



**Government as a Cause of the 2008 Financial Crisis:
A Reassessment After 10 Years**

John B. Taylor

Remarks prepared for the “Causes” Session
“Workshop Series on the 2008 Financial Crisis:
Causes, The Panic, The Recession, Lessons”

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HOOVER INSTITUTION
434 GALVEZ MALL
STANFORD UNIVERSITY
STANFORD, CA 94305-6010

October 19, 2018

This paper reassesses empirical findings about the causes of the 2008 financial crisis in the light of research and events during the past 10 years. My original assessment, made a decade ago, was that empirical research “strongly suggests that specific government actions and interventions should be first on the list of answers” to the question “what caused the financial crisis?” Empirical studies with newer data, longer time periods, more countries, and different statistical or economic modelling techniques confirms that original assessment. The paper focuses on monetary policy. Other government actions possibly causing the crisis include deviations from existing prudential regulatory rules and interventions by Fannie Mae and Freddie Mac.

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The purpose of this paper is to reassess empirical findings about the causes of the 2008 financial crisis and the severity of the Great Recession in the light of research and events during the past 10 years. My original assessment, made a decade ago, was that empirical research “strongly suggests that specific government actions and interventions should be first on the list of answers” to the question “what caused the financial crisis?”² A review of empirical studies conducted over the past decade with newer data, longer time periods, more countries, and different statistical or economic modelling techniques confirms that original assessment to a remarkable degree.

This paper focuses on monetary policy. Other government actions possibly causing the crisis include deviations from existing prudential regulatory rules and interventions by government sponsored enterprises, Fannie Mae and Freddie Mac.³ These actions are considered in other parts of this workshop series.

¹ Mary and Robert Raymond Professor of Economics, Stanford University and George P. Shultz Senior Fellow in Economics, Hoover Institution, Stanford University

² John B. Taylor (2009), *Getting Off Track: How Government Actions and Interventions Caused, Worsened and Prolonged the Financial Crisis*, Hoover Press, Stanford University, p xi.

³ See Morgenson and Rosner (2011) and Wallison (2015). Boettke and Horowitz (2009) consider these factors in combination with monetary policy mistakes.

How the World Looked Circa 2007

In the year before the onset of the financial crisis, I wrote and presented several empirical papers showing that recent monetary policy decisions deviated from policies that had worked well in the past and were thereby causing problems. One paper, presented in August 2007 in Jackson Hole Wyoming at the annual Federal Reserve conference, showed empirically that there was a significant deviation in 2003-2005 from the more rules-based monetary policy strategy that had worked well in the two prior decades.⁴ The resulting extra low policy interest rates were a factor leading to a search for yield, excessive risk taking, a boom and bust in the housing market, and eventually the financial crisis and recession. Another paper, presented in June 2007 in Girona Spain at a National Bureau of Economic Research conference showed empirically that these actions spread internationally as central banks tended to follow each other in setting their policy interest rate.⁵ Thus, the unusually low interest rates in the United States led to unusually low interest rates in Europe. I summarized these two papers in a keynote address⁶ at the Bank of Canada at a conference in honor of Governor David Dodge in November 2008, and in the book *Getting Off Track: How Government Actions and Interventions Caused, Worsened and Prolonged the Financial Crisis*.

⁴ John B. Taylor (2007a) "Housing and Monetary Policy," in *Housing, Housing Finance, and Monetary Policy* proceedings of Federal Reserve Bank of Kansas City Symposium, Jackson Hole, Wyoming, pp. 463-476.

⁵ John B. Taylor (2007b), "Globalization and Monetary Policy: Missions Impossible," NBER conference in Girona Spain on June 13, 2007, later published in Mark Gertler and Jordi Gali (Eds.) *The International Dimensions of Monetary Policy*, The University of Chicago Press, 2009, pp. 609-624

⁶ John B. Taylor, (2008), "The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong," *A Festschrift in Honour of David Dodge's Contributions to Canadian Public Policy*, Bank of Canada, November, pp. 1-18.

The Impact of Policy Getting Off Track

Figure 1 is based on a simple time-series chart that I presented in August 2007 at Jackson Hole (Taylor (2007a)). The chart is from *The Economist* magazine, whose editors copied my chart and added a clever headline—"Loose fitting." The chart shows that the Fed held its policy interest rate well below the Taylor rule from 2003 to 2005. Poole (2007) published a similar finding in February of that year when he was President of the Federal Reserve Bank of St. Louis.

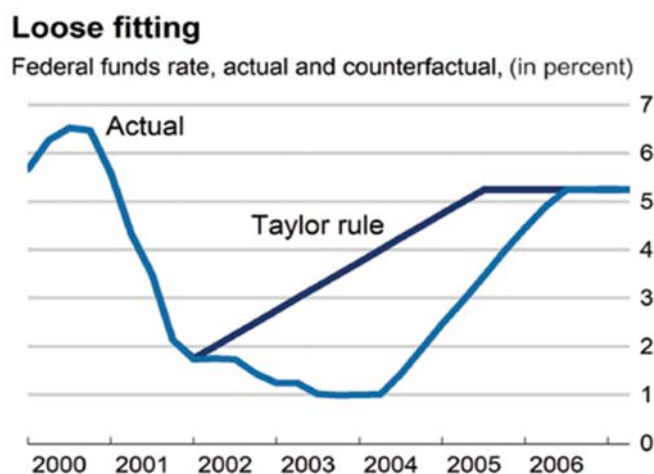


Figure 1. Chart published in *The Economist*, October 18, 2007.

Figure 2 shows the actual boom and bust in housing starts during this period and a counterfactual simulation of what housing would have looked like if the Fed had kept its interest rate in line with the rule. The simulation is based on an empirically estimated econometric model relating housing starts to the interest rate in the years before the crisis. When I simulated that model with the interest rate recommended by the rule rather than the actual interest rate, the boom and the bust disappeared, as shown in Figure 2. If the Fed had not held rates too low, there

would have been less search for yield, less risk-taking and fewer problems on the banks' balance sheets.

