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How sensitive is the economy to large interest rate increases? Evidence from the taper tantrum*

Nitish Sinha[†] and Michael Smolyansky[†]

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Abstract

The “taper tantrum” of 2013 represents one of the largest monetary policy shocks since the 1980s. During this episode, long-term interest rates spiked 100 basis points—a move unintentionally induced by policymakers. However, this had no observable negative effect on the overall U.S. economy. Output, employment, and other important variables, all performed either in line with or better than consensus forecasts, often improving considerably relative to their earlier trends. We conclude that, from low levels, a 100 basis point increase in long-term interest rates is probably too small to affect overall economic activity and discuss the implications for monetary policy.

JEL Classifications: E43, E44, E52, E58

Keywords: Monetary policy, taper tantrum, quantitative easing, Federal Reserve

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As central banks around the world tighten monetary policy to fight inflation, there remains enormous uncertainty over a fundamental question: Just how sensitive are economies to large increases in interest rates? In this paper, we study the “taper tantrum” of mid-2013, which offers a natural experiment that can shed light on this question. The taper tantrum was among the largest monetary policy shocks since the 1980s. During this episode, long-term government bond yields spiked by about 100 basis points following statements by Fed Chair Bernanke that the Federal Reserve would reduce the pace of asset purchases under its quantitative easing (QE) program. The ferocity of the market reaction was a true “monetary policy shock,” in that it was completely unanticipated and unintended by policymakers and was unrelated to the ordinary or systemic reaction of policy to prevailing economic conditions. (Bernanke (2015, 2022)). At the time, many observers justifiably worried that this inadvertent tightening of monetary policy could undermine the still-fragile economic recovery.

As this paper shows, however, the dramatic rise in long-term interest rates due to the taper tantrum had no noticeable negative effect on overall output growth, the unemployment rate, inflation, and other important economic variables.

We reach this conclusion in two ways. First, we simply compare the performance of each variable after the taper tantrum to its earlier trend. This comparison provides evidence on whether the taper tantrum actually slowed the economy. Second, we evaluate how each variable performed relative to the expectation of professional economic forecasters, as measured just prior to the taper tantrum. Specifically, we rely on the forecaster survey conducted by Blue Chip Economic Indicators in early-May 2013, which contains consensus estimates of key economic variables through to 2014:Q4 (about one-and-a-half years after the onset of the shock). The estimates of professional forecasters reflect relevant information known at the time and thus provide an important benchmark. Importantly, the consensus forecasts that we use could not incorporate the effects of the taper tantrum, since this was an unanticipated event and the forecasts were made beforehand. If the main variables of interest performed in line with, or better than, consensus expectations and prior trends, this substantially weakens the case that the taper tantrum slowed the economy.

We find that, following the taper tantrum, real GDP growth actually accelerated slightly relative to its earlier trend and came in essentially in line with consensus forecasts. Moreover, the

unemployment rate improved substantially more than what professional forecasters were expecting, and job growth accelerated markedly compared to its pre-taper tantrum trend. Meanwhile, the inflation rate did not change following the taper tantrum. Taken together, these findings suggest that the 100 basis point increase in interest rates due to the taper tantrum did not have any observable negative effect on the aggregate economy.

Of all the major components of GDP, only residential investment fell slightly—by about 2 percent in total during 2013:Q4 and 2014:Q1, thus indicating a fairly rapid response. It then essentially returned to its prior trend. The effect of this on overall GDP was negligible, however, because residential investment represents only a small share of total output. In contrast to residential investment, growth in nonresidential investment accelerated following the taper tantrum and exceeded consensus expectations, as did personal consumption expenditures. Net exports also performed almost exactly in line with consensus estimates.

Our motivation for studying the taper tantrum stems from the fact that large monetary policy shocks are exceedingly rare in recent decades. This presents a serious challenge to understanding the effects of monetary policy on economic activity. Indeed, since monetary policy is an endogenous response to prevailing economic conditions, shocks to monetary policy are needed to identify its causal effects. Although there exists a large literature on monetary policy shocks, a recent and thorough review by Ramey (2016) comes to the striking conclusion that many well-known estimates of the effects of monetary policy lack robustness and simply break down for samples estimated after the early 1980s. In particular, for post-1983 samples, contractionary monetary policy shocks are often found to have expansionary effects—e.g., following a surprise increase in the federal funds rate, the unemployment rate *declines*. According to Ramey, the reason for this is that “we can no longer identify monetary policy shocks well. Monetary policy is being conducted more systematically, so true monetary policy shocks are now rare.” Ramey concludes that, for the era following the Volker-disinflation, “we simply do not have enough information to produce estimates with any great certainty.”

Given this striking conclusion, we believe that studying the economy’s response to the taper tantrum is especially important. Of course, the taper tantrum is a single event. Nonetheless, it represents a very large and exogenous shock that occurred within the last decade—hence, this episode deserves the particular attention of monetary economists and professionals. At the very

least, it would be reasonable to update one's priors based on how the economy performed in response to this shock.

How then should we interpret our findings? The most immediate and dramatic conclusion is simply this: raising long-term interest rates by 100 basis points is too small an increase to have any noticeable negative effect on output growth, employment, or inflation. In other words, our findings suggest that—within at least a 100 basis point range—the exact level of long-term interest rates might not make any appreciable difference to the economy's overall performance.

We add a caveat to these conclusions. Specifically, the taper tantrum occurred when interest rates were already very low, with 10-year Treasury yields increasing from about 2 percent to about 3 percent. It is possible that if rates were to rise by a similar amount, but from a higher starting level, the effect on the economy could be more contractionary. Without further assumptions, our study cannot directly answer whether this the case or not. Likewise, it would also be unreasonable to extrapolate the non-effect that we find to much larger increases in long-term rates (e.g., 300 basis points).

