International Housing Price Dynamics: Monetary Policy, Current Account Deficits, and Credit Standards

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Abstract: We investigate the direct impact that monetary policy and current account balances have on housing markets, as well as their indirect impact through changing credit standards. Using an unbalanced panel of 57 countries from 1990-2014, we regress real housing returns on cumulative Taylor rule deviations and changes in current account balances relative to GDP. Unlike prior studies, we use central bank surveys and economic data to identify credit demand and credit supply shocks related to monetary policy and current account deficits. Our preliminary findings indicate that monetary policy does not explain the observed housing returns. In fact, tight monetary policy is correlated to higher housing returns. Current account deficits, on the other hand, are correlated with higher housing prices. Part of this correlation, however, simply reflects that higher housing demand, and thus higher credit demand, result in larger current account deficits. Finally, we find that credit standards are capable of explaining some portion of housing returns over select sub-periods, but that these results are quite sensitive to the choice of the sub-period.

Key words: Taylor rule, current account, monetary policy, housing prices, financial crisis

1. INTRODUCTION

Between January 2000 and October 2007, *real* housing prices in the United States rose thirty-eight percent. By the end of 2007, however, housing prices had began a quick and steady decline which continued over the following two years. By January 20013, as nominal housing prices began to rise, real housing prices were still twenty-two percent lower than in October 2007. This downturn in housing prices, however, was not isolated to the United States and there is now a large and growing literature related to the underlying causes of the housing boom and subsequent bust. In particular, researchers have focused on three hypotheses: loose monetary policy, an international savings glut reflected in current account imbalances, and a deterioration in lending standards.

Reinhart and Rogoff (2008), for instance, present historical evidence that housing bubbles appear to be associated with loose monetary policy and loose credit standards, and that housing markets are frequently at the center of financial crises. Nevertheless, the role that monetary policy plays in asset bubbles, as well as the recessions that often accompany them, is not fully understood. While Taylor (2007) notes the historically low interest rates seen in the United States from 2002 to 2006 are consistent with the claim that loose monetary policy is related to the housing boom, the boom was a widespread phenomenon not isolated to the United States. When looking at the international evidence, loose monetary policy doesn't universally explain the run-up in international housing prices. South Africa, for instance, experienced greater housing price growth than did the U.S. from 2002 to 2006, despite short-term interest rates averaging over 8%. Similarly, housing prices actually decreased in Japan from 2002 to 2006 despite Japan's short-term interest rate averaging a meager 5 basis points.

The most popular alternative explanation for the housing crisis is the savings-glut hypothesis. Proponents of this hypothesis point to the accumulation of large financial imbalances between developed and developing countries between 2000 and 2006. In particular, Asia began running large current account surpluses with Europe and the United States in the late 1990s. These imbalances, like loose monetary policy, appear to be correlated with the boom and bust in residential real estate in these advanced economies. Nevertheless, this savings-glut theory faces its own shortcomings. For instance, Sweden ran large current

account surpluses over this time period and experienced even larger housing price increases than the United States which ran large deficits over the same period.

These two theories, however, are not mutually exclusive. Both monetary policy and current account deficits contribute to the availability of credit within a nation, and hence can influence housing demand and credit standards. Proponents of both theories, for instance, link the housing boom to a rapid expansion in credit, particularly for high risk borrowers. Section 1.1 discusses the roles that monetary policy and current account deficits may have played in the housing bubble, as well as some of the papers that support each theory. Other studies, however, propose that the easing of credit standards and financial innovations in the mortgage market were responsible for the housing bubble. We discuss these theories in Section 1.2, as well as note to what extent credit standards may simply reflect changes in monetary policy and current account balances.

1.1. *Monetary Policy & Current Account Deficits*

Since the 1980s, central banks have primarily conducted monetary policy using short-term interest rates.[1] This transition to interest rate targeting is partially credited for the moderation in business cycle fluctuations experienced between 1985 and 2005, both in the United States (Taylor (1999) and Clarida et al. (2000)) and internationally (Clarida et al. (1998)). Indeed, this Great Moderation is often attributed to central banks following some form of the Taylor rule (Taylor (1993) and Taylor (1999)), a simple monetary policy rule based on the level of inflation and output:

$$i_t^* = r^* + \pi_t + \beta(\pi_t - \pi^*) + \gamma y_t \tag{1}$$

where i_t^* is the time t target policy rate, r^* is the equilibrium real rate, π^* is the target inflation rate, and y_t is the output gap, defined as the percentage difference at time t between output and potential output.

Recently, however, Taylor (2007) and Allen and Rogoff (2011) note that many central banks deviated

[1] Allen and Rogoff (2011) note that central banks abandoned monetary aggregates for inflation targeting via interest rates once policy makers came to accept the academic consensus that monetary policy can't change long-run unemployment.

from the Taylor rule for an extended period during the early 2000s, holding interest rates well below the prescribed level. Such low interest rates, particularly when maintained for an extended period, may contribute to the formation of asset bubbles and financial imbalances. For instance, Brunnermeier and Julliard (2008) note that low nominal interest rates can contribute to housing bubbles if consumers focus on monthly payments and not fundamentals. Furthermore, Bernanke (2010) concedes that innovations in the mortgage market, such as adjustable rate mortgages, have helped to lower monthly payments and may make housing prices more responsive to monetary policy. In addition, Taylor (2014) and Cardarelli et al. (2008) identify loose monetary policy as a contributing factor to the housing bubble and the subsequent financial crisis, while Maddaloni and Peydró (2011) show that countries with loose monetary policy before the financial crisis fair worse during the crisis.