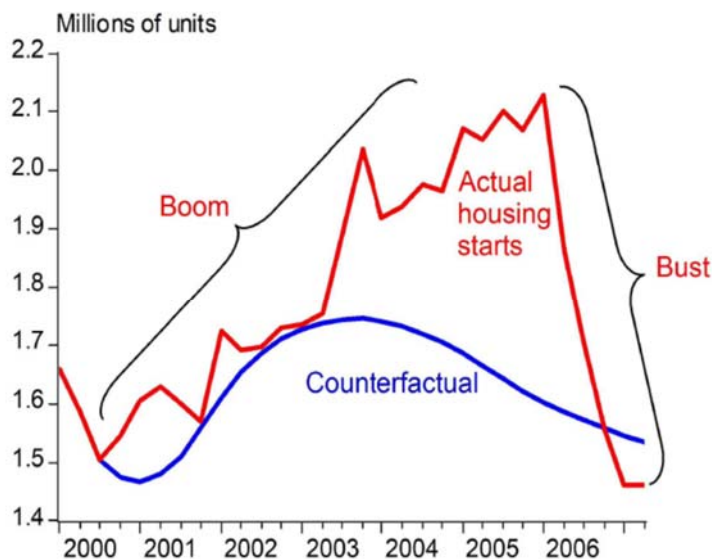


Figure 2. The Boom-Bust in Housing Starts Compared with the Counterfactual (Source: Taylor (2007a))

This “too low for too long” story was controversial at the time. I recall being hesitant to tell it when I was invited to make a presentation at the annual monetary conference in Jackson Hole, especially since the monetary policy decision makers attending the conference were friends. According to the transcript of the conference, I said: “Maybe this isn’t the best way to put it as a guest, but in some sense, it seems to me that the real concern is preventing central banks from causing asset bubbles, as much as from responding to them.” I was not making an argument that the Fed should have responded to bubbles. Rather I showed that the rate was too low according to basic macroeconomic considerations in the Taylor rule and may have caused a bubble.

To be sure, the research did not suggest that this was the only reason for the housing boom and bust. The government support of housing through Fannie Mae and Freddie Mac was

likely a factor behind the boom as were lax enforcement by government regulators which allowed for risky mortgage loans with very high loan to value ratios. These too, however, are examples of deviations from rules-based policy.

Moreover, some of those regulatory mistakes were endogenous to the monetary-induced boom and bust in housing. This endogeneity can be illustrated with a chart from the same 2007 paper replicated in Figure 3. It shows that foreclosure rates and delinquency rates were inversely related to the rise and fall in housing price inflation. People were willing to make mortgage payments and avoid foreclosure as they saw the prices of their homes rising rapidly. The low foreclosure and delinquency rates also led to less stringent lending standards and regulations. But these low foreclosure and delinquency rates were temporary, and the rate rose again as soon as housing prices inflation turned down. The regulatory mistakes with lax standards were thus connected to monetary policy mistakes which led to the housing boom.

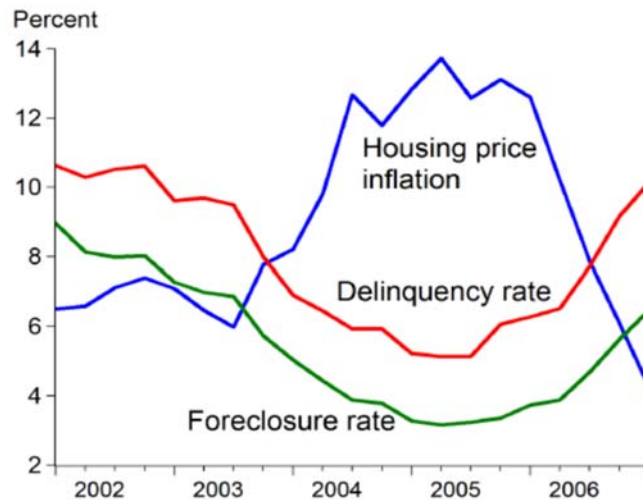


Figure 3. House Prices, Delinquencies & Foreclosures on Subprime Adjustable-Rate Mortgages (Source: Taylor (2007a))

A Reassessment of the Impact of Policy Getting Off Track

As I was researching and writing about the role of monetary policy in the housing boom and bust in the United States, economists Ahrend, Cournède and Price (2008) at the OECD were independently discovering the same phenomenon in several other countries. Figures 4 and 5 show their striking results for the countries in the Eurozone.

The scatter plot in Figure 4, which is drawn from their paper, shows the relationship between *housing investment* and the deviation from the Taylor rule in the Eurozone countries from 2001Q3 to 2006Q4. Figure 5 shows the relationship between *housing loans* and the same deviation over the same period. Both Figure 4 and Figure 5 show a strong positive relationship between interest rate deviations from what domestic economic conditions would suggest and the housing market. Observe that among Eurozone countries the deviations are largest in Greece, Ireland and Spain, and that these are the three countries with the largest booms in both housing investment and lending according to the OECD data. Ahrend (2010) later wrote that “‘below Taylor’ episodes have generally been associated with the build-up of financial imbalances in housing markets.”

Observe also that Germany is at the other side of the scatter, with interest rates closer to the rule and much more modest developments in housing. Of course, within the Eurozone there is only one policy interest rate, but that rate was clearly too low for macroeconomic conditions in some countries. Even within the “one size fits all” framework of the Eurozone, it appears that the rate could have been nearer the middle, and thus higher.