Still, the experience of the taper tantrum has important implications for the conduct of monetary policy. In particular, it suggests that once an economic recovery has commenced, central banks might be able to begin policy tightening more rapidly than otherwise believed, with apparently little downside risk to economic growth and employment. The case for doing so would be stronger if there are countervailing risks of maintaining an overly accommodative policy for too long, such as financial stability risks or the risk of inflation.

Our findings also suggest that monetary policy actions that seek to push down long-term interest rates below some critically low level might not be particularly effective. During the taper tantrum, 10-year Treasury yields increased from about 2 percent to 3 percent with no observable negative effect on the aggregate economy. Accordingly, there is a reasonable case to be made that perhaps little was gained from pushing Treasury yields below 3 percent.

I. Related literature

Our paper contributes to a large empirical literature that studies how shocks to monetary policy affect the economy, recently reviewed by Ramey (2016). Since the taper tantrum involved a shock to long-term interest rates, our study is also relevant to the literature that examines the economic effects of unconventional monetary policy actions.¹ With regard to the latter, we reach our conclusions indirectly: we argue that the economy’s lack of response to the taper tantrum suggests that there may be diminishing benefits of pushing down long-term rates below some critical level. Other papers that examine the taper tantrum have focused on either its spillover effect on emerging markets (Avdjiev and Takáts (2014) and Chari, Stedman, and Lundland (2021)) or on its effect on particular financial instruments (Dannhauser and Hoseinzade (2022)). Methodologically, our study identifies a large monetary policy shock based on an analysis of the historical record and examines its effects on the U.S. economy. This “narrative approach” has a long tradition within monetary economics, going back to the classic work of Friedman and Schwartz (1963), and more recently Romer and Romer (1989, 2004).²

To put the magnitude of the taper tantrum’s monetary tightening in context, it is useful to compare it to high-frequency (i.e., surprise) movements in Treasury yields around FOMC announcements, which many studies use to identify monetary policy shocks.³ We calculate that—based on a standard 30-minute window around FOMC announcements since 1994—the mean increase in 10-year Treasury yields is a miniscule 3 basis points, while the 95th percentile is 9 basis points, and the maximum 16 basis points. In other words, the taper tantrum’s 100 basis point increase in 10-year Treasury yields is an order of magnitude larger than even the most extreme high-frequency interest rate shock, which underscores the importance of studying this episode closely.

A distinctive feature of the taper tantrum is that it involved a shock to long-term interest rates. This makes the shock especially potent, since firms and households tend to borrow at longer

¹ According to Fabo et al. (2021) the literature on this topic is large, consisting of at least 54 papers. For the U.S. context see, e.g., Engen, Laubach, Reifschneider (2015) and Wu and Xia (2016). Overall, the average study estimates that QE has a moderately positive effect on output, although there is substantial heterogeneity.

² Ramey (2016) also argues that historical case studies offer among the best evidence on the effects of monetary policy shocks. One such study is Velde (2009), which examines a large money supply shock in France in 1724.

³ Examples include Kuttner (2001), Cochrane and Piazzesi (2002), Gürkaynak et al. (2005), Gertler and Karadi (2015), Nakamura and Steinsson (2015), Jarocinski and Karadi (2020), among others.

maturities (e.g., the 30-year fixed rate mortgage is standard).⁴ In contrast, most studies on the effects of monetary policy present their estimates based on either shocks to the federal funds rate or to shorter-term interest rates (with maturities of 1 to 2 years). Of course, this is entirely appropriate in most contexts, given that the Federal Reserve controls the federal funds rate directly and can influence shorter-term rates through forward guidance. However, it is also the case that the pass-through from near-term to long-term interest rates is considerably less than one-for-one. Gertler and Karadi (2015), for example, estimate that a 100 basis point increase in 2-year nominal Treasury yields around FOMC announcements is associated with about a 40 basis point increase in 10-year rates (both real and nominal). In other words, it would take substantially more than 100 basis points of tightening in short-term interest rates to achieve the same magnitude of shock to long-term rates that occurred during the taper tantrum. Overall, given the size of this shock, we think it is important for economists to know how the economy responded.

II. Background and timeline

In September 2012, the Federal Reserve embarked on its third round of large-scale asset purchases—colloquially known as “QE3.” This amounted to the Federal Reserve purchasing \$85 billion in securities per month, comprised of \$45 billion in longer-term Treasury securities and \$40 billion in agency mortgage-backed securities. The purchases were part of a broader suite of highly accommodative policies aimed at combating the slow economic recovery in the aftermath of the Global Financial Crisis. These included setting the target range for the federal funds rate at its effective lower bound—between 0 to 1/4 percent—along with forward guidance that this ultra-low range would be maintained as long as the unemployment rate was above 6-1/2 percent and inflation was projected to be no more 2-1/2 percent. Unlike prior asset purchase programs, QE3 did not specify a total purchase volume nor provide an end date, but rather involved an

⁴ The majority of corporate debt is also in the form of longer-term corporate bonds. That said, to the extent that some firms and households prefer to borrow at shorter maturities, this would limit the impact of the taper tantrum, since shorter-term rates did not move much during this episode (the federal funds rate remained fixed at 0–1/4 percent and 2-year Treasury yields rose by at most 20 basis points).

open-ended commitment that purchases would continue “if the outlook for the labor market does not improve substantially.”⁵

