RIETI Discussion Paper Series 18-E-076

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The Research Institute of Economy, Trade and Industry
https://www.rieti.go.jp/en/

RIETI Discussion Paper Series 18-E-076

November 2018

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Abstract

Unemployment has tumbled since the Global Financial Crisis (GFC). This paper investigates whether news of a tightening labor market since the GFC has generated expectations of an overheating economy or excessive Fed tightening. Evidence from the response of interest rates, exchange rates, Treasury Inflation Protected Securities and other assets indicates that investors did not expect a strong labor market to produce inflation. Neither did they expect the Fed to overreact and derail growth. The Fed has thus succeeded so far in navigating between the shoals of overheating and premature tightening.

Keywords: Nonfarm employment; Federal funds rate; Inflationary expectations

JEL classification; E58, G12, E44

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*This study is conducted as a part of the project "East Asian Production Networks, Trade, Exchange Rates, and Global Imbalances" undertaken at the Research Institute of Economy, Trade and Industry (RIETI).
Acknowledgments: This research is supported by the JSPS Grants-in-Aid for Scientific Research (B, 17H02532). I thank Keiichiro Kobayashi, Masayuki Morikawa, Atsushi Nakajima, and Makoto Yano for invaluable comments. I thank the RIETI staff for their kind help and cooperation. Any errors are my own responsibility.
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1. Introduction

Will a tight labor market stoke inflation? How will the Fed respond to labor market pressure? As unemployment has fallen from 10 percent in October 2009 to 3.7 percent in September 2018, these questions have come to the fore.

Unemployment of 3.4 percent in 1968 and 1969 was followed by accelerating inflation that devastated the bond market (Greenspan, 1993). On the other hand, unemployment that fell to 4 percent or less between 1996 and 2000 did not lead to inflation but instead contributed to productivity increases of 2.8 percent per year by pulling many into the labor force and providing them with on-the-job training (Jorgenson *et al*., 2008). Is the low unemployment after the Global Economic Crisis (GFC) presaging a rise in inflation or an economic boom without overheating?

To address these questions this paper investigates how financial markets process news of rising employment after the GFC. Did they expect it to lead to higher inflation? Did they believe that the Fed would fall behind the curve and allow inflation to rise? Did they anticipate that the Fed would tighten too much and depress growth?

In previous work Lapp and Pearce (2012) examined how news of 14 macroeconomic variables affected expected future monetary policy over the January 1995 to March 2008 period. They calculated news as the difference between the government announcement of the variable and the previously expected value as measured by the median forecast of a survey of market participants by Money Market Services. They calculated expected monetary policy using the federal funds rate (FFR) futures market. They found that a one standard deviation positive innovation in core CPI inflation would increase the expected FFR target in the same month by 2.4 basis points and that a one standard deviation positive innovation in nonfarm employment

(NFE) would increase the target by 1.6 basis points. Across the current month and the next two months, their most robust finding was that news of NFE affected the expected FFR target.

Frankel and Engel (1984) investigated the response of financial markets to money supply news over the 1979 to 1982 period. They measured news as the difference between the Fed announcement of money supply growth for the prior week and the previously expected value obtained from a survey by Money Market Services. They found that positive innovations in the money supply increased nominal interest rates. They observed that this could either be because the money supply increase would raise expected inflation or because the increase was expected to produce a subsequent decrease in the money supply that would raise real rates. Engel and Frankel showed that if the news increased expected inflation it would generate a capital outflow and depreciate the dollar and if it increased real rates it would generate a capital inflow and appreciate the dollar. They found that unexpected increases in the money supply appreciated the dollar, implying that investors reacted to expectations of future monetary policy tightening.

Hardouvelis and Barnhart (1989) examined how commodity prices responded to money supply news over the 1979 to 1982 period. Like Engel and Frankel (1984) they measured news as the difference between the Fed announcement of money supply growth for the prior week and the previously expected value obtained from Money Market Services. They demonstrated that if the Fed had credibility in fighting inflation then positive innovations in the money supply would lower commodity prices and if the Fed did not have credibility then positive money supply shocks would raise commodity prices. Using a random coefficients Kalman filter model they found that the response of commodity prices was initially positive and only turned negative in 1981. This implies that the Fed gradually gained credibility. They also found that credibility increased as actual inflation approached the Fed's target rate.