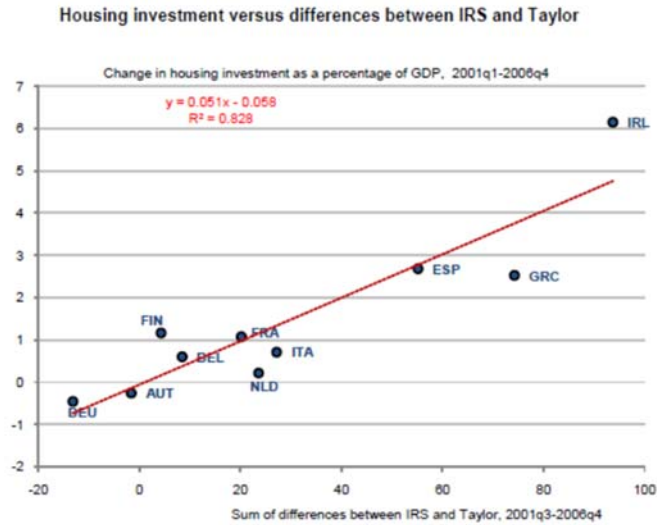


Figure 4. Housing Investment and Deviations from the Taylor Rule
(Source: Ahrend, Cournede, and Price (2008))

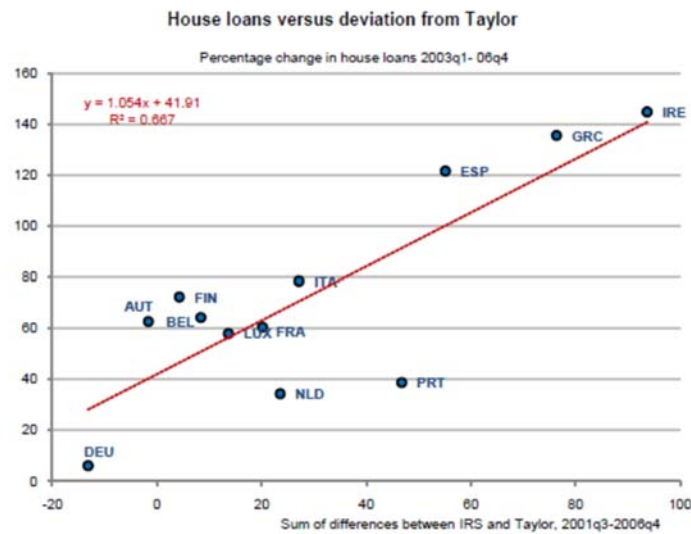


Figure 5. Housing Loans and Deviations from Taylor Rule
Source: Ahrend, Cournede, and Price (2008)

Other research followed. Jarocinski and Smets (2008) of the European Central Bank found evidence in the United States that “monetary policy has significant effects on housing

investment and house prices and that easy monetary policy designed to stave off perceived risks of deflation in 2002-04 has contributed to the boom in the housing market in 2004 and 2005.”

Figure 6 is drawn from the research work of George Kahn (2010) of the Federal Reserve Bank of Kansas City. It shows a relation in the United States between the deviation from a policy rule (TRDEV1) and housing prices measured relative to rents. Taking account of that deviation explains much of the boom in housing prices in the 2003-2007 period. Kahn (2010) wrote that “When the Taylor rule deviations are excluded from the forecasting equation, the bubble in housing prices looks more like a bump.”

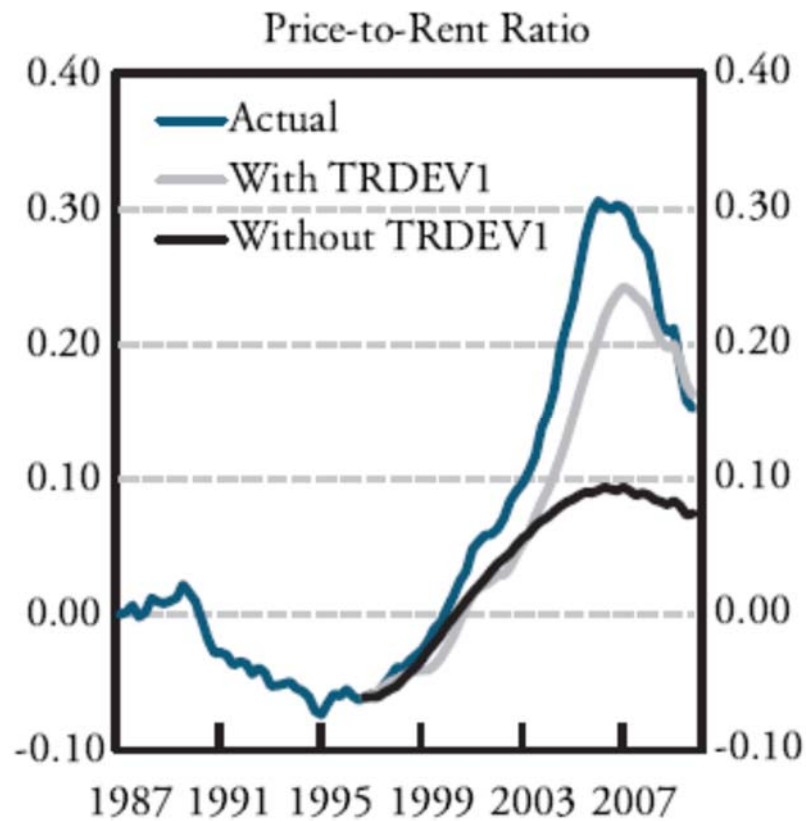


Figure 6. U.S. Housing Prices and Deviations from the Taylor Rule
(Source: Kahn (2010))

Research by Bordo and Landon-Lane (2013) added more evidence by considering longer spans of time and more countries. Using data from 18 OECD countries from 1920 to 2011, they too found that unusually low interest rates have been a significant cause of booms in housing prices as well as in stock and commodity prices

Oscar Jordà, Moritz Schularick, and Alan Taylor (2015) considered even longer time periods, a broader set of countries, and a role for the credit channel of monetary policy. They began their paper with an illustrative examination of the Eurozone countries which replicates the results reported above. They wrote that “...common monetary policy administered by the ECB meant that for some countries monetary conditions would be ‘too loose,’ whereas for some others they would be ‘too tight.’ Booming economies would be encouraged to grow, slumping economies to decline, resulting in greater real economic instability.... If transmission works through the credit channel of monetary policy, then countries facing excessive monetary ease would see larger credit booms than normal.... Prima facie, the events in the Eurozone in the 1999–2008 pre-crisis phase seem to conform to this narrative.”