Nevertheless, Bernanke (2010) argues that only a small portion of housing prices can be explained by deviations from the Taylor rule, and shows that homeowners' monthly payments are more sensitive to the existence of new mortgage contracts (such as interest only adjustable rate mortgages and negative amortization mortgages) than to the historically low interest rates. Similarly, Campbell et al. (2009) cast doubt on the hypothesis that low interest rates are to blame for the run-up in housing prices, noting that changes in national and regional risk-premia account for much of the variability in the U.S. housing market.

Bernanke (2010), as an alternative explanation for the housing bubble, presents evidence that changes in the current account are associated with the run-up in international housing prices that precipitated the financial crisis. This is consistent with the historical evidence reported by Reinhart and Rogoff (2011) who note that capital inflows often surge ahead of banking crises. In addition, Adam et al. (2011) show that G7 countries with larger housing returns from 2001 to 2007 tend to run larger current account deficits over that same time period. Furthermore, Aizenman and Jinjarak (2009) estimate that a one standard deviation increase in the lagged current account deficit is associated with roughly a ten percent increase in housing prices. Mendocino and Punzi (2014) show that shocks to foreign savings can account for both a large portion of the volatility in the current account deficit as well as house prices. Allen and Hong (2011) tie these current account imbalances to the 1997 Asian financial crises which led Asian countries to accumulate excess reserves, resulting in a savings glut that in turn financed current account deficits in other countries.

Caballero and Krishnamurthy (2009) note that these capital flows are predominantly from central banks looking for a risk-free asset, resulting in large capital flows to reserve currencies, primarily the U.S. Dollar and the Euro.

Jinjarak and Sheffrin (2011), however, show that current account deficits have only a weak direct-effect on housing prices, though they do have an indirect-effect through mortgage rates. Furthermore, Favilukis et al. (2013) note that capital inflows alone can't explain the bulk of international housing price increases. Laibson and Mollerstrom (2010) further note that the observed capital inflows are used to finance increased consumption, but that under the savings-glut hypothesis capital inflows should primarily spur investment. As an alternative explanation, Laibson and Mollerstrom (2010) suggest that causality may be in the opposite direction: rising house prices lead to higher consumption through a wealth effect, and this consumption is financed from abroad. Favilukis et al. (2013), however, point out that capital inflows did not reverse when the housing market crashed, which is inconsistent with the wealth effect theory.

1.2. *Credit Standards & Financial Innovations*

These two explanations of the international housing boom, loose monetary policy and current account deficits, need not be mutually exclusive. Both loose monetary policy and current account deficits affect housing demand by increasing the availability (and nominal cost) of credit. For instance, Allen and Rogoff (2011) argue that both loose monetary policy and large current account deficits greatly increased the availability of credit in the U.S., Ireland, and Spain, contributing to the housing bubble in these markets. Similarly Mendocino and Punzi (2014) contend that monetary policy is an important determinant of the current account and that both can impact housing prices. Furthermore, not only can monetary policy and current account imbalances affect housing demand through lower interest rates, but also through changes in who is eligible to receive credit.

For instance, shocks to credit supply may buoy housing demand by not only reducing monthly payments, but by also lowering credit standards. These lower credit standards increase housing demand by providing loans to consumers that previously could not obtain credit, as well as allowing consumers in gen-

eral to borrow larger sums. Maddaloni and Peydró (2011) document that loose monetary policy leads banks to lower their credit standards, while Allen and Rogoff (2011) note the mounting evidence that monetary policy affects banks' willingness to make risky loans.[2] Similarly, Caballero and Krishnamurthy (2009), Allen and Rogoff (2011), and Allen and Hong (2011) argue that large capital inflows created an excessive supply of housing credit and drove down lending standards in the United States.

The loosening in credit standards, furthermore, is related to the financial innovations made in mortgage markets in the early 2000s. Caballero and Krishnamurthy (2009), for instance, argue that demand for risk-less assets fuels the securitization of risky assets in the United States. This rapid increase in the securitization of mortgages greatly increases lending capacity, particularly to credit constrained consumers. Indeed, Favilukis et al. (2013) note that the percent of sub-prime mortgages grew from under ten percent of mortgage originations to forty percent between 2002 and 2006. Furthermore, Mian and Sufi (2009) show that house price growth in the United States is related to this increase in mortgage securitization, and in particular to the securitization of mortgages to sub-prime borrowers. Once the housing bubble bursts, however, sub-prime loans largely disappear.[3] Lower credit standards, however, are not only associated with an increase in securitization, but also new mortgage instruments such as non-amortizing loans and option adjustable rate mortgages. Bernanke (2010) argues that these financial market innovations play an important role in the housing boom, and Favilukis et al. (2013) argue that financial market innovations are in fact the main cause of the housing bubble.