Ramchander, Simpson, and Chaudhry (2005) investigated how news of 23 macroeconomic variables affected interest rates and interest rate spreads over the February 1991 to September 2000 period. Like Lapp and Pearce (2012) they measured news as the difference between the government announcement of a variable and the previously expected value of the variable obtained from Money Market Services. They reported that yields are most sensitive to news of NFE, the consumer price index, and hourly earnings. They also found that unexpected increases in NFE did not affect the spread between the 3-year Treasury yield and the FFR, the 10-year Treasury yield and the FFR, or the 30-year Treasury yield and the FFR. They concluded that increases in NFE increase the inflation premium in Treasury yields.

This paper seeks to fill a gap in the literature by investigating how financial markets processed NFE news for the period after the GFC. Unlike what Ramchander *et al.* reported for the 1991-2000 period, evidence from Treasury Inflation Protected Securities (TIPS) reported here indicates that news of unexpected increases in NFE barely affected the inflation premium. The results also indicate that positive innovations in NFE caused investors to expect the Fed to tighten and that they would not tighten too much.

The next section presents the data and methodology. Section 3 presents the results. Section 4 concludes.

2. Data and Methodology

On the first Friday of the month the Bureau of Labor Statistics (BLS) announces the change in NFE for the previous month. This announcement is closely watched by the Fed and by financial markets (see, e.g., Fleming, 2018). Bloomberg surveys market participants to learn their forecasts for the NFE announcement. Because the BLS later revises their data, data on the

original NFE announcements are culled from the *Financial Times*, the *Wall Street Journal*, and other financial publications. The median forecast from the Bloomberg survey is used to measure the previously expected value for the announcement.

This paper investigates how NFE news affects the whole term structure of interest rates on Treasury securities (from four-week to 30-year) using daily interest rate changes. It also investigates how the news affects the Standard & Poor's (S&P) 500 Stock Index. Economic theory implies that stock prices equal the expected present value of future net cash flows. NFE news could affect stock prices by affecting future expected cash flows (for instance, by increasing expectations of future economic activity) or by affecting discount rates (for instance, by increasing interest rates). Examining how NFE news affects stock prices may thus shed light on how it affects the broader economy.

This paper also examines how employment news affects exchange rates. As discussed above, Engel and Frankel (1984) showed that news that increases real rates will appreciate the dollar and that news that increases expected inflation will depreciate the dollar.

Another way to investigate how news affects real interest rates and expected inflation is to compare yields on ordinary Treasury securities and Treasury inflation-protected securities (TIPS). The difference between these yields is called the breakeven rate and is a measure of longer-term inflation expectations. It is not a perfect measure because there may be an inflation risk premium in nominal Treasury rates and thus in the breakeven rate. In addition, since TIPS securities are less liquid than ordinary Treasury securities, there may be a liquidity premium in TIPS rates (see Lacker, 2016). Nevertheless, the breakeven rate is the most common measure of longer-term inflation expectations.

The model regresses daily changes in interest rates, TIPS rates, breakeven rates, the log of stock prices, or the log of exchange rates on news about NFE:

$\Delta i_t = \alpha_1 + \alpha_2 (NFE_t - E_{t-1}(NFE_t))$,

where Δi_t is the change in the interest rate, TIPS rate, breakeven rate, log stock price, or log exchange rate over the 24-hours bracketing the announcement, NFE_t is the announcement from BLS at date t about nonfarm payroll employment in the previous month, and $E_{t-1}(NFE_t)$ is the previously expected value of NFE from the Bloomberg survey.

Thorbecke (2018) investigated how news of large scale asset purchases (LSAP) by the Fed during the GFC affected inflationary expectations. If investors believed that LSAP would raise inflation, they would sell assets exposed to inflation and purchase inflation hedges. This would lower the prices of assets that are harmed by inflation and raise the prices of assets that benefit from inflation. Results across 60 assets indicated that initially LSAP announcements lowered expected inflation. However, during the third round of LSAP in late 2012 news of LSAP raise expected inflation. This implies that the Fed had gained credibility by the end of 2012. The sample period in this paper thus begins in January 2013, when the Fed had achieved credibility with investors, and extends to August 2018.

3. Results

Table 1 shows the effect of NFE news on Treasury interest rates of all maturities and on the Federal Reserve Board broad trade-weighted nominal exchange rate and the Standard & Poor's 500 (S&P 500) Stock Index. There is no effect on 4-week, 3-month, and 6-month Treasury rates. There is a small effect on the 1-year rate, and the impact grows monotonically up to the 7-year rate. News of higher NFE has no effect on the S&P 500 Index but appreciates the

FRB trade weighted value of the dollar. The appreciation implies that the real interest rate is increasing.

The TIPS rate measures the impact on real interest rates and the breakeven rate on expected inflation. Unexpected increases in NFE increase both, but the effect is twice as large on the TIPS rate as on the breakeven rate. This indicates that the real interest rate increases by more than expected inflation, explaining why the exchange rate appreciates.