Figure 7, drawn from their paper, nicely illustrates these findings. It compares three Eurozone countries—Ireland, Spain and Germany—over the period from 1999Q1 to 2008Q1. The top panel of Figure 7 shows that the ECB interest rate was too low for conditions in Ireland and Spain as measured by the Taylor rule throughout this period. In contrast, in Germany the interest rate was quite close, perhaps a bit on the high side, to what a Taylor rule would say.

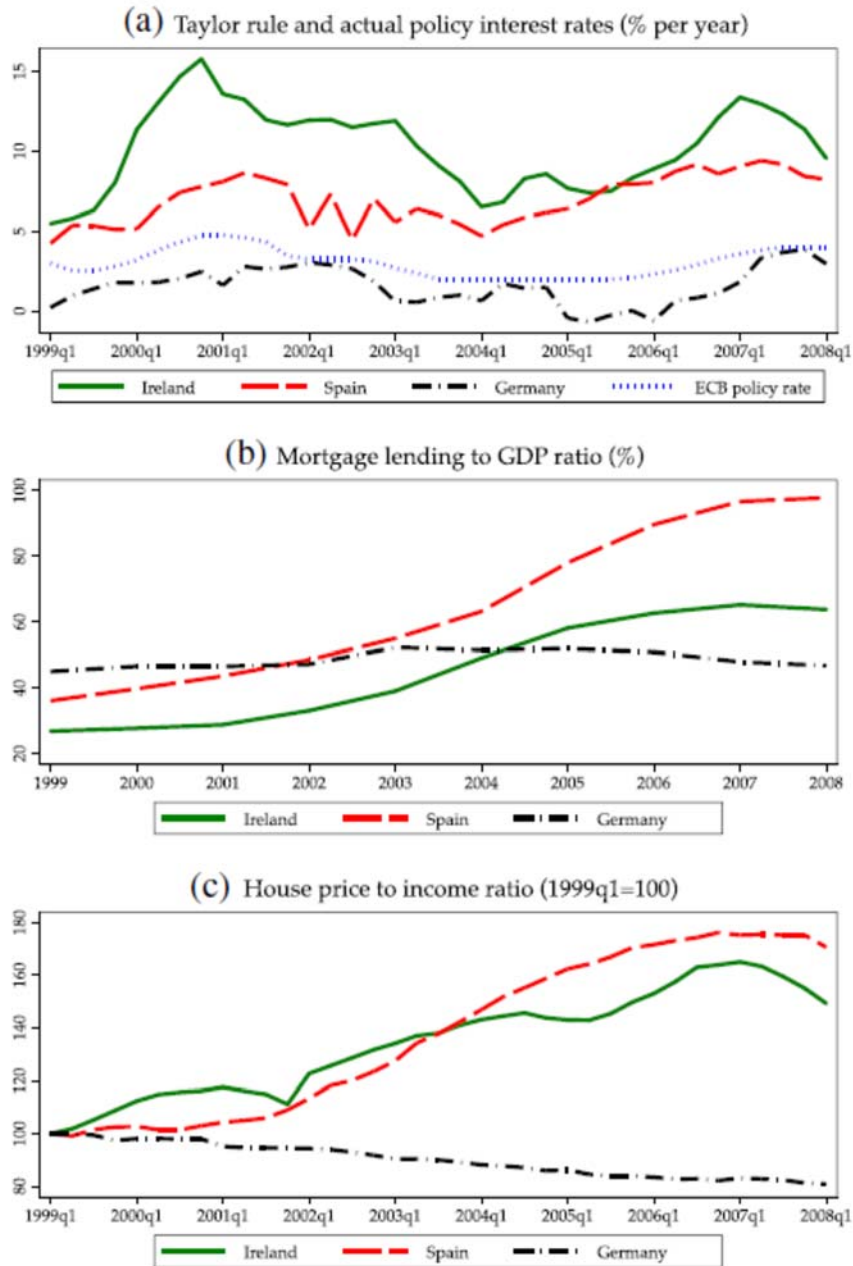


Figure 7. Short-term Interest Rates, Credit Growth, House Prices: Ireland, Spain, Germany
 Source: Oscar Jorda, Moritz Schularick, Alan Taylor (2015)

The second panel of Figure 7 looks at mortgage lending as a share of GDP for these three countries. It shows that mortgage lending grew much more rapidly in Spain and Ireland compared with Germany, much as one would expect from the interest rate difference.

The third panel of Figure 7 shows housing prices in the three countries, confirming the finding of an association of interest rate deviations from policy rules and housing price inflation. The authors write that “These data provide some support to the hypotheses, often asserted in analyses of the Eurozone crisis, that periphery countries experienced an exogenous monetary easing which went on to fuel credit and housing price boom and bust cycles—ending in economic crises and output disasters for countries like Ireland and Spain.”

These results replicate and confirm those of Ahrend, Cournède and Price (2008) for the Eurozone countries. But Jordà, Schularick, and Taylor (2015) also go further to consider 17 countries over a span of more than a century, combining different large data sets on lending and housing prices. They consider the following countries where the two listed time intervals show when they had mortgage lending data and housing price data, respectively:

Australia	1870–2011	1870–2012
Belgium	1885–2011	1878–2012
Canada	1874–2010	1921–2012;
Switzerland	1870–2011	1900–2012;
Germany	1883–2011	1870–2012;
Denmark	1875–2010	1875–2012;
Spain	1904–2012	1970–2012;
Finland	1927–2011	1905–2012;
France	1870–2010	1870–2012;
U.K.	1880–2011	1899–2012;
Italy	1870–2012	1970–2012;
Japan	1893–2011	1913–2012;
Netherlands	1900–2011	1870–2012;
Norway	1870–2010	1870–2012;
Sweden	1871–2011	1870–2012;
U.S.	1896–2011	1890–2012.

Their statistical analysis used an instrumental variable method to distinguish the parts of a country’s money/credit policy decisions that are endogenous to domestic factors from exogenous foreign effects due to exchange rate concerns. They find that monetary policy—either

through lower interest rates or easier credit than normal—leads to bigger lending and housing price booms. They write that their findings “expose a close link between mortgage credit and house price booms on the one hand, and financial crises on the other. Over the past 140 years of modern macroeconomic history, mortgage booms and house price bubbles have been closely associated with a higher likelihood of a financial crisis.”