Even so, as detailed in Bernanke (2015, 2022), several FOMC participants had serious misgivings about the program. Their concerns primarily reflected (i) doubts about the program’s likely effectiveness, (ii) worries that continued asset purchases could stoke excess risk-taking and undermine financial stability, and (iii) unease that the Fed may eventually incur operating losses once interest rates rise. Skeptical FOMC participants made the case internally that pursuing an ineffective program was “worse than doing nothing” and argued that an “off ramp” was needed (Bernanke (2015, 2022)).⁶

Chair Bernanke first signaled the end of the asset purchase program on May 22, 2013, during the question-and-answer session that was part of the Chair’s testimony to the Joint Economic Committee of Congress (JEC). He stated that: “If we see continued improvement and we have confidence that that is going to be sustained, then we could *in the next few meetings, take a step down in our pace of purchases* [italics added].” Moreover, the minutes of the FOMC’s April 30-May 1 meeting, which were released later that day, revealed that “*A number of participants expressed willingness to adjust the flow of purchases downward as early as the June meeting* [italics added] if the economic information received by that time showed evidence of sufficiently strong and sustained growth.” These two statements, in essence, marked the beginning of a dramatic rise in both nominal and real long-term Treasury yields over the succeeding months, as shown in Figure 1, Panel A. This market response that eventually became known as the “taper tantrum.”

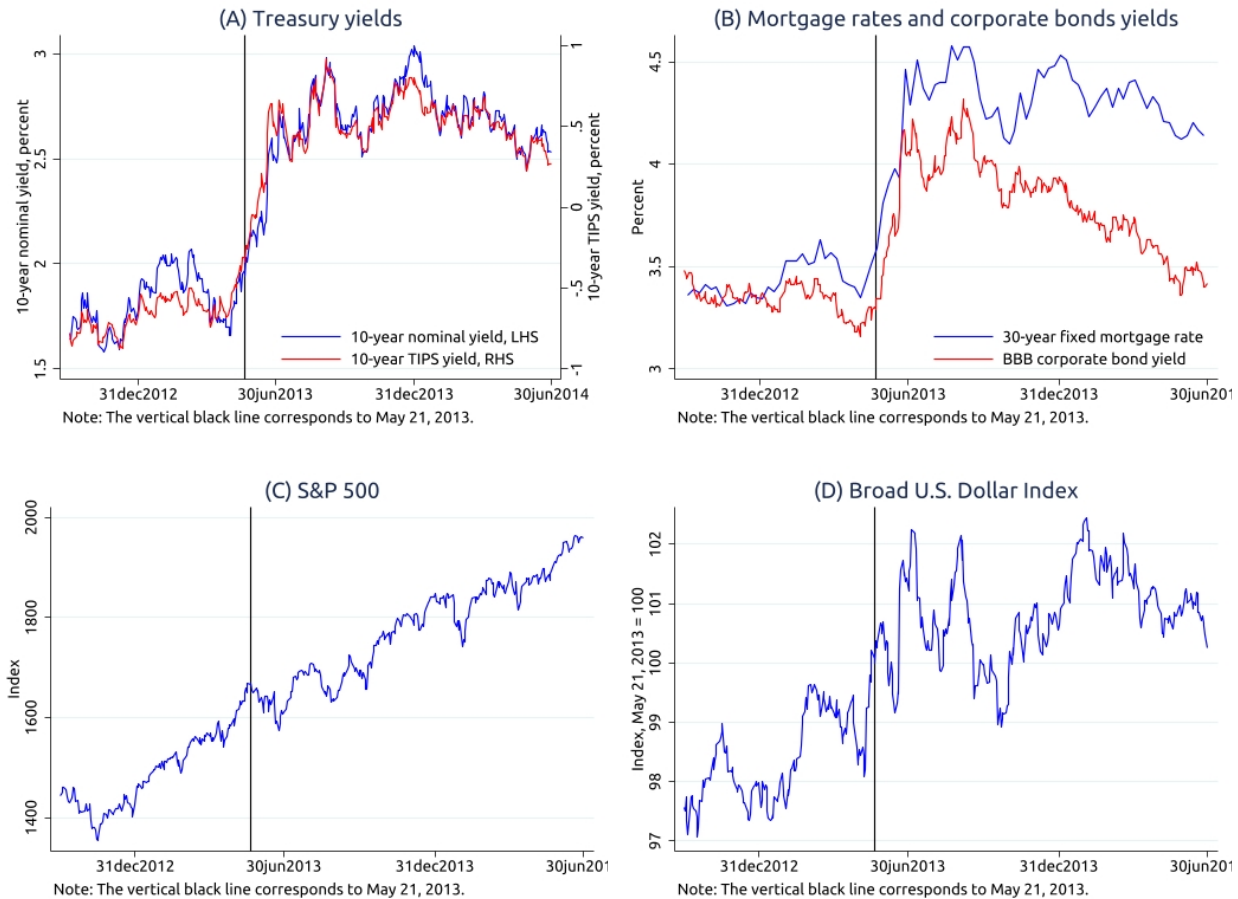
The move upward in long-term Treasury yields was further reinforced on June 19, 2013, following the post-FOMC press conference. During the press conference, Chair Bernanke announced that “the Committee currently anticipates that it would be appropriate to *moderate the monthly pace of purchases later this year*. And if the subsequent data remain broadly aligned with our current expectations for the economy, we would continue to *reduce the pace of*

⁵ See, <https://www.federalreserve.gov/newsevents/pressreleases/monetary20120913a.htm>.

⁶ See also the minutes of the FOMC’s April 30-May 1, 2013, meeting.

purchases in measured steps through the first half of next year, ending purchases around midyear [italics added].”

Figure 1: Financial market responses



Source: Freddie Mac; ICE Data Indices LLC; S&P Dow Jones Indices LLC; all retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org>.