In this paper, we investigate the direct impact that monetary policy and current account balances have on housing markets, as well as their indirect impact through changing credit standards and financial innovations. Using an unbalanced panel of 57 countries from 1990-2014 we investigate the role monetary policy, current account deficits, and lending standards play in explaining housing returns. Specifically, we regress real housing returns on cumulative Taylor rule deviations and changes in the current account relative to nominal GDP. We then add data from central bank surveys regarding changes in credit standards and

[2]As further evidence that investors in general, not just banks, respond to nominal rates, Hau and Lai (2016) document that investors in countries with loose monetary policy shift their portfolio allocations away from risk-free assets and towards equity investments

[3]Keys et al. (2013) show that 90 percent of sub-prime loans were securitized prior to the financial crisis, but none were securitized in 2008.

credit demand. This results in a loss in observations since the survey data is only available for 30 countries, and the data is generally not available before 2000. Nevertheless our cross-section of countries is larger than most other studies which tend to focus on the U.S. market. In addition, prior studies using international data tend to use housing data that varies in terms of frequency, aggregation, and property types. We are able to verify our results hold by using international housing data for 23 countries that is closely related to the quarterly U.S. data of single-family housing prices compiled by the Federal Housing Finance Agency.[4] Our preliminary findings indicate that current account deficits and credit standards are capable of explaining some portion of housing returns over select sub-periods, but that these results are sensitive to the choice of the sub-period. Monetary policy, however, is either not significantly related to housing prices, or has the opposite effect: tight monetary policy is related to higher housing returns.

The rest of the paper is organized as follows. We describe the house price, current account, monetary policy, and central bank survey data in Section 2. Section 3 shows cross-country patterns of housing price returns versus monetary policy deviations, changes in current account balances, and changes in credit standards. Section 4 reports regression results and introduces other economic variables to the analysis. Section 5 concludes.

2. DATA

Our data set consists of quarterly housing prices for 57 countries. House price data for most countries is available back to 1990Q1, though only eight countries have current account data and monetary policy variables stretching back that far. Central bank survey data is available for 30 countries. We have both credit demand and credit standards surveys for 27 of these countries; Indonesia only provides a credit demand survey while Canada only reports credit standards. Survey data prior to 1999 is available only for the United States. Detailed descriptions of these data are provided below.

[4]We are grateful for Adrienne Mack and Enrique Martinez-Garcia for providing the data. See Mack and Martínez-García (2011) for more details.

House Price Data

We obtain house price data from two sources: the Federal Reserve Bank of Dallas Monetary Policy Institute[5] and Cesa-Bianchi et al. (2015). The Dallas Fed's database is updated quarterly and contains information on nominal and real house prices for single-family housing in twenty-three countries, and is updated quarterly. The Fed's housing data includes the U.S. and many European countries, as well as Australia, Canada, Japan, New Zealand, South Africa, and South Korea. For the U.S., this quarterly price index is constructed using repeat sales of existing single-family houses, and comes from the Federal Housing Finance Agency (FHFA). For other countries in the database, the Federal Reserve Bank of Dallas selects a house price index that is similar to the FHFA quarterly house price index.[6] The Federal Reserve Bank of Dallas seasonally adjusts each series using the Census X-12 multiplicative method, and deflates nominal prices with the personal consumption expenditure (PCE) using 2005 as the base year. The Dallas Fed also provides quarterly observations on private disposable income for most countries in the dataset.

The Dallas Fed data is augmented with quarterly housing data from Cesa-Bianchi et al. (2015), which Ambrogio Cesa-Bianchi provides on his website.[7] Cesa-Bianchi et al. (2015) compile their housing data from the Organization for Economic Co-operation and Development (OECD), the Bank for International Settlements (BIS), and an additional twelve lesser-developed countries. The data begins in 1990Q1 but ends in 2012Q4, two years earlier than the Dallas Fed Data. Unlike the Dallas Fed data, these housing price indexes are not in general comparable to the FHFA data, e.g. several indexes are based on valuation and not transaction prices. The data is, however, seasonally adjusted "using the X12 procedure with the additive option" and nominal prices are "deflated with a country-specific CPI (also seasonally adjusted)."

Our final (unbalanced) sample consists of 57 countries with observations from 1990Q1 through 2014Q4. Figure 1 graphs in separate panels the country-by-country cumulative real housing returns for both data sets: the Dallas Fed sample is in panel (a) and the Cesa-Bianchi data in panel (b). The dashed horizontal line in the figure represents 2007Q3, roughly the onset of the financial crisis. While roughly two-thirds of

[5] http://www.dallasfed.org/institute/houseprice/index.cfm

[6] One advantage of Fed data set, as opposed to data series taken directly from the Bank for International Settlements, is that the indexes are uniformly constructed in terms of frequency, aggregation methods, and seasonal adjustment. See Mack and Martínez-García (2011) for a complete summary of the methodology.

[7] https://sites.google.com/site/ambropo/home

the countries in the Dallas Fed's data experience a noticeable drop in housing prices around the onset of the financial crisis, only about one-half of the countries in the Cesa-Bianchi data do. The Dallas Fed data contains primarily developed economies in western Europe and Asia, while the Cesa-Bianchi data includes several developing economies spread more broadly throughout the world. Throughout the analysis we verify that our results are not driven by the differences in composition and construction of the two housing datasets.