Another important addition to the research that has bearing on the cause of the financial crisis is that of Mian, Sufi and Verner (2017). In addition to finding an impact of household debt and low interest rates on real GDP, they find a boom-bust pattern in which the initial positive impact is followed by negative impact. Using regression methods, they show that there is a negative impact of household debt relative to GDP during the years 2002 to 2007 on the change in real GDP from 2007 to 2010. Mian, Sufi and Verner (2017) write that “A one standard deviation increase in the household debt to GDP ratio over the last three years (6.2 percentage points) is associated with a 2.1 percentage point decline in GDP over the next three years.”

Figures 8 and 9 summarize their findings in a useful way. Figure 8 shows simply that there is a boom and bust effect of household lending on real GDP. Initially, real GDP rises as credit rises, but after 2 years or so the impact reverses.

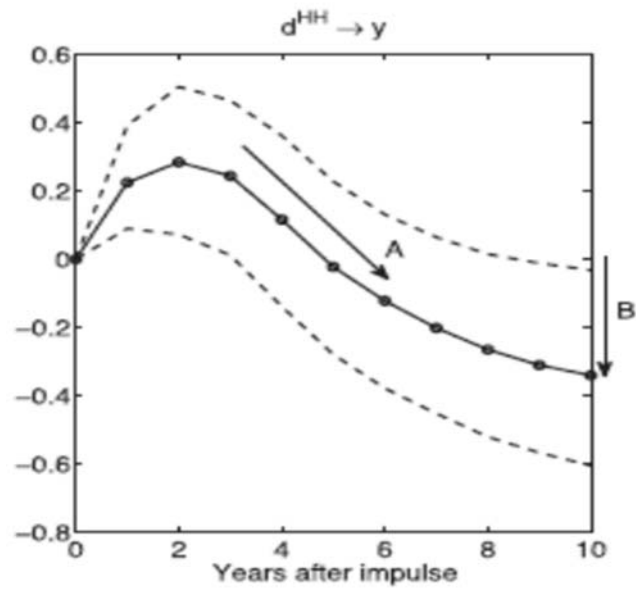


Figure 8. Impact of Household Debt on real GDP; shown by impulse response function from of VAR estimated over 30 countries from 1960-2012 (Source: Mian, Sufi, Verner (2017), Figure I, middle panel, p. 1765)

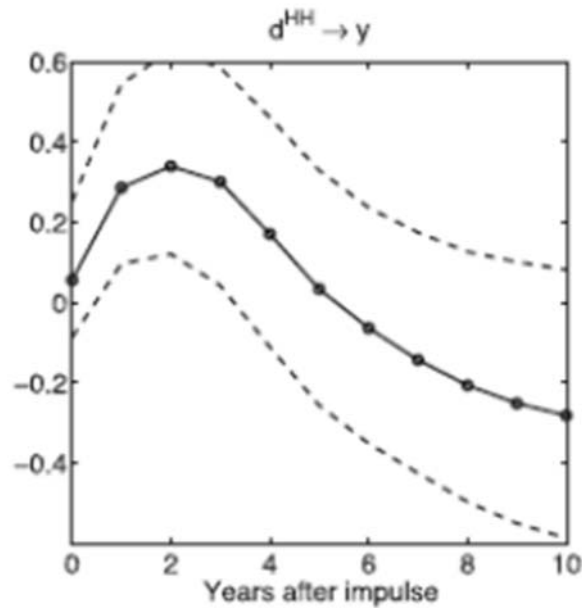


Figure 9. Impact of negative mortgage lending spread shock on real GDP; shown by impulse response function from VAR estimated from 30 countries, 1960 -2012. (Source: Mian, Sufi, Verner (2017), Figure IV, middle panel, p. 1789)

Figure 9 endeavors to pull out the interest rate effects via the mortgage spread. The mortgage spread is defined as the “difference between the interest rate on mortgage loans and the 10-year government bond”. It shows that a low mortgage spread leads to an expansion of credit and then a bust. They argue that this is evidence of supply side effects because, if it were demand side, the mortgage spread would rise. Their explanations for why the bust followed the boom include wage and interest rate rigidities, a reversion of sentiments from a “too low” spread environment to a “too high” spread environment, or simply a disruption in the financial system.

The mechanism by which the spread is affected by policy interest rates set by the central bank has been recently examined by Adrian, Estrella and Shin (2018). Their illustrative chart for the United States, reproduce here as Figure 10, shows that the lower policy interest rates steepen the yield curve. The higher spread leads to an increase in profitability and an increase in loan supply from financial intermediaries. This means that the often-stated “conundrum” that long rates would not follow short rates by enough was not a real issue for monetary policy: because the key variable was the spread between short and long rates, a reduction in the short interest rate would stimulate lending even if the long rate did not change.

Adrian, Estrella, Shin (2018) showed that the federal funds rate, by affecting the spread, changes the profit margin between 10-year and 3-month treasury securities: when the federal funds rate goes down, the spread goes up (10yr/3mo) which encourages more lending or more credit supply. Thus, a lower interest rate increases the supply of credit and thus housing prices. Adrian, Estrella and Shin (2018) describe the mechanism as follows: “Banks and other intermediaries typically borrow in order to lend. Since the loans offered by banks tends to be of longer maturities than the liabilities that fund those loans, the term spread is indicative of the marginal profitability of an extra dollar of loans on intermediaries’ balance sheets.”