The ferocity of the market reaction following these remarks came as a genuine shock to policymakers. As Bernanke (2015) explains: “I had thought... that the path I laid out was close to what markets expected... but the movements on my Bloomberg screen after the press conference were not what I expected. If the trends continued, it would amount to an *unintended tightening of monetary policy conditions* [italics added].”

Indeed, those trends did continue throughout the summer. Overall, from May 21 (the day before Chair Bernanke’s Congressional testimony) to September 5 (the peak for that month), nominal 10-year Treasury yields rose by about 100 basis points, from 1.94 percent to 2.98 percent. Over

the same period, yields on Treasury Inflation Protected Securities (TIPS)—i.e., real yields—increased by around 125 basis points, from -0.34 percent to 0.92 percent.

At the time, both market participants and the Federal Reserve Bank of New York (NY Fed) interpreted these moves as being driven by an unambiguous shock to monetary policy. For example, the Survey of Primary Dealers, which was presented at the June 2013 FOMC meeting, asked respondents to rate the importance of various factors behind the sharp rise in 10-year Treasury yields. Dealers consistently assigned the highest importance to changes in the stance of monetary policy as well as policy uncertainty.⁷ Likewise, at the July 2013 FOMC meeting, a summary of financial developments by the NY Fed stated that “over the past few months, long-term Treasury rates moved up notably, in large part because of Federal Reserve communications at the JEC testimony and June FOMC meeting that investors interpreted as pointing to a less accommodative stance of monetary policy.”⁸ The same factors were cited by the NY Fed at the September 2013 FOMC meeting: “the increases in interest rates continued to be driven by shifting expectations for Federal Reserve policy.” Overall, there can be little doubt that the spike in long-term interest rates was driven by a true shock to monetary policy.

As shown in Figure 1, Panel A, this shock to longer-term interest rates was persistent. Although long-term rates drifted down somewhat from mid-September to late-October, the trend then reversed, and 10-year nominal Treasury yields ended the year slightly above their September peak, at 3.04 percent.⁹ At the end of April 2014, nominal 10-year Treasury remained about 75 bps above their level on May 21, 2013, while 10-year TIPS yields were around 85 basis points higher.

Importantly, as shown in Panel B, the spike in Treasury yields was passed directly through to other key borrowing rates within the economy. In particular, the average 30-year fixed rate mortgage increased by about 100 basis points from mid-May to early-September 2013, as did

⁷ See Exhibit 1, Panel 2, of <https://www.federalreserve.gov/monetarypolicy/files/FOMC20130619material.pdf>.

⁸ See, <https://www.federalreserve.gov/monetarypolicy/files/FOMC20130731meeting.pdf>.

⁹ At the September 2013 meeting, the FOMC surprised markets by delaying the start of tapering. As Chair Bernanke stated during the post-FOMC press conference, one reason for the delay was that “the tightening of financial conditions observed in recent months, if sustained, could slow the pace of improvement in the economy and the labor market.” Ultimately, tapering was announced at the December 2013 FOMC meeting.

yields on benchmark corporate bond indexes. Given the magnitude and speed of these moves, the taper tantrum represents one of the largest monetary policy shocks since the 1980s.

Panel C of Figure 1 considers the behavior of the S&P 500 index. Interestingly, although the S&P 500 index initially declined by as much as 6 percent from May 21 to June 24, 2013, it subsequently rebounded and continued its earlier upward trend. By year-end, the index was up about 11 percent since May 21, even as 10-year Treasury had increased by 100 basis points. This provides some suggestive evidence that perhaps the marginal equity market investor did not expect the taper tantrum to slow the ongoing economic recovery.

Panel D shows the broad U.S. dollar index.¹⁰ Although the dollar exhibited some volatility following the taper tantrum, the net effect was quite limited. From May 21 to early-September 2013, the broad dollar index appreciated only by about 2 percent, and it ended the year essentially unchanged relative to its May 21 level. One reason for this muted effect is that the taper tantrum pushed up government yields around the world. For example, in the U.K., 10-year gilt yields spiked by 110 basis points from May 21 to early-September, while over the same period German 10-year bund yields increased by about 65 basis points.¹¹ This effectively limited the size of interest rate differentials between countries, which are key determinants of exchange rates.

III. Economic effects

What effect did the taper tantrum have on the U.S. economy? To shed light on this question, Figures 2 and 3 plot the trajectory of key economic variables around this episode.

Of course, we cannot know how economic conditions would have evolved had the taper tantrum never occurred. There is only one history, and counterfactuals are unobservable. However, by simply plotting the data we can examine how each indicator performed relative to its prior trend. This exercise provides evidence on whether the spike in interest rates due to the taper tantrum slowed the economy, and if so, by how much. For each panel, the dashed red line shows the

¹⁰ We use the nominal broad dollar index released by the Federal Reserve. See, <https://www.federalreserve.gov/releases/h10/>.

¹¹ The taper tantrum also had an acute effect on emerging market asset prices, exchange rates and capital flows.

extrapolation of a linear time trend estimated over approximately the 18-month period prior to the taper tantrum.¹² The vertical black line corresponds to the start of the taper tantrum (2013:Q2 for quarterly data and May 2013 for monthly data).

In each panel, we also report how the relevant variable performed compared to its consensus (i.e., mean) forecast from the survey of economic forecasters conducted by Blue Chip Economic Indicators, provided by Haver Analytics. This comparison serves as an important benchmark. Consensus expectations by professional forecasters reflect relevant information known at the time. If several main economic indicators underperformed relative to consensus expectations, this bolsters the case that the taper tantrum had some negative effect on the economy. In contrast, if all the main indicators meet or exceed consensus expectations, then the case that the taper tantrum had a negative effect is much weaker—particularly if each indicator also followed or outperformed its earlier trend.