Monetary Policy & Current Accounts

We estimate monetary policy using the Taylor rule. We collect inflation, output, and interest rate data for each country from the Federal Reserve Bank of St. Louis which in turn collects much of the data from the IMF, World Bank, and other sources. We define inflation using the consumer price index for each country, and we use the call money rate (overnight loans) as the relevant policy interest rate. Missing observations are collected by hand from Bloomberg. The output gap is calculated using the Hodrick-Prescott filter to identify trend real GDP. We use this data to estimate the tightness of monetary policy using the Taylor rule given in Equation 1. Deviations from the Taylor rule are defined as the difference between the proscribed interest rate calculated using Equation 1 and the observed call money interest rate. Specifically, we construct the deviations such that negative values are associated with loose monetary policy (observed interest rates are below the target rate), while positive values are associated with tight policy (observed interest rates are above the target rate).

For robustness, we estimate the Taylor rule following several specifications. First, as in Taylor (1999), we define the equilibrium real-rate and inflation target as 2%, and β and γ as 0.5. Next, we estimate the Taylor rule by allowing a time-varying inflation target for each country that equals the country's average inflation rate over the past four years. In addition we allow for the policy inertia documented by Clarida et al. (2000) and re-estimate the rule for both inflation targets. Results are qualitatively similar under all four specifications. Tables and graphs, however, are based on the Taylor rule estimated with a time-varying inflation target and with policy inertia.[8]

Current account data is also taken from the Federal Reserve Bank of St. Louis. When data is not

[8]Including policy inertia and a time-varying inflation target results in the best overall fit in explaining housing returns. We do not adjust the t-statists to account for this specification search.

available through the St. Louis Fed, current account data is collected from Bloomberg. In our analysis we focus on changes in current accounts, not levels. Reductions in the current account can be thought of as net cash inflows to the country from abroad. As such, reductions in the current account (larger deficits) should be associated with an increase in credit, thereby increasing housing demand through lower interest rates and (possibly) relaxed credit standards. Hence, both the current account and monetary policy variables should be negatively related to housing prices.

Figure 2 graphs, over time and for each country, the estimated Taylor rule deviations (panel a) and changes in the current account scaled by GDP (panel b). For both panels, observations below the x-axis should correspond to an increase in housing credit due to loose monetary policy (panel a) or an increase in the current account deficit (panel b). As evident in the figure, both variables are more volatile for smaller, less developed economies.

Credit Standards and Credit Demand Data

Data on credit standards and credit demand are obtained from lending surveys conducted by central banks. For the U.S., data is taken from the Senior Loan Officer Opinion Survey on Bank Lending (SLOOS), which is published quarterly by the Federal Reserve.[9] The data is available beginning in 1997Q1. Lown et al. (2000) provide background information regarding the survey and examine its validity. They find that changes in lending standards reported in the survey are associated with loan growth.

We measure credit standards using Question 13A (in the current version of the survey), "Over the past three months, how have your bank's credit standards for approving applications from individuals for mortgage loans to purchase homes changed?" Based on the responses, we create a diffusion index equal to 100∗(net % "tightened considerably") + 50*(net % "tightened somewhat") + 0*(net % "remained basically unchanged") - 50*(net % "eased somewhat") - 100*(net % "eased considerably"). Thus, a positive value for the variable indicates a net tightening of credit standards and a negative value indicates a net easing of credit standards. Beginning in 2007Q1, the question is asked about various categories of mortgages. We follow the methodology used by Favilukis et al. (2013) and calculate the diffusion index as a weighted average of prime

[9] http://www.federalreserve.gov/boarddocs/snloansurvey/

and subprime loans with a weight of 0.75 for prime in 2007 and 0.95 thereafter.[10]

We obtain data for other European countries (Belgium, France, Germany, Ireland, Italy, Luxembourg, Netherlands, and the Euro area) from the Euro area bank lending survey.[11] These data are all available beginning in 2002Q4. The survey question is "Over the past three months, how have your banks credit standards as applied to the approval of loans to households changed?" The available responses are the same as in the U.S. survey.

Finally, we obtain data for Canada[12] (beginning 1999Q2), Denmark [13] (beginning 2008Q4), Japan[14] (beginning 2000Q2), South Korea[15] (beginning 2002Q1), and the United Kingdom[16] (beginning 2007Q2) from their respective central banks. While the questions differ slightly, all countries except Canada report a diffusion index. Instead, Canada only reports a balance of opinion, defined as "the weighted percentage of surveyed financial institutions reporting tightened credit conditions minus the weighted percentage reporting eased credit conditions."[17] Similar to the monetary policy and current account variables, an increase in credit standards should be negatively correlated to housing prices.

With the exception of Canada, all the countries for which we obtained credit standards survey data also ask bank officers about changes in credit demand. For example, in the SLOOS for the U.S. Question 14 asks "apart from normal seasonal variation, how has demand for mortgages to purchase homes changes over the past three months?" The available responses are: "substantially stronger", "moderately stronger", "about the same", "moderately weaker", and "substantially weaker". For each country, positive values for credit demand indicate that demand is stronger while negative values indicate weaker credit demand. As such, higher values might also indicate an increase in housing demand, corresponding to the increased demand for credit.