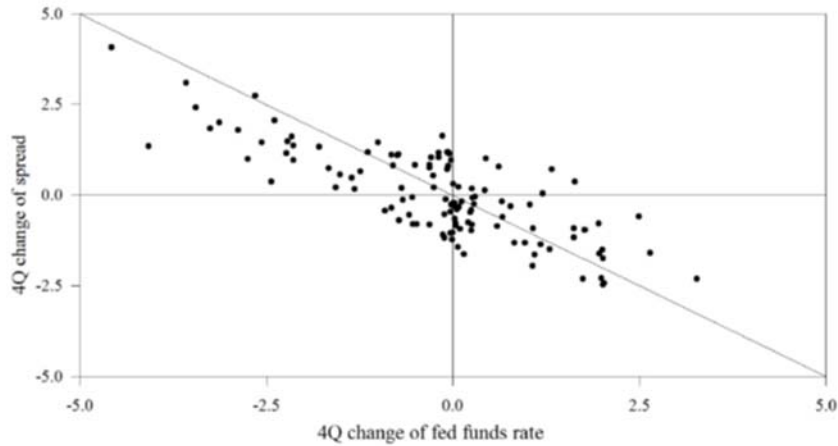


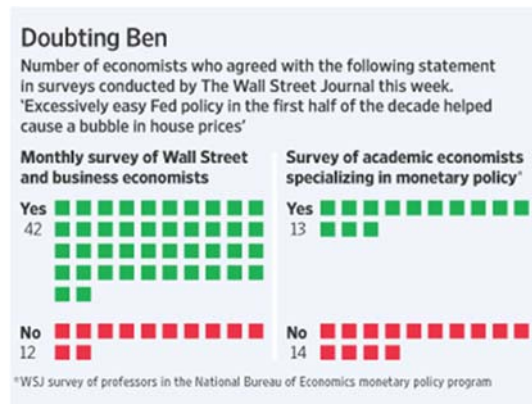
Figure 10. Changes in the Federal Funds Rate and the Term Spread.
 (Source: Adrian, Estrella and Shin (2018))

Other Views

To be sure, there are other views. Bernanke (2010) gave a widely-reported speech before the American Economic Association annual meeting in January 2010 arguing that the policy interest rate was not excessively low if you used, rather than the Taylor rule, another policy rule in which the Fed’s *forecast* of inflation was included rather than actual inflation. I wrote in response in Taylor (2010) that the Fed’s inflation forecast was low in comparison with the average forecast in private sector and, also, importantly lower than with what actually transpired. I also noted that you did not need to use policy rules to conclude that rates are too low in this period; simple comparisons with earlier period where policy worked well were enough.

It is important to note that at the time many others objected to the explanation given by Bernanke (2010). This was documented in an article published the same month as the speech, entitled “Bernanke Challenged on Rates’ Role in Bust,” by Jon Hilsenrath in the *Wall Street Journal*. The survey reported in that article show that 68 percent of economists (55 of 81) in an informal survey agreed that “Excessively easy monetary policy by the Federal Reserve in the

first part of the decade helped cause a bubble in house prices,” as shown here. The percentage was 78 percent among business economists—42 of 57—as shown in this summary from that article. Since then, as discussed above, there has been more research showing the connection between excessively easy monetary policy and the boom in housing prices.



International Spillovers of Policy

Now consider the international contagion of monetary policy actions, including deviations from rules-based monetary policy. Some of the empirical results summarized above (Ahrend, Cournède and Price (2008) and Jorda, Schularick and Taylor (2015)) show that there were deviations of interest rates from policy rules in other countries during the period running up to the crisis. The question is whether these deviations were connected causally across countries through spillovers, perhaps due to central banks following each other.

Figure 11, drawn from Taylor (2007b), shows the period from 2000Q1 to 2006Q4. It illustrates how deviations from rules-based policy with unusually low interest rates in the United States led to extra low interest rates in Europe. The blue line shows the deviation of the ECB policy rate from the Taylor rule with inflation measured as the four-quarter rate of change in the harmonized index of consumer prices. I regressed this deviation on a constant and on the U.S. federal funds rate. The estimated coefficient on the federal funds rate was .21 and was statistically significant with a standard error of .056. The plot of the fitted values from this

regression is shown by the red line in Figure 11. Thus, a good part of negative residual (policy rate below the rule) is explained by the federal funds rate being lower than normal. The chart shows that this deviation is closely correlated with the Federal Reserve’s policy rate. The connection illustrates the international contagion of monetary policy deviations. If you simply add the federal funds rate to an estimated policy rule in the Eurozone in this period, the estimated coefficient is .10.

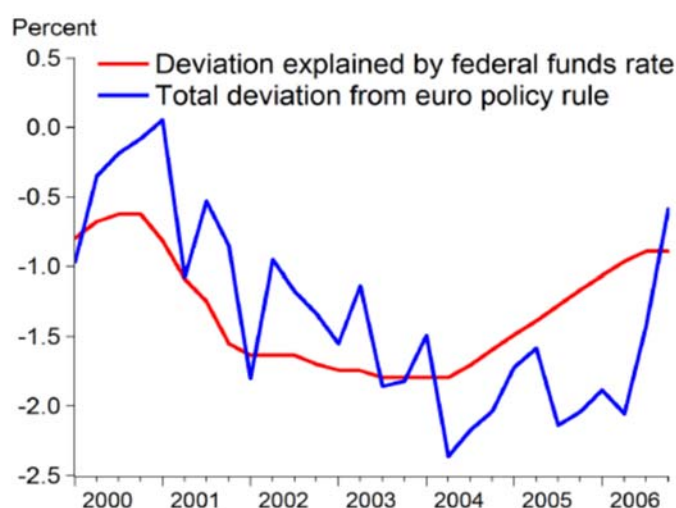


Figure 11. Deviations from Eurozone Policy Rule as Explained by Federal Funds Rate (Source: Taylor (2007b))

A Reassessment of International Spillovers of Policy

In the past 10 years, a huge amount of econometric evidence has accumulated showing that deviations from policy rules in one country are correlated with interest rate changes in other countries. Much of this evidence is nicely summarized in a chart produced by the Bank for International Settlements which is reproduced in Figure 12. It shows that the interest rate decisions and the interest rates implied by the policy rule were very close to each other in the 1990s, and up until somewhere around 2003. But in the following years—the years leading up to

the crisis—there was a large deviation: the policy rule in many central banks called for a higher policy interest rate than the actual decisions, as I pointed out for the United States in Taylor (2007a).