Accordingly, we use the Blue Chip survey from May 2013—which was carried out in late-April or early-May, before the taper tantrum started—and compare the consensus forecast of each variable to its realization for the period 2013:Q2 to 2014:Q4. The end date, 2014:Q4, is the furthest out that forecasts are available in the May 2013 Blue Chip survey.¹³ Since the 100 basis point increase in interest rates due to taper tantrum had occurred by early-September 2013, this gives 16 months over which to detect a response. Given our findings, this should be an adequate amount of time. That is, since we do not find any observable negative effect by 2014:Q4, it would be unreasonable to attribute anything happening afterwards (i.e., in 2015 or later) to the taper tantrum, as opposed to other economic events happening at that later time.

Before discussing each indicator in detail, we acknowledge one potential challenge to our overall approach—specifically, it is possible that the economy may have experienced some contemporaneous positive shock that offset the actual negative effect of the taper tantrum. While we cannot fully rule this out, we argue that is unlikely. Importantly, our close reading of the historical record does not reveal that there was any such offsetting and identifiable positive

¹² Specifically, for quarterly series the estimation sample is 2011:Q3 to 2013:Q1 and for monthly series the estimation sample is December 2011 to May 2013.

¹³ We end each chart in 2014:Q4 to match the maximum horizon of the consensus forecast.

shock.¹⁴ We also emphasize the negative reaction of residential investment following the taper tantrum (discussed in detail below). Residential investment is the most interest rate sensitive component of GDP, and its negative reaction is an important “proof of concept.” If there was an offsetting positive shock, then it seems that we would not have seen a negative reaction even in residential investment. Moreover, given the non-reaction of GDP, such a hypothetical positive shock would have had to *perfectly* offset the supposed negative affect of the taper tantrum. For other variables, like consumption and employment, the positive shock would have had to more than offset the taper tantrum. A contemporaneous yet unidentified positive shock having such a complicated configuration of effects seems unlikely. We would therefore argue that the most reasonable interpretation of our findings is that there was no offsetting positive shock—rather, the 100 basis point increase in long-term rates due to taper tantrum simply had no meaningfully negative aggregate effect.