[10] Favilukis et al. (2013) use weights for prime loans of 0.75 in 2007 and 0.95 in 2008, which are the only years in their data that have subprime loans. Subprime loans appear again in the survey beginning in 2012Q2. We continue to use a weight of 0.95 for prime loans during this period.

[11] https://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html

[12] http://www.bankofcanada.ca/publications/slos/

[13] http://www.statbank.dk/DNUDPRIV

[14] http://www.boj.or.jp/en/statistics/dl/loan/loos/

[15] http://eng.bok.or.kr/eng/engMain.action (Monetary Policy Report)

[16] http://www.bankofengland.co.uk/publications/Pages/other/monetary/creditconditions.aspx

[17] In addition, some countries report the diffusion index as a positive value for easing credit standards and negative for tightening. To keep our data consistent, we use the negative of the given diffusion index for such countries. For each country positive values indicate that credit standards are stronger and negative values indicate weaker standards. As such, positive values should be associated with lower housing demand for credit constrained consumers.

Figure 3 graphs the time series of the survey responses by country. Panel (a) graphs credit demand based on the surveys beginning in 2000Q1, while panel (b) graphs credit standards. Observations above the x-axis indicate that credit demand (panel a) and credit standards (panel b) are increasing. Both series exhibit a fair degree of variation, though credit demand is more likely to fall below the x-axis than credit standards. That is, banks appear less likely to report that their lending standards are relaxing than they are to report that credit demand is falling. This may simply be an artifact of the time period, or a reluctance on the part of banks to admit to the central bank that they are relaxing their credit standards.

3. HOUSING PRICES, THE SAVINGS GLUT, AND LOOSE MONETARY POLICY

The average increase in housing prices from 2000Q1 to 2007Q3 is 72.7% for the countries in our data set, and the median increase is 35.7%.[18]. These housing price increases are often followed by a housing slump in the post-crisis period, from 2007Q4-2012Q4.[19] Over this latter period, housing prices on average drop 3.8% and the median decline is 6.2%. If these run-ups and reversals represent a housing bubble, the size of the price run-up before the financial crisis should be related to the size of the housing slump in the post-crisis period. To examine this point, Figure 4 sorts countries (from high to low) based on the cumulative real housing return from 2000Q1 to 2007Q3. The figure also reports each country's cumulative housing return in the post-crisis period, from 2007Q4 to 2012Q4. As is clear in the figure, not every country which experiences a large increase in house prices prior to the crisis experiences a large drop in housing prices in the post-crisis period. Several countries (i.e. Sweden, Canada, Norway, Belgium, etcetera) experience positive housing returns in the post-crisis period despite experiencing large returns prior to the crisis. Even for countries that do experience a reversal, housing price drops are not necessarily related to the degree of the pre-crisis housing price gains (i.e. France, New Zeland, Czech Republic, etcetera). Still other countries (i.e. Peru, Israel, Austria, etcetera) experience negative returns in the pre-crisis period, but large housing price increases in the post-crisis period.

Though the data doesn't appear to indicate a world wide housing bubble, we now investigate whether

[18] Only forty-six of the fifty-seven countries have housing price data starting in 2000Q1

[19] We evaluate changes up until 2012Q4 since the Cesa-Bianchi et al. (2015) data ends in 2012Q4.

current account deficits, loose monetary policy, or changes in credit standards and credit demand can explain the observed housing price dynamics. We note that positive values of the credit demand survey should be positively related with housing prices (higher credit demand indicates stronger housing demand), while increasing credit standards, increasing Taylor rule deviations (tighter monetary policy), and increases in the current account (cash outflow to foreign countries) should be negatively related to housing prices.

3.1. *Current Account and Housing Prices*

We first summarize the empirical relation between housing returns and the current account. Figure 5 graphs by country real quarterly housing returns as a function of the change in the current account to GDP ratio. Based on the savings glut hypothesis, we should observe negatively sloped regression lines for countries that experience housing run-ups financed by current account deficits. Consistent with the hypothesis, 47 of the slopes are negative though only seven are significant at the 5% level in a two tail test.

Nevertheless, it is possible that prolonged current account deficits are needed to impact housing prices as temporary increases may not significantly affect the availability and cost of credit. Hence, we next investigate average current account deficits over time. Because the Cesa-Bianchi et al. (2015) data ends in 2012Q4 and several countries are missing current account data prior to 2000Q1,we limit our attention to this time period. Figure 6 plots each country's cumulative housing return as a function of cumulative changes in the current account to GDP ratio. Panel (a) plots the pre-financial crisis sub-period of 2000Q1 to 2007Q3, and panel (b) the post-crisis sub-period of 2007Q4 to 2012Q4. Countries to the left of the y-axis represent those with capital inflows related to a growing current account deficit, and to the right are countries with capital outflows related to a growing current account surplus. Regression estimates are reported in column (1) of Table 1, and standard errors are clustered by country. Similar to the data in Bernanke (2010), between 2000Q1 and 2007Q3 those countries with larger current account deficits tend to have larger housing price increases. We observe this graphically in Figure 6 panel (a), and we note that removing the three outliers (the Baltic states) does not change the qualitative conclusions. The slope coefficient on current accounts, reported in column (1) of Table 1 panel (a), is -6.19 and is significant at the 1% level. While this negative

relationship between the current account and housing returns also holds in the post-crisis period in panel (b), it is not as strong. Nevertheless, the slope coefficient on the current account remains negative and significant: a one percent increase in current account deficit relative to GDP leads to a 2.68% increase in housing prices, consistent with the theory that foreign capital inflows can partially explain housing prices.

