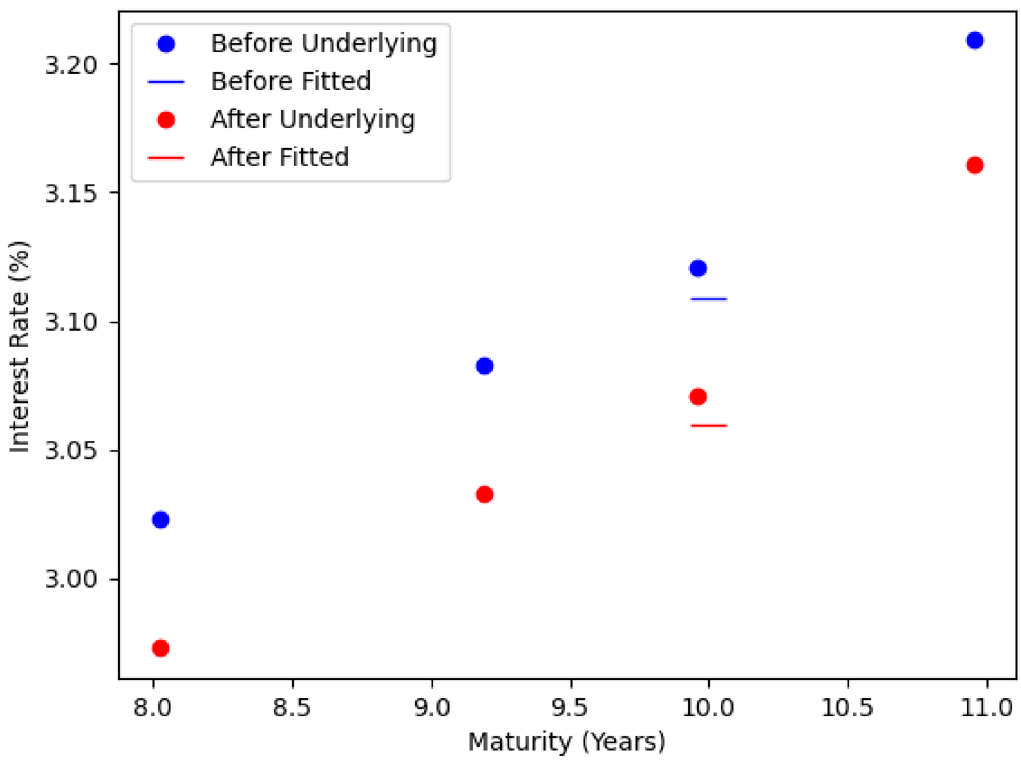

Figure A.2: Nonparametric Approach

The figure shows the method used to construct the yield curve for Australia on May 7, 2013, when the policy rate fell from 3 percent to 2.75 percent. I consider the estimation of the five-year interest rate with a two-year window. Sources: Bloomberg, Refinitiv.

B Additional Results

B.1 Alternative Versions of Table 1

Table B.1: Central Bank Information Effects — Lagged Difference

	Δ Domestic Forecast			Δ Domestic F. – Δ US F.		
	CPI	GDP	Unemp.	CPI	GDP	Unemp.
	Panel A: Short-Term Rates					
Δ 6-Month Rate	0.222	0.727***	-0.262	-0.137	-0.092	0.255
	(0.148)	(0.179)	(0.151)	(0.168)	(0.193)	(0.159)
N	932	932	718	932	932	718
	Panel B: Medium-Term Rates					
Δ 2-Year Rate	0.247	0.424**	-0.078	-0.089	-0.162	0.144
	(0.128)	(0.164)	(0.141)	(0.153)	(0.180)	(0.151)
N	1252	1252	975	1252	1252	975
	Panel C: Long-Term Rates					
Δ 10-Year Rate	0.455*	0.429	-0.210	-0.176	-0.575*	0.016
	(0.204)	(0.258)	(0.217)	(0.243)	(0.281)	(0.233)
N	1290	1290	982	1290	1290	982

This is similar to table 1. The difference is that I look at the concurrent change in the domestic forecast relative to the past change in the US forecast; that is, $(\mathbb{E}_{t+1m}[V_{z,y(t)}] - \mathbb{E}_{t-1m}[V_{z,y(t)}]) - (\mathbb{E}_{t-\epsilon}[V_{US,y(t)}] - \mathbb{E}_{t-2m-\epsilon}[V_{US,y(t)}]) = \alpha + \beta \Delta I_{z,t} + \epsilon_{z,t}$. Sources: Bloomberg, Consensus Economics, Refinitiv.