When the crisis and the deep recession came, central banks lowered their interest rates in accordance with simple rules. Starting after the crisis, however, they again began to deviate from rules-based policy, and that deviation continued throughout most of the post crisis years, at least until recently. Thus, the chart reveals that central banks throughout the world have deviated in much the same way from this representative monetary policy rule for the interest rate.

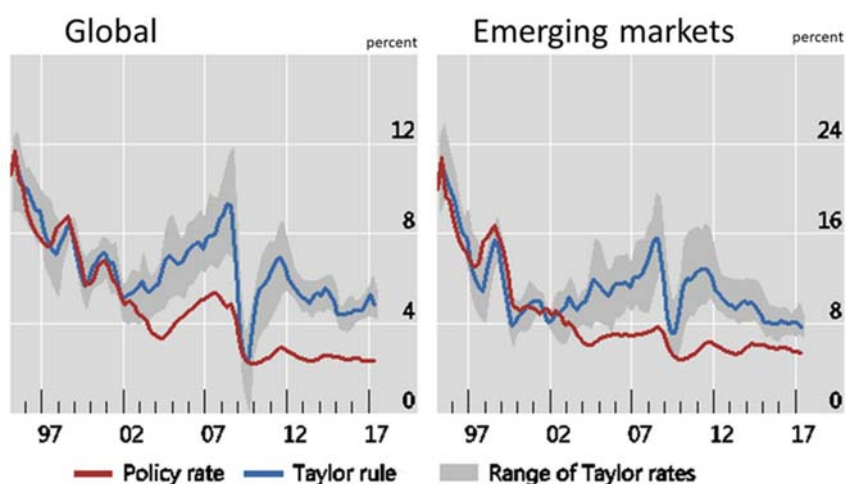


Figure 12. Policy Rates and Taylor Rule
(Source: Boris Hofmann, BIS (2018))

A look at the data for each of the central banks represented in Figure 12 shows much the same thing. Often there is a deviation that began before the crisis, followed by a rule-like reduction in the policy rate during the crisis, and then a period after the crisis when the rate is “too low” again. There are exceptions in Brazil, where the policy rate was often above the rule,

and in Australia, where the policy rate stayed close to the rule throughout the period.

Nevertheless, the overall characterization of the data is clear: Data throughout most of the world reveals correlated deviations of central bank interest rate from the policy rule for the interest rate.

The correlations between the interest rates is likely due to central banks following each other as they make their policy decisions about their policy interest rate. Central bankers often admit these reactions. The Norges Bank, for example, reports explicitly that its policy interest rate is affected by interest rate decisions at the ECB. This causal connection, documented with an interest rate reaction function by Taylor (2007b) as described above, has been shown by many others including Gray (2013), Carstens (2015) and Edwards (2017). With such reaction functions, one measures the reaction of central banks to other countries' interest rates by including the foreign central bank's interest rate in the reaction function. The foreign interest rate is usually significant.

To use more recent experiences in the past ten years, we must take account of the fact that central banks have been using two separate monetary policy instruments in recent years: the policy interest rate and the size of the balance sheet. In Taylor (2018), I examined the balance sheet of four central banks: The Federal Reserve, the European Central Bank, the Bank of Japan, and the Swiss National Bank. The purchases of assets by these banks are financed by increases in central bank liabilities, mainly "reserve balances." For the Fed, the Bank of Japan, and the ECB, purchases of domestic bonds are financed by reserve balances. For the SNB, purchases of foreign currency denominated securities are financed by reserve balances. In addition, each of these central banks sets its short-term policy interest rate, which in the case of the Fed is the federal funds rate.

For these four central banks, the framework thus includes eight different policy instruments for the four central banks: the balance sheet items (R for reserve balances) R_U , R_J , R_E , and R_S , and the short-term policy rates (I for interest rate) I_U , I_J , I_E , and I_S , where the subscripts indicate the United States (U), Japan (J), Europe (E) and Switzerland (S).

Figure 13 gives the cross correlations of the eight policy instruments in the four countries using monthly data for the dozen years from 2005 to 2017. There is a strong positive correlation between the reserve balances in each country. There is also a strong positive correlation between the interest rate instrument in each country, which is consistent with the interest rate contagion already mentioned.

	R_U	R_J	R_E	R_S	I_U	I_J	I_E	I_S
R_U	1.00							
R_J	0.72	1.00						
R_E	0.49	0.64	1.00					
R_S	0.89	0.85	0.69	1.00				
I_U	-0.77	-0.36	-0.44	-0.58	1.00			
I_J	-0.53	-0.45	-0.37	-0.48	0.49	1.00		
I_E	-0.81	-0.57	-0.51	-0.71	0.76	0.87	1.00	
I_S	-0.84	-0.61	-0.59	-0.76	0.78	0.85	0.97	1.00

Sample: 2005.1 2017.5

Figure 13. Correlations Between Reserve Balances and Interest Rates
(Source: Taylor (2018))

The reasons for the correlations between reserve balances in the different countries can be better understood by studying the actual the paths of reserve balances for the Fed, the BOJ, and the ECB. The Fed started large-scale asset purchases of U.S. Treasuries and mortgage-backed securities in 2009. These purchases, called Quantitative Easing (QE) I, II and III, were financed largely with reserve balances.

This expansion of reserves balances in the United States was followed by an expansion by the Bank of Japan at the start of 2013. Soon thereafter the ECB started increasing reserve balances. In other words, the positive correlations between reserve balances are due to Japan following the increase in reserve balances in the U.S., and the ECB following Japan and the U.S.

The timing of reserve balances and exchange rate movements is illustrated in Figures 14 and 15. The top part of each figure shows the time series patterns of reserve balances for the three large central banks with scale on the right-hand vertical axis measured in units of the local currency—millions of dollars, hundreds of million yen, and millions of euros. The lowest line in the three figures shows the exchange rate between the dollar and the yen and the euro.

Figure 14 shows the dollar getting weaker against the yen following the increase in reserve balances in the US, until the BOJ increased its own reserve balances and the dollar then strengthened against the yen. Figure 15 shows the weakening of the euro against the dollar and the yen after the action by the ECB.