Table 2 looks at interest rate spreads to examine the impact across the term structure. There is a small impact on the spread between the 1-year and 6-month rate. The impact is largest on the spread between the 2-year and 1-year rate. It remains large for the 3-year minus 2-year and 5-year minus 3-year spread. There is no effect on the 7-year minus 5-year spread. This implies that investors expect positive NFE shocks to increase interest rates between one and five years in the future.

The sample period here differs from previous episodes because the federal funds rate was close to zero for several years. It seems likely that the real interest rate responses more than one year in the future evident in Tables 1 and 2 reflect anticipations that positive NFE innovations will cause the Fed to raise interest rates once the Fed starts lifting rates again. To test whether the interest rate responses in Tables 1 and 2 reflect anticipated monetary policy, the FFR can be interacted with NFE news. When the FFR was close to zero, investors would have expected a response in the more distant future rather than over the next few months that Lapp and Pearce (2012) found over a period when interest rates were not stuck at the lower bound. After "liftoff", when the FFR started increasing, they would expect less of an effect in the distant future. If this is true the coefficient on NFE*FFR should be negative.

Table 3 presents the results. Focusing on interest rate spreads, the coefficient on NFE*FFR is negative for all parts of the term structure from the 3-month minus 4-week spread to the 5-year minus 3-year spread. This indicates that when the federal funds rate was low, investors expected positive innovations in NFE to raise interest rates in the future. The effect is by far the largest for the 2-year minus 1-year spread. Examining the exchange rate, when the federal funds rate is low an unexpected increase in NFE causes the dollar to appreciate. This indicates that the real interest rate is increasing. Further confirmation of this comes from the TIPS rate and the breakeven rate. The coefficient on NFE*FFR is negative and significant for the TIPS rate but insignificant for the breakeven rate. Thus when the FFR was low, investors expected positive innovations in NFE to cause the Fed to tighten in the future and raise real interest rates.

What can we learn about how investors expect future Fed policy to affect the economy? The finding that NFE*FFR does not affect the breakeven rate implies that investors do not expect the future tightening to impact inflation. Thus they do not expect the future tightening to have a disinflationary effect. This indicates that they do not expect the Fed to overreact to an expanding economy. Since higher real interest rates in the future will decrease spending, the insignificant coefficient on NFE*FFR in the breakeven regression implies that the slope of the Phillips Curve relating inflation to unemployment is small.

Comparing Tables 1 and 3, the impact of a positive shock to NFE on 5-year expected inflation is about the same when the Fed's response in considered (Table 3) or when it is not (Table 1). A one standard deviation positive shock to NFE (=55,939) would only increase 5-year expected inflation by one basis point (=55,939x1.64x10^{-7} or 55,939x1.89x10^{-7}). The small

response is consistent with the hypothesis that inflation expectations are well anchored and that investors are not concerned that a strong labor market will stimulate accelerating inflation.

4. Conclusion

This paper investigates how news of payroll employment affect financial markets during the period after the Global Financial Crisis. Unemployment has fallen steadily from 10 percent in October 2009 to 3.9 percent in July 2018.

The results indicate that positive shocks to NFE cause almost no increase in expected inflation. They do cause investors to expect the Fed to raise real interest rates in the future. These higher interest rates have no disinflationary effect, however, implying that investors do not expect the Fed to tighten too much and derail economic growth.

Fed Chairman Powell (2018) said that the Federal Open Market Committee had to navigate between the shoals of overheating and premature tightening. The results in this paper indicate that they are doing well after the GFC. However, complacency is not warranted. The U.S. is imposing tariffs that will restrict aggregate supply and raise prices. U.S. budget deficits exceeding a trillion dollars per year will stoke aggregate demand. If inflation accelerates and inflationary expectations risk becoming unanchored, the Fed will need to act aggressively to maintain its hard-earned credibility.