Table B.2: Central Bank Information Effects — Narrow Forecast Window

	Δ Domestic Forecast			Δ Domestic F. – Δ US F.		
	CPI	GDP	Unemp.	CPI	GDP	Unemp.
	Panel A: Short-Term Rates					
Δ 6-Month Rate	0.054	0.378***	-0.197	-0.330***	-0.022	0.053
	(0.088)	(0.105)	(0.107)	(0.097)	(0.125)	(0.124)
N	933	933	719	930	930	716
	Panel B: Medium-Term Rates					
Δ 2-Year Rate	0.087	0.274**	-0.142	-0.198*	0.099	-0.053
	(0.078)	(0.098)	(0.089)	(0.087)	(0.115)	(0.103)
N	1253	1253	976	1249	1249	972
	Panel C: Long-Term Rates					
Δ 10-Year Rate	0.214	0.320*	-0.315*	-0.164	0.180	-0.206
	(0.124)	(0.154)	(0.136)	(0.141)	(0.184)	(0.159)
N	1291	1291	983	1287	1287	979

This is similar to table 1. The difference is that I measure the change in the forecasts in a one-month window rather than a two-month window; that is, $(\mathbb{E}_{t+0.5m}[V_{z,y(t)}] - \mathbb{E}_{t-0.5m}[V_{z,y(t)}]) - (\mathbb{E}_{t+0.5m}[V_{US,y(t)}] - \mathbb{E}_{t-0.5m}[V_{US,y(t)}]) = \alpha + \beta \Delta I_{z,t} + \epsilon_{z,t}$. Sources: Bloomberg, Consensus Economics, Refinitiv.

Table B.3: Central Bank Information Effects — Excluding Japan

	Δ Domestic Forecast			Δ Domestic F. – Δ US F.		
	CPI	GDP	Unemp.	CPI	GDP	Unemp.
	Panel A: Short-Term Rates					
Δ 6-Month Rate	0.222	0.727***	-0.262	-0.373*	-0.138	0.295
	(0.148)	(0.179)	(0.151)	(0.159)	(0.195)	(0.169)
N	932	932	718	929	929	715
	Panel B: Medium-Term Rates					
Δ 2-Year Rate	0.247	0.424**	-0.078	-0.300*	0.007	0.167
	(0.128)	(0.164)	(0.141)	(0.141)	(0.176)	(0.156)
N	1252	1252	975	1248	1248	971
	Panel C: Long-Term Rates					
Δ 10-Year Rate	0.455*	0.429	-0.210	-0.228	0.134	-0.039
	(0.204)	(0.258)	(0.217)	(0.227)	(0.279)	(0.241)
N	1290	1290	982	1286	1286	978

This is similar to table 1. The difference is that I exclude Japan and look at only the other eight countries/zones. Sources: Bloomberg, Consensus Economics, Refinitiv.

Table B.4: Central Bank Information Effects — Relative to Developed Panel

	Δ Domestic Forecast			Δ Domestic F. – Δ Dev. F.		
	CPI	GDP	Unemp.	CPI	GDP	Unemp.
	Panel A: Short-Term Rates					
Δ 6-Month Rate	0.237	0.730***	-0.267	-0.183	-0.005	0.119
	(0.147)	(0.211)	(0.145)	(0.101)	(0.142)	(0.112)
N	1015	1015	801	1015	1015	801
	Panel B: Medium-Term Rates					
Δ 2-Year Rate	0.258*	0.430*	-0.076	-0.098	0.053	0.036
	(0.126)	(0.187)	(0.133)	(0.090)	(0.128)	(0.103)
N	1414	1414	1137	1414	1414	1137
	Panel C: Long-Term Rates					
Δ 10-Year Rate	0.482*	0.481	-0.222	-0.066	0.097	-0.072
	(0.200)	(0.289)	(0.201)	(0.143)	(0.198)	(0.157)
N	1450	1450	1142	1450	1450	1142

This is similar to table 1. The difference is that I look at the concurrent change in the domestic forecast relative to the concurrent average change in forecast for Australia, Canada, the eurozone, the United Kingdom, and the United States; that is, $(\mathbb{E}_{t+1m}[V_{z,y(t)}] - \mathbb{E}_{t-1m}[V_{z,y(t)}]) - (\mathbb{E}_{t+1m}[V_{Dev,y(t)}] - \mathbb{E}_{t-1m}[V_{Dev,y(t)}]) = \alpha + \beta \Delta I_{z,t} + \epsilon_{z,t}$. Sources: Bloomberg, Consensus Economics, Refinitiv.