Note, however, that the current account may increase because foreigners reduce their supply of credit to a country or because the country's demand for credit falls. While the savings glut hypothesis impacts housing prices via credit supply shocks, it is possible the capital flows are caused by credit demand shocks. We next try to identify movements in the current account that result from credit demand shocks versus those that relate to credit supply shocks. Because supply shocks result in price and quantity moving in opposite directions, we identify credit supply shocks related to a country's current account as those observations where the current account deficit and money market issuance (quantity) move in the same direction, but the 90-day interest rate (price) moves in the opposite direction. Similarly, credit demand shocks are identified as those observations where the current account deficit, money market issuance, and the 90-day interest rate all move in the same direction.

Figure 7 graphs the frequency over time of credit supply and credit demand shocks identified by the current account, while Figure 8 reports the average real quarterly return for these credit demand and credit supply shocks. Figure 8 panel (a) reports average returns for observations labeled as positive credit supply shocks related to the current account, negative credit supply shocks related to the current account, as well as for all other observations. Panel (b) does the same for credit demand shocks identified by the current account. To ensure results aren't driven by differences in our two house price datasets, average returns are reported separately for the Dallas Fed data and the Cesa-Bianchi data. Consistent with the savings glut hypothesis, housing returns in panel (a) are higher for observations identified as positive credit supply shocks than those identified as negative credit supply shocks. Nevertheless, supply shocks related to the current account do not provide a full picture. Evident in panel (b), the largest housing returns are associated with positive credit *demand* shocks. For these observations the current account deficit is growing due to increased credit demand, not because of excess supply created by a savings glut. That is, growing credit demand appears to have a larger impact on housing prices than does a growing credit supply caused by larger current account

deficits. Hence a portion of the current account's explanatory power can be attributed to demand shocks, not simply a savings glut. We should note, however, that supply and demand shocks are not mutually exclusive explanations for housing price movements. In addition, it is still the case that changes in the current account result in supply shocks, and these shocks seem to impact housing prices.

3.2. *Monetary Policy and Housing Prices*

We next analyze monetary policy's impact on housing prices. Loose monetary policy, both through money illusion and expanded access to credit, may increase housing demand (at least in the short-run) and drive up housing prices. Tight monetary policy, however, should have the opposite effect. Figure 9 graphs quarterly housing returns as a function of lagged deviations from the Taylor rule. Countries with a wider *horizontal* spread exhibit more variation in monetary policy. Countries with a larger *vertical* spread exhibit greater quarterly volatility in housing returns. Under the monetary policy hypothesis, the regression lines should be negatively sloped as loose monetary policy results in higher housing returns. Nevertheless, only 19 of the 57 countries with observations exhibit a negative relation between the Taylor residual at t and the housing prices at $(t+1)$. None of these 19 are significant at the 5% level in a two-tail test.[20]

Because persistent deviations from the Taylor rule may be needed to significantly impact housing returns, we next look at the relation between housing prices and cumulative monetary policy in the pre-crisis and post-crisis periods. Specifically, Figure 10 panel (a) plots *cumulative* real housing returns relative to average Taylor rule deviations for the pre-crisis sub-sample (2000Q1 to 2007Q3) and panel (b) plots the post-crisis sub-sample (2007Q3 to 2012Q4). Countries to the left of the y-axis represent those with consistently looser monetary policy, and to the right those with tighter monetary policy. Regression estimates are reported in column (2) of Table 1. Similar to the data in Bernanke (2010), panel (a) of Figure 10 indicates a majority of countries exhibit loose monetary policy prior to the financial crisis, and these countries exhibit larger housing returns than those with tighter monetary policy. This clustering of 31 of the 57 countries in the upper left quadrant is consistent with the hypothesis that monetary policy played a role in the global run-up

[20]Estimating the Taylor rule without policy inertia results in nine of these slope coefficients being significant at the 5% level. Nevertheless, the same Taylor rule estimates provide a worse in-sample fit in the panel regressions reported in Section 4.

in housing prices prior to the financial crisis. The regression's slope coefficient, reported in column (2) of Table 1 panel (a), is negative and significant at the 5% level. Note, however, that if we exclude the four outliers (Ukraine and the three Baltic states), the regression coefficient is no longer significant at the 10% level. Furthermore, panel (b) of both Figure 10 and Table 1 reveal that, while policy deviations for most countries are negative in both the pre-crisis and post-crisis periods, the relation between monetary policy and housing returns is actually *positive* in the post-crisis period.