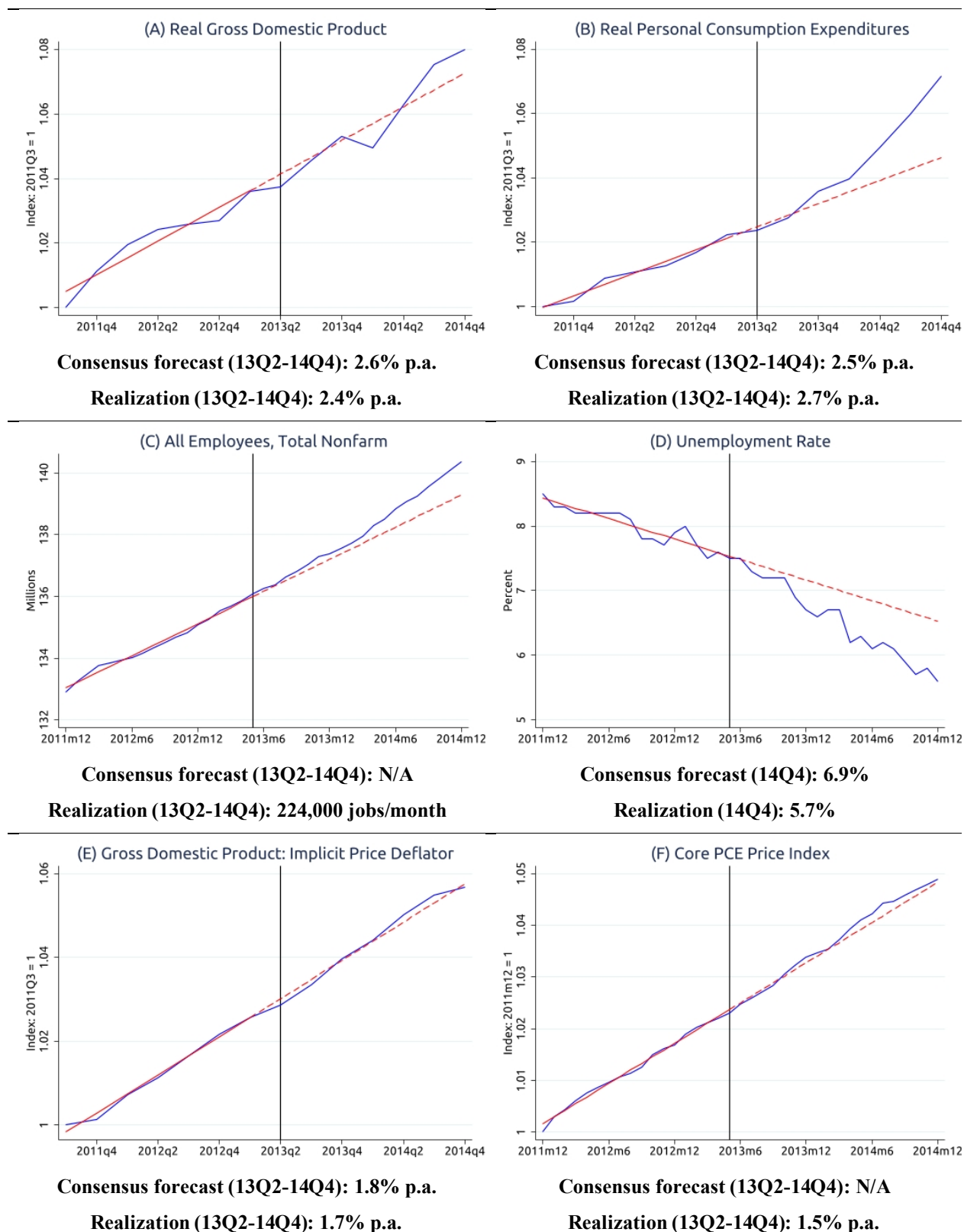
Figure 2

Panel (A): Real GDP grew at a slightly above-trend pace after the taper tantrum compared to the period immediately prior. This is evident from the fact that real GDP, shown by the solid blue line, ended 2014:Q4 a bit above the red dashed lined (which depicts the extrapolation of the pre-taper tantrum trend). In other words, GDP growth actually accelerated slightly after the taper tantrum, which indicates that the 100 basis point spike in interest rates did not have any observable negative effect.

From 2013:Q2 to 2014:Q4, real GDP grew at quite a robust annualized pace of 2.4 percent. This rate of growth was slightly below the Blue Chip consensus forecast of 2.6 percent. Overall though, it’s fair to characterize real GDP growth as coming in essentially in line with expectations. Although consensus forecasts were off by 0.2 percentage points, this error is very small and not particularly meaningful. Forecasters are rarely able to predict GDP growth, or any variable for that matter, to the exact decimal place, particularly over the almost two-year long horizon that we consider. To put the forecast error in context, the root mean-squared error of two-year-ahead Blue Chip consensus forecasts for real GDP growth, expressed as an annual rate,

¹⁴ For example, we have read market commentaries and historical FOMC documents (which are now publicly available). These did not reveal any identifiable positive shock that might have offset the taper tantrum.

Figure 2: Main measures of economic performance



Source: Bureau of Economic Analysis and Bureau of Labor Statistics; retrieved from FRED, <https://fred.stlouisfed.org>.

is 1.3 percent, according to estimates by the Congressional Budget Office.¹⁵ An error of 0.2 percentage points is then indeed very small and essentially amounts to just noise.

A careful examination of Panel A also reveals that real GDP experienced one negative quarter of growth following the taper tantrum, in 2014:Q1, during which growth came in at -1.4 percent (annualized). In that quarter, a deceleration in private inventory accumulation and a decline in net exports each subtracted 1.4 percentage points from GDP growth.¹⁶ Changes in inventories and net exports (the latter is discussed in more detail below) are the two most volatile components of GDP. As such, not much signal should be taken from the fact that these moderately decelerated for one quarter. We therefore do not think that the decline in GDP in 2014:Q1 had much to do with the taper tantrum.

Our overall conclusion, then, is that the taper tantrum did not have any noticeable effect of real GDP growth. Real GDP growth followed its earlier trend and came in roughly in line with consensus forecasts.

Panel (B): Real personal consumption expenditures (PCE) clearly accelerated following the taper tantrum. Moreover, for the period 2013:Q2 to 2014:Q4, real PCE growth slightly exceeded Blue Chip consensus forecasts, growing at a robust annual rate of 2.7 percent, compared to the consensus estimate of 2.5 percent. We have also examined light vehicles sales (autos and light trucks, not shown), which are usually considered a particularly interest rate sensitive segment of consumption given that most purchases are financed with auto-loans. These came in above expectations (16 million per year for 2013-2014 compared to a consensus forecast of 15.6 million). Overall, the strong performance of PCE is clearly inconsistent with the taper tantrum having a negative effect of the economy.

Panels (C) and (D): The growth in nonfarm payroll employment, shown in Panel C, also accelerated following the taper tantrum. Although Blue Chip does not provide forecasts of this variable, it does provide forecasts of the unemployment rate, shown in Panel D. The unemployment rate declined at a faster pace following the taper tantrum compared to its earlier trend. By 2014:Q4, the unemployment rate had declined to 5.7 percent (average for the quarter).

¹⁵ See <https://www.cbo.gov/publication/57684>. The estimate is based on the sample period 1980-2019.

¹⁶ Private inventories still increased, but at a slower pace than in the prior quarter, and so were a negative contributor to GDP growth.

This was notably below the Blue Chip consensus forecast of 6.9 percent. Simply put, the considerable improvement in the labor market is not consistent with the taper tantrum having a negative effect on the economy.

Panels (E) and (F): We consider two measures of inflation—the GDP implicit price deflator, Panel E, and the core PCE price index, Panel F. These both maintained the same trend following the taper tantrum as before. Inflation, as measured by the GDP price deflator, came in at 1.7 percent from 2013:Q2 to 2014:Q4, which was just a fraction below the consensus forecast of 1.8 percent. Over the same period, core PCE inflation came in at 1.5 percent.¹⁷ Inflation was subdued in the years following the Global Financial Crisis. However, the rate of inflation did not change after the taper tantrum. It is therefore difficult to conclude that the taper tantum had any noticeable effect on inflation.

Figure 3

Figure 3 delves deeper, considering various components of GDP as well as industrial production.¹⁸

Panels (A): Real residential investment is the one component of GDP where a clear negative effect of the taper tantrum is evident. Prior to the taper tantrum, real residential investment closely followed its trend, exhibiting very little deviation around that trend. After the taper tantrum struck, however, it declined at an annualized rate 6.1 percent in 2013:Q4 and 2.8 percent in 2014:Q1. In total, this decline was actually very small, amounting to only about 2 percent.¹⁹ Moreover, after falling for two quarters, real residential investment essentially returned to the same trend it was on prior to the taper tantrum.