TABLE 1

The Effect of News of Nonfarm Payroll Employment (NFE) on Interest Rates and Asset Prices

Variable	Coefficient on NFE	R-squared	Standard Error of Regression
4-week Treasury	$0.360\text{x}10^{-7}$ ($0.409\text{x}10^{-7}$)	-0.0054	0.0206
3-month Treasury	$0.128\text{x}10^{-7}$ ($0.202\text{x}10^{-7}$)	-0.0116	0.0122
6-month Treasury	$0.562\text{x}10^{-7}$ ($0.464\text{x}10^{-7}$)	0.0304	0.0146
1-year Treasury	$1.26\text{x}10^{-7}$* ($0.632\text{x}10^{-7}$)	0.0882	0.0211
2-year Treasury	$2.88\text{x}10^{-7}$*** ($1.05\text{x}10^{-7}$)	0.1394	0.0383
3-year Treasury	$4.23\text{x}10^{-7}$*** ($1.16\text{x}10^{-7}$)	0.1829	0.0485
5-year Treasury	$5.21\text{x}10^{-7}$*** ($1.35\text{x}10^{-7}$)	0.1841	0.0594
7-year Treasury	$5.45\text{x}10^{-7}$*** ($1.37\text{x}10^{-7}$)	0.1820	0.0626
10-year Treasury	$4.46\text{x}10^{-7}$*** ($1.19\text{x}10^{-7}$)	0.1505	0.0570
30-year Treasury	$3.59\text{x}10^{-7}$*** ($1.11\text{x}10^{-7}$)	0.1097	0.0541
S&P 500 Stock Index	$6.15\text{x}10^{-9}$ ($1.37\text{x}10^{-8}$)	-0.0137	0.0083
FRB Trade-Weighted Exchange Rate (Broad)	$2.39\text{x}10^{-8}$*** ($8.53\text{x}10^{-9}$)	0.1218	0.0034
5-year TIPS	$3.57\text{x}10^{-7}$ *** ($1.34\text{x}10^{-7}$)	0.0856	0.0606
5-year Breakeven	$1.64\text{x}10^{-7}$ ** ($0.683\text{x}10^{-7}$)	0.0704	0.0305

Notes: The coefficient on NFE represents the coefficient on news of monthly changes in nonfarm payroll employment (NFE) in a regression of the change in the interest rate or asset price on NFE news. NFE news equals the difference between Bureau of Labor Statistics announcements of the change in NFE from the previous month and the previously expected value of this announcement as measured by the median forecast from a Bloomberg survey of market participants. FRB Trade Weighted Exchange Rate (Broad) is the Federal Reserve Board broad nominal trade-weighted exchange rate, S&P 500 Stock Index is the Standard and Poors' 500 Stock Index, 5-year TIPS is the yield on 5-year Treasury inflation-protected securities (TIPS), and 5-year Breakeven is the is the difference between the 5-year nominal Treasury rate and the 5-year TIPS rate. The 5-year TIPS rate is a measure of real interest rates over the next 5 years and the 5-year breakeven rate is a measure of expected inflation over the next 5-years. Heteroskedasticity and autocorrelation consistent standard errors are in parentheses. The sample period extends from January 2013 to August 2018.

TABLE 2

The Effect of News of Nonfarm Payroll Employment (NFE) on Treasury Interest Rate Spreads Across the Term Structure

Variable	**Coefficient on NFE**	**R-squared**	**Standard Error of Regression**
3-month - 4-week Treasury	-0.232×10^{-7} (0.380×10^{-7})	-0.0108	0.0198
6-month – 3-month Treasury	0.434×10^{-7} (0.446×10^{-7})	0.0076	0.0161
1-year – 6-month Treasury	0.698×10^{-7}* (0.398×10^{-7})	0.0489	0.0152
2-year – 1-year Treasury	1.62×10^{-7}*** (6.45×10^{-8})	0.0884	0.0271
3-year – 2-year Treasury	1.36×10^{-7}*** (3.73×10^{-8})	0.1259	0.0190
5-year – 3-year Treasury	0.976×10^{-7}*** (0.342×10^{-7})	0.0568	0.0199
7-year – 5-year Treasury	0.243×10^{-7} (0.269×10^{-7})	-0.0046	0.0139
10-year – 7-year Treasury	-0.991×10^{-7}** (0.380×10^{-7})	0.1420	0.0131
30-year – 10-year Treasury	0.868×10^{-7} (0.569×10^{-7})	0.0457	0.0194

Notes: The coefficient on NFE represents the coefficient on news of monthly changes in nonfarm payroll employment (NFE) in a regression of the change in the interest rate spread on NFE news. NFE news equals the difference between Bureau of Labor Statistics announcements of the change in NFE from the previous month and the previously expected value of this announcement as measured by the median forecast from a Bloomberg survey of market participants. Heteroskedasticity and autocorrelation consistent standard errors are in parentheses. The sample period extends from January 2013 to August 2018.