As an alternative to measuring monetary policy via the Taylor rule, we next identify monetary policy using ex-post observations on inflation and output. Specifically, positive policy shocks (monetary tightenings) are defined as observations where the policy rate increases while both inflation and output fall in the subsequent quarter. Similarly, negative shocks (monetary loosenings) are identified as observations where the policy rate decreases while inflation and output increase in the subsequent quarter. Note that the Taylor rule always classifies countries as having tight or loose monetary policy since the observed policy rate will be either above or below the prescribed rate, but this data driven definition does not. When an observation can't be assigned to either tight or loose monetary policy regime, we label it as neutral. For comparison, we also label as neutral deviations from the Taylor rule that are within one half of one standard deviation from the prescribed policy rate for that country. Figure 11 graphs the number of countries over time that are classified as implementing tight or loose monetary policy based on this data driven definition as well as the Taylor rule.[21] The data driven definition tends to slightly lead the Taylor rule definition. This is likely because the Taylor rule is backward looking and defines optimal monetary policy using the recent past, not forward looking expectations.[22]

Figure 12 reports the average quarterly housing returns for observations where a country is classified as having a loose, tight, or neutral monetary policy stance in that quarter. Panel (a) reports averages using the monetary policy stance defined by the data, while panel (b) reports averages for the policy stance defined by the Taylor rule. As before, average returns are reported separately for the Dallas Fed data and the Cesa-

[21]The Taylor rule will classify a country as being above (tight) or below (loose) the prescribed policy rule. The data driven definition, however, will not always classify all countries in these two categories. Some countries will be classified as having indeterminate, or neutral, monetary policy.

[22]Using future realizations of inflation and output to define the Taylor rule would require the use of instrumental variables in later regression analysis.

Bianchi data. Contrary to the hypothesis that loose (tight) monetary policy is related to positive (negative) housing returns, average housing returns are actually higher when monetary policy is tight as opposed to loose. This is true for both definitions of monetary policy and both data sets. This indicates the previous (non)results regarding monetary policy and housing returns are not due to the backward looking nature of the Taylor rule, nor are they specific to developed versus developing economies.

Monetary policy's primary impact on housing prices, however, may be indirect via the credit supply. As monetary policy tightens (loosens), so does the credit supply which will indirectly reduce (increase) housing demand. To investigate, we identify possible credit supply shocks related to tight and loose monetary policy. Since quantity and price move in opposite directions for supply shocks, negative (positive) credit supply shocks related to monetary policy are those observations where monetary policy in the previous quarter is classified as tight (loose) and money market issuance decreases (increases) while the 90-day bank rate increases (decreases). An observation is not classified as a credit supply shock related to monetary policy if monetary policy is classified as neutral, or if money market issuance (quantity) and bank rates (price) move in the same direction. Figure 13 reports the average quarterly housing return for these credit supply shocks related to monetary policy. As in Figure 12, observations with positive credit supply shocks (i.e. loose monetary policy) are actually associated with *lower* quarterly real housing returns than are quarters with negative credit supply shocks (i.e. tight monetary policy). Once again, this is inconsistent with the hypothesis that loose monetary policy drove housing returns prior to the financial crisis.

Finally, it is possible that changes in monetary policy have an indirect impact on housing prices by augmenting or offsetting the impact that changes in the current account have on housing prices. Column (3) of Table 1 presents regression results where both the cumulative Taylor rule deviations and changes in the current account relative to GDP are included in the regression. Column (4) also reports regression results when an interaction term is included. The regression coefficient on monetary policy remains insignificant in the latter period when the change in the current account is included in the regression, and the interaction term is also insignificant in both time periods. Columns (3) and (4) of Table 1 provide little evidence that monetary policy augments the effects of the current account on housing prices.

3.3. *Credit Standards and Credit Demand*

Both loose monetary policy and the savings glut are hypothesized to have caused the housing boom by creating an abundance of available credit and/or money illusion. While we don't find evidence that monetary policy significantly impacts housing prices, we do find a correlation between the current account and housing returns. Furthermore, we find evidence consistent with the savings glut hypothesis by identifying credit supply shocks driven by changes in the current account and noting that housing prices are higher for positive supply shocks than for negative. We next evaluate the relation between housing prices and the reported changes in credit standards and credit demand as reported by central banks.

In this section, as in Favilukis et al. (2013), we treat credit standards as synonymous with credit supply. Credit standards are defined such that a positive value indicates an increase in credit standards relative to other periods. Thus, if easing of credit standards contributed to the housing bubble, the regression coefficient should be negative. Positive values of credit demand, however, indicate a net increase in demand for loans. This could be due to a wealth effect as homeowners use rapidly growing housing values to finance the purchase of a second home. We also note that the credit standards and credit demand may overlap; there may be an increase in demand for credit as standards ease and credit becomes available to homeowners who could not obtain credit before. Similarly, loose monetary policy and current account deficits, by increasing the credit supply, may reduce real interest rates and thereby increase credit demand. We investigate these possibilities later in the paper.

Because countries have different start dates for the credit standards and credit demand surveys, and most countries begin their surveys after 2002, we can't evaluate cumulative changes in the pre-crisis and post-crisis as in Table 1. Instead we focus on quarterly real housing returns and not cumulative returns for both periods. This leaves us with an unbalanced panel spanning from 1990Q1 to 2014Q4. We lag observations on Taylor rule deviations, changes in the current account, and the survey data. Orphanides (2001) argues that monetary policy effects are felt with a lag, and the same is likely true for the impact current account deficits have on the credit market. In addition, using lags can mitigate problems of endogeneity. Finally, we incorporate central bank survey data regarding credit standards and credit demand to control for unobserved

shocks to credit supply and credit demand.