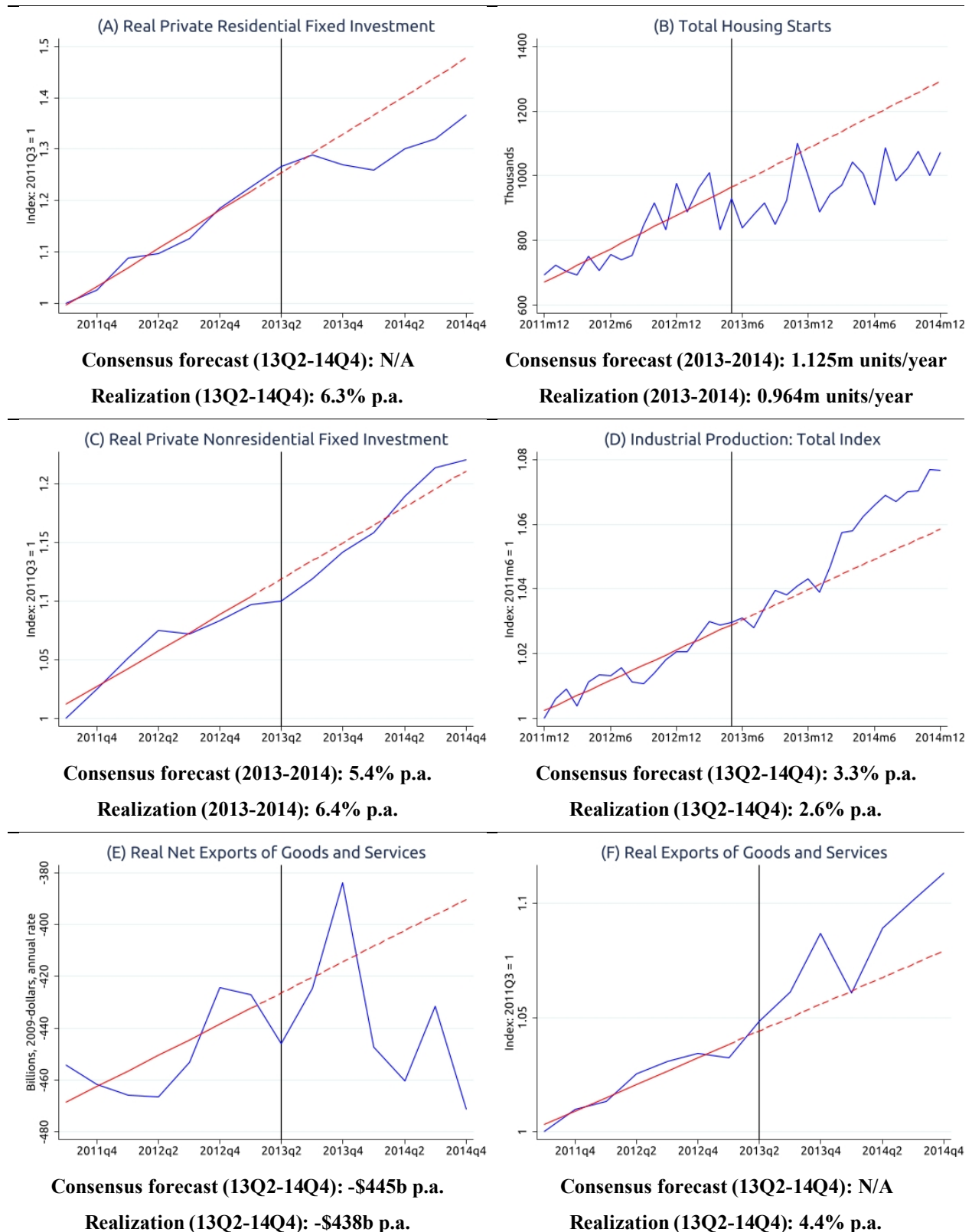
The case that the decline in residential investment was caused by the taper tantrum is very strong. The timing of the decline makes the causal argument especially persuasive. As shown in

¹⁷ Although forecasts are not available for this variable, it is the Fed's preferred measure of underlying inflation.

¹⁸ For two of the variables in the figure—housing starts and real nonresidential investment—Blue Chip forecasts are only available at annual horizons rather than quarterly horizons. For these two variables we still use the May 2013 Blue Chip survey and provide a comparison of the forecasts and the realizations for the full period 2013-2014.

¹⁹ I.e., $2\% = 1 - (1 - 0.061/4) * (1 - 0.028/4)$.

Figure 3: Additional measures of economic performance



Source: Bureau of Economic Analysis and Federal Reserve; retrieved from FRED, <https://fred.stlouisfed.org>.

Panel B of Figure 1, the taper tantrum abruptly pushed up mortgage rates, with the average 30-year fixed rate mortgage increasing by about 100 basis points from mid-May to late-June 2013 (i.e., the second half of 2013:Q2). Real residential investment continued to expand in 2013:Q3, which makes sense since an instantaneous response would not be expected (much of the investment done in 2013:Q3, for example, would likely have been commenced earlier). The fact that the series started to decline in 2013:Q4, however, shows that the response can be quite rapid, essentially occurring within a couple quarters of the interest rate shock.

The negative reaction of residential investment provides a template for what an actual response would look like. Residential investment is generally regarded as the most interest rate sensitive component of GDP.²⁰ In that sense, it serves as a proof of concept we find a negative affect precisely for this component.

Why then did the decline in residential investment following the taper tantrum leave no evident imprint on overall GDP growth? The reason is that residential investment is only a small share of GDP—as of 2013:Q2, it amounted to only 3 percent of overall GDP. As such, the decline in residential investment only subtracted 0.2 percentage points from annualized GDP growth in 2013:Q4 and 0.1 percentage points in 2014:Q1. In other words, the direct effect on overall GDP was negligible.