TABLE 3

The Effect of News of Nonfarm Payroll Employment (NFE) and NFE Interacted with the Level of the Federal Funds Rate (FFR) on Interest Rates and Asset Prices

Variable	**Coefficient on NFE**	**Coefficient on NFE*FFR**	**R-squared**	**Standard Error of Regression**
4-week Treasury	-0.0003×10^{-7} (4.45×10^{-8})	0.858×10^{-7} (0.988×10^{-7})	-0.0073	0.02070
3-month Treasury	-0.264×10^{-7} (0.268×10^{-7})	0.825×10^{-7}** (0.385×10^{-7})	0.0062	0.0120
6-month Treasury	0.729×10^{-7} (0.588×10^{-7})	-0.329×10^{-7} (0.572×10^{-7})	0.0219	0.0148
1-year Treasury	1.71×10^{-7}** (0.792×10^{-7})	-1.04×10^{-7} (0.897×10^{-7})	0.0879	0.0212
2-year Treasury	4.78×10^{-7}*** (1.16×10^{-7})	-4.38×10^{-7}*** (1.62×10^{-7})	0.2055	0.0369
3-year Treasury	6.66×10^{-7}*** (1.26×10^{-7})	-6.31×10^{-7}*** (1.68×10^{-7})	0.2456	0.0486
5-year Treasury	8.03×10^{-7}*** (1.57×10^{-7})	-6.39×10^{-7}*** (1.38×10^{-7})	0.2386	0.0577
7-year Treasury	8.27×10^{-7}*** (1.62×10^{-7})	-6.33×10^{-7}*** (2.39×10^{-7})	0.2295	0.0612
10-year Treasury	6.71×10^{-7}*** (1.50×10^{-7})	-5.82×10^{-7}*** (1.89×10^{-7})	0.1852	0.0561
30-year Treasury	5.40×10^{-7}*** (1.48×10^{-7})	4.14×10^{-7}** (1.82×10^{-7})	0.1316	0.0537
3-month – 4-week Treasury	-0.261×10^{-7} (0.404×10^{-7})	-0.032×10^{-7} (0.964×10^{-7})	-0.0248	0.0199
6-month – 3-month Treasury	0.993×10^{-7}* (0.528×10^{-7})	-1.15×10^{-7}** (0.517×10^{-7})	0.0359	0.0158
1-year – 6-month Treasury	0.983×10^{-7}* (0.551×10^{-7})	-0.714×10^{-7} (0.733×10^{-7})	0.0450	0.0151
2-year – 1-year Treasury	3.07×10^{-7}*** (0.735×10^{-7})	-3.33×10^{-7}*** (1.09×10^{-7})	0.1731	0.0258
3-year – 2-year Treasury	1.88×10^{-7}*** (0.459×10^{-7})	-1.13×10^{-7}*** (0.560×10^{-7})	0.1394	0.0190
5-year – 3-year Treasury	1.36×10^{-7}*** (0.500×10^{-7})	-0.884×10^{-7} (0.597×10^{-7})	0.0545	0.0201
7-year – 5-year Treasury	0.238×10^{-7} (0.425×10^{-7})	0.060×10^{-7} (0.413×10^{-7})	-0.0184	0.0135
10-year – 7-year Treasury	-1.56×10^{-7}*** (0.507×10^{-7})	1.21×10^{-7}*** (0.508×10^{-7})	0.1922	0.0127
30-year – 10-year Treasury	-1.37×10^{-7}* (0.779×10^{-7})	0.977×10^{-7} (0.633×10^{-7})	0.0488	0.0195
S&P 500 Stock Index	0.478×10^{-8} (2.01×10^{-8})	-2.21×10^{-8} (3.21×10^{-8})	-0.0251	0.0084
FRB Trade Weighted	4.27×10^{-8}*** (1.01×10^{-9})	-4.25×10^{-8}*** (1.08×10^{-9})	0.2066	0.0033

Exchange Rate (Broad)				
5-year TIPS	6.14×10^{-7}*** (1.77×10^{-7})	-5.88×10^{-7}*** (2.14×10^{-7})	0.1321	0.0593
5-year Breakeven	1.89×10^{-7}* (0.953×10^{-7})	-0.510×10^{-7} (1.42×10^{-7})	0.0598	0.0309

Notes: The coefficient on NFE represents the coefficient on news of monthly changes in nonfarm payroll employment (NFE) and the coefficient on NFE*FFR represents the coefficient on NFE interacted with the level of the federal funds rate during the month of the announcement. The coefficients come from a regression of changes in the interest rate, interest rate spread, or asset price on NFE and NFE*FFR. NFE news equals the difference between Bureau of Labor Statistics announcements of the change in NFE from the previous month and the previously expected value of this announcement as measured by the median forecast from a Bloomberg survey of market participants. Heteroskedasticity and autocorrelation consistent standard errors are in parentheses. The sample period extends from January 2013 to July 2018.

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