B.2 Alternative Versions of Table 3

Table B.5: Predicting Monetary Policy Surprises with US GDP — 1-Month Lag

	ΔI_{6m}	ΔI_{2y}	ΔI_{10y}
		Panel A	
Δ USA CPI Before Meeting Forecast	0.024**	0.026***	0.013**
	(0.009)	(0.007)	(0.004)
N	1023	1500	1536
		Panel B	
Δ USA GDP Before Meeting Forecast	0.027***	0.015**	0.007*
	(0.007)	(0.005)	(0.003)
N	1023	1500	1536
		Panel C	
Δ USA Unemp. Before Meeting Forecast	-0.056***	-0.040***	-0.015*
	(0.013)	(0.010)	(0.006)
N	1023	1500	1536

This is similar to table 3. The difference is that I look at the one-month change in the US forecast prior to the meeting; that is, $\Delta I_{z,t} = \alpha + \beta(\mathbb{E}_{t-\epsilon}[V_{US,y(t)}] - \mathbb{E}_{t-1m-\epsilon}[V_{US,y(t)}]) + \epsilon_{z,t}$ Sources: Bloomberg, Consensus Economics, Refinitiv.

Table B.6: Predicting Monetary Policy Surprises with US GDP — Concurrent Change

	ΔI_{6m}	ΔI_{2y}	ΔI_{10y}
		Panel A	
Δ USA CPI Forecast Around Meeting	0.015**	0.013***	0.007**
	(0.005)	(0.004)	(0.002)
N	1012	1486	1521
		Panel B	
Δ USA GDP Forecast Around Meeting	0.015***	0.007*	0.002
	(0.004)	(0.003)	(0.002)
N	1012	1486	1521
		Panel C	
Δ USA Unemp. Forecast Around Meeting	-0.032***	-0.020***	-0.004
	(0.007)	(0.006)	(0.003)
N	1012	1486	1521

This is similar to table 3. The difference is that I look at the two-month change in the US forecast around the meeting; that is, $\Delta I_{z,t} = \alpha + \beta(\mathbb{E}_{t+1m}[V_{US,y(t)}] - \mathbb{E}_{t-1m}[V_{US,y(t)}]) + \epsilon_{z,t}$ Sources: Bloomberg, Consensus Economics, Refinitiv.

Table B.7: Predicting Monetary Policy Surprises with US GDP — Relative to Past Domestic

	ΔI_{6m}	ΔI_{2y}	ΔI_{10y}
		Panel A	
Δ Domestic CPI Before Meeting Forecast	0.013	0.006	0.007*
	(0.007)	(0.006)	(0.004)
N	1023	1422	1458
		Panel B	
Δ Domestic GDP Before Meeting Forecast	0.012**	0.007	0.005*
	(0.004)	(0.004)	(0.002)
N	1023	1422	1458
		Panel C	
Δ Domestic Unemp. Before Meeting Forecast	-0.019*	-0.003	-0.002
	(0.009)	(0.007)	(0.004)
N	806	1141	1146

This is similar to table 3. The difference is that I look at the two-month change in the domestic forecast prior to the meeting; that is, $\Delta I_{z,t} = \alpha + \beta(\mathbb{E}_{t-\epsilon}[V_{z,y(t)}] - \mathbb{E}_{t-2m-\epsilon}[V_{z,y(t)}]) + \epsilon_{z,t}$ Sources: Bloomberg, Consensus Economics, Refinitiv.

B.3 Alternative Version of Table B.8

Table B.8: Predicting Monetary Policy Surprises with US GDP by Central Bank — Concurrent Forecast Change

Dependent	ΔI_{6m}		
	Δ USA Forecast Around Meeting		
Independent	CPI	GDP	Unemp.
Australia	-0.018	0.016	0.007
	(0.029,125)	(0.019,125)	(0.031,125)
Canada	0.016	0.032*	-0.045
	(0.023,102)	(0.015,102)	(0.031,102)
Eurozone	0.002	0.003	-0.008
	(0.009,179)	(0.006,179)	(0.011,179)
Japan	0.011*	0.001	-0.014
	(0.004,83)	(0.002,83)	(0.008,83)
New Zealand	0.013	0.043*	-0.023
	(0.023,125)	(0.020,125)	(0.030,125)
Norway	-0.051	0.047	
	(0.027,106)	(0.025,106)	
Sweden	0.064*	-0.005	
	(0.028,49)	(0.022,49)	
Switzerland	0.098*	0.095**	
	(0.041,59)	(0.027,59)	
United Kingdom	0.008	0.014	-0.022
	(0.012,187)	(0.013,187)	(0.013,187)

This is similar to table 4. The difference is that I look at the two-month change in the US forecast around the meeting; that is, $\Delta I_{z,t} = \alpha + \beta(\mathbb{E}_{t+1m}[V_{US,y(t)}] - \mathbb{E}_{t-1m}[V_{US,y(t)}]) + \epsilon_{z,t}$ Sources: Bloomberg, Consensus Economics, Refinitiv.