Panel (B): Total housing starts confirm the story from Panel A, although this series is more volatile than residential investment. In particular, housing starts underperformed relative to their prior trend and came in below consensus forecasts (964 thousand units per year for 2013-2014 versus a consensus forecast of 1.125 million).

Panel (C): The response of nonresidential investment is very different. Following the taper tantrum, real nonresidential investment essentially maintained its earlier trend. Moreover, real nonresidential investment beat its consensus forecast, growing at a robust annual rate of 6.4 percent in 2013 and 2014, compared to the consensus forecast of 5.4 percent. This is quite a striking fact given that corporate borrowing costs increased notably following the taper tantrum. As shown in Panel B of Figure 1, benchmark BBB corporate bond yields shot up by as much as

²⁰ E.g., residential investment fell notably during the two most recent Federal Reserve hiking cycles, in 2018 and 2022. Of course, unlike the taper tantrum, these do not represent clean monetary policy shocks.

100 bps from mid-May to early September 2013. By the end of 2013, BBB yields were still about 65 bps higher than their levels in mid-May.

The lack of response in nonresidential investment is therefore surprising on some level, since a higher cost of capital, and its presumed negative effect on business investment, is thought of as one of the most traditional channels of monetary policy transmission. How then can we explain our findings? One possibility is that the 100 basis point increase in corporate borrowing costs observed during the taper tantrum is simply too small to put any noticeable dent in business investment.

It turns out that this is precisely consistent with what business executives say. As detailed by Sharpe and Suarez (2021), surveys of U.S. chief financial officers (CFOs) reveal that business investment is remarkably insensitive to increases in interest rates. For example, the overwhelming majority of executives—84 percent—indicate that their firms would not reduce their investment plans in response to a hypothetical 100 basis point increase in borrowing rates, holding demand and product market conditions constant. In the same survey, CFOs were asked specifically about how their firms responded to the taper tantrum: 91 percent indicated that they had not reduced their capital spending.²¹ Our findings are therefore in line with the survey evidence. Intuitively, corporate investment is undertaken with the long-run in mind, and it seems that few investment projects are so marginal and so tenuous that they would be abandoned as a result of a 100 basis point increase in borrowing costs.

Panel (D): We also consider the effects on industrial production, since many studies on monetary policy shocks examine this variable. Growth in industrial production accelerated following the taper tantrum, exceeding its earlier trend. On the other hand, industrial production came in moderately below consensus forecasts, growing at an annualized rate of 2.6 percent from 2013:Q2 to 2014:Q4, versus a consensus estimate of 3.3 percent. Given its above-trend growth, and all of our other results, we do not take much signal from the fact that industrial production moderately underperformed relative to consensus forecasts.

²¹ Sharpe and Suarez (2021) also report that the average firm has a very high hurdle rate of about 15% for evaluating potential investment projects, and that this rate tends to be very sticky over time.

Panel (E) and (F): If tighter monetary policy leads to an appreciation of the exchange rate, this could negatively affect net exports (through the standard exchange rate channel of monetary policy transmission). In the case of the taper tantrum, however, Panel D of Figure 1 showed that the effect on the U.S. exchange rate was fairly muted. Panel E shows that real net exports were lower after the taper tantrum relative to an extrapolation of the prior trend. On the other hand, net exports are one of the most volatile components of GDP, which is evident even for the period shown in the chart. This means that simply extrapolating earlier trends may not be appropriate. It is more noteworthy that real net exports came in almost exactly in line with consensus forecasts (about -\$440 billion, annualized, over 2013Q2 to 2014Q4).²² Moreover, Panel F shows that U.S. real exports (i.e., without subtracting imports) grew at an above-trend pace following the taper tantrum, meaning that the volatility in net exports was driven by volatility in imports (not exports). Taken together, these facts suggest that the exchange rate channel was not particularly important during the taper tantrum.

IV. Conclusions

The main conclusions from our analysis are then as follows. A 100 basis point increase in long-term interest rates is too small to have any noticeable negative effect on GDP growth, employment, or inflation. We add the caveat that the taper tantrum occurred when interest rates were already very low. It is possible that if rates were to rise by a similar amount, but from a higher starting level, the effect on the economy could be more contractionary.

The taper tantrum is of course a single event. However, given the magnitude of this shock and the rarity of large monetary policy shocks in recent decades, we would argue that this episode deserves particular attention. Our findings therefore have important implications for the conduct of monetary policy.

²² For consensus expectations of net exports, we use the Blue Chip survey dated August 2013. This is because the May 2013 survey, which we use for all other variables, provides forecasts of net exports based on chained 2005-dollars. The corresponding data series using 2005-dollars ends in July 2013. The Blue Chip survey for August 2013 is the first to use 2009-dollars. We report the realization of net exports also based on 2009-dollars, using the vintage series as of June 2015 (available from <https://alfred.stlouisfed.org>). For all other variables, we use the most recently available vintage (based on chained 2012-dollars).

One implication is that central banks might be able to begin policy tightening more rapidly into an economic recovery than otherwise believed, with little downside risk to the economy. The case for doing so would be stronger if there are countervailing risks of maintaining an overly accommodative policy for too long, such as financial stability risks or the risk of inflation.

Another possible implication of our findings is that monetary policy actions that seek to push down long-term interest rates below some critically low level might not be particularly effective. The taper tantrum resulted in 10-year Treasury yields increasing from about 2 percent to 3 percent, with no observable negative effect on the overall economy. There is thus a reasonable case to be made that perhaps little was gained from pushing Treasury yields below 3 percent.

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