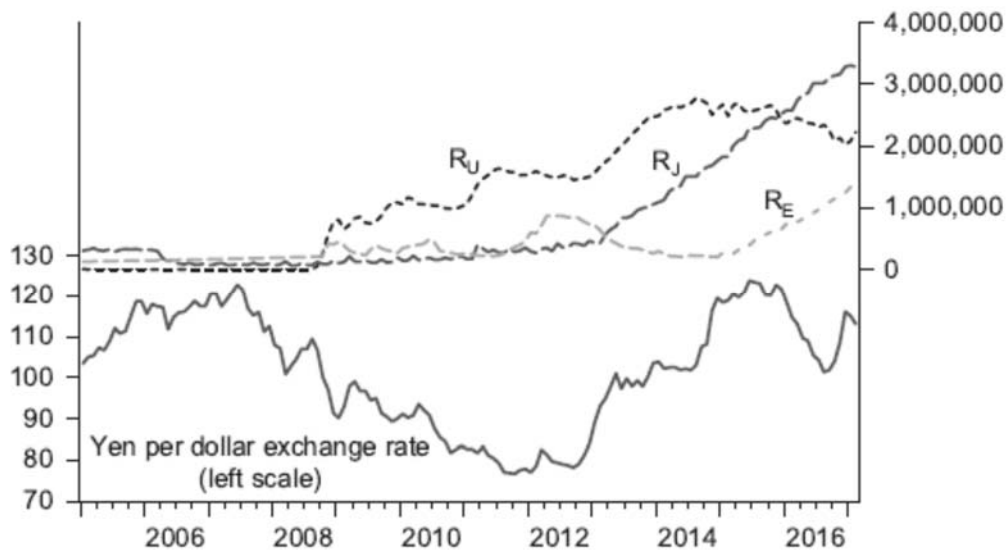


Figure 14. Yen Dollar Exchange Rate & Reserve Balances at Fed(R_U), BOJ(R_J),ECB(R_E) (Source: Taylor (2018))

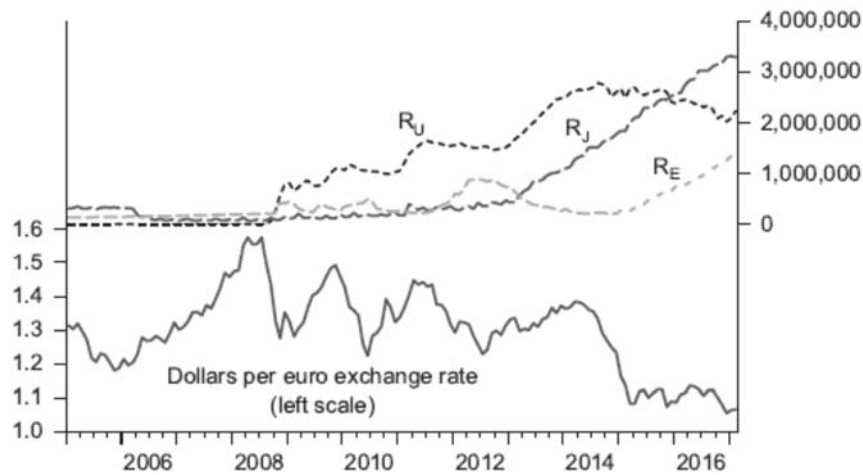


Figure 15. Euro-Dollar Exchange Rate & Reserve Balances: Fed(R_U), BOJ(R_J), ECB(R_E)
(Source: Taylor (2018))

Various policy statements by central bankers are consistent with these findings.

Following the global financial crisis and the start of the US recovery, the yen significantly appreciated against the dollar as the Fed extended its large-scale asset purchase program financed with increases in reserve balances. The yen appreciation in Japan became a key issue in the 2012 Japanese election, and when Shinzo Abe was elected he appointed Haruhiko Kuroda under whom the Bank of Japan implemented its own quantitative easing. A depreciation of the yen accompanied the change in monetary policy. The subsequent moves by the ECB toward quantitative easing were also due to concerns about an appreciating euro. At the Jackson Hole conference in August 2014, Mario Draghi spoke about these concerns and suggested quantitative easing, which soon followed. This shift in policy was followed by a weaker euro.

While the correlations show a close association between the policies in the different countries some have argued that this was the result of central banks individually trying to provide liquidity, as outlined by Bernanke (2013), rather than that they were following each

other as part of a competitive devaluation process. However, as reported in Taylor (2018), there are statistically significant exchange rate effects in estimated regressions of exchange rates on reserve balances. The regression equations showed that an increase in reserve balances by the Bank of Japan caused the yen to depreciate against the dollar and the euro, that an increase in reserve balances by the Fed causes the dollar to depreciate against the yen and the euro, and that an increase in reserve balances by the ECB causes the euro to depreciate against the yen and the dollar.

Conclusion

The purpose of this paper is to review research during the past ten years related to the cause of the financial crisis and the Great Recession. In papers written in 2007 I showed (1) that a deviation of monetary policy from the more rules-based policy followed in the prior two decades led to a housing boom and bust which led in various ways to the crisis, and (2) that this deviation spread internationally to other countries as central banks tended to follow each other.

There are few if any issues in economics where all agree. Nevertheless, much empirical research during the past ten years is remarkably consistent with these views. The “getting off track” narrative that these government actions and interventions helped cause the financial crisis should not be forgotten even as the debate goes on and alternative views, including those outlined by Bernanke (2010, 2013) are discussed as in this paper. There are lessons to be learned about economic models and about policy.

The lesson for modeling is that we need to take better account of the boom-bust dynamics of the financial sector interacting with the real sector as observed in many countries by Mian, Sufi and Verner (2017). Indeed, even with all the research on the connection between finance

and macroeconomics I have not seen these dynamics fleshed out. And we need to better understand and model the international impacts of monetary policy.

The lesson for policy is that it was a mistake to deviate from rules-based monetary policy for both domestic and international reasons, and that it is important to establish and follow a rules-based national and international monetary system in the future. A rules-based monetary policy is an essential part of a well-functioning market economy (Taylor (2014)).

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