Table 2 reports regression results for the full sample period in panel (a), as well as the pre-crisis and post-crisis sub-periods in panel (b) and panel (c), respectively. Only the coefficient on changes in credit demand, reported in column (4), is significant in all three periods. This is true even when all four variables are included in the regression, column (5). The change in the current account is significant and negative in the full-sample, column (1) of panel (a), but not when the survey data is included, column (5) of panel (a). This is consistent with Favilukis et al. (2013) who argue that changes in credit standards are a principal driver of housing prices, though it should be noted that including the survey data in the regression cuts the sample to one third its original size. While not reported in the table, we note that the change in the current account is also negative and insignificant in panel (a) if the survey data is excluded but we only use the sub-sample of countries with credit demand surveys. Furthermore, while changes in credit demand and credit standards are significant in the overall sample, the coefficient on changes in credit standards is only significant in the post-crisis period, panel (c).

As previously noted, housing prices may be significantly impacted by long-term changes in the current account, monetary policy, or credit standards, but not by short-term fluctuations. Table 3 reports regression results using each independent variables' average over the prior two years. In the full sample, reported in panel (a), changes in the current account are negative and significant when other variables are excluded, column (1), but not when the survey data are included, column (5). Changes in credit demand, column (4), is the only variable consistently significant throughout the panels in Table 3. Nevertheless, changes in credit demand are not significant in explaining housing returns in the post-crisis sample, panel (c), when the other variables are included, column (5): here changes in credit standards is the only variable that is significant, though only at the 10% level.

4. HOUSING PRICES, SUPPLY SHOCKS, DEMAND SHOCKS, AND ECONOMIC FUNDAMENTALS

The savings glut and loose monetary policy explanations of the housing cycle are both supply side stories. It is interesting to note that credit demand is an important factor in explaining our observed housing data.

As such, it is important to disentangle credit supply and credit demand shocks in the data, and as far as possible, identify the causes of the shocks. For instance, credit standards may be changing due to changes in monetary policy, the willingness of foreigners to extend credit, as a non-price mechanism for rationing credit, or due to changing economic conditions. We will start by looking at housing returns as a function of economic variables, and then use the economic data to identify demand and supply shocks as well as their potential causes.

4.1. *Economic Fundamentals*

We collect data related to each country's economic fundamentals. Unless noted otherwise, all our data comes from the St. Louis Fed. Since housing returns related to market fundamentals should also be evident in equity markets, we obtain share price indexes for each country. If observations for a country are not available from the St. Louis Fed, we obtain from Bloomberg a broad-based equity index for that country. This leaves us with data for 41 countries. Figure 14 shows cumulative growth in real GDP, housing prices, and the stock market for each of these countries. Panel (b) graphs separately the nine countries where the cumulative stock or housing return exceeds 200%. Roughly half the sample exhibit higher real housing returns than stock market returns since 2000Q1. Indeed, Argentina, Austria, Croatia, Peru and Slovenia have much larger drops in their equity markets during the financial crisis, denoted with the dashed vertical line, than in their housing markets. While this may indicate a deviation from economic fundamentals, in part this is due to the more pronounced impact that the financial crisis appears to have on the stock market. Indeed, if money illusion or a wealth effect were a primary factor in explaining falling housing prices around the financial crisis, we would expect movements in housing prices and stock market prices to be highly correlated.

To capture housing demand based on the economic fundamentals, like Terrones and Otrok (2004) we include the growth in real GDP. In addition, Stock and Watson (1989) and Estrella and Hardouvelis (1991) note the yield curve's slope reflects information about future economic growth.[23] As such, we also include the spread between the yields on each government's treasury bills and 10-year notes. Though for most countries the data on treasury notes is well reported, the data on treasury bills is often missing. We supplement

[23] Alternatively, flattening yield curve may encourage banks to seek yield by making riskier or longer-term loans.

the treasury data using observations from Bloomberg. If this data isn't available, then we use the 90-day interbank rate. If this isn't available, we construct the term spread by substituting the call money rate for the treasury bill rate. We also proxy for economic conditions using the unemployment rate and growth in real consumption. Finally, we control for demographic impacts on housing demand by gathering data on population growth rates, and we control for supply elasticity using both population density per square kilometer and the ratio of coastline to total area. Summary statistics for these variables are provided in Table 4.

Table 5 regresses quarterly housing returns onto lagged observations of the independent variables, while Table 6 regresses quarterly housing returns onto averages of the independent variables over the prior two years. In general the results are not consistent for our measures of economic growth (growth in real GDP and consumption, unemployment, and the term spread) or demographic controls (population growth, population density, and ratio of coastline to total area). Signs and significance of these control variables are sensitive to the time period and the inclusion of the survey data. Changes in credit demand, however, remain positive and significant over the full sample (panel (a) in both tables). Lagged changes in the current account, however, are not significant in the full sample (panel (a) of Table 5) though average changes over the prior two years are significant in the full sample (panel (a) of Table 6). Comparing all three panels, however, the current account's explanatory power seems concentrated in the post-crisis period when the coefficient on changes in credit standards is also significant. Credit demand is significant in most regressions, though none of the variables do a particularly good job explaining housing prices prior to the financial crisis, perhaps the period of most interest.

4.2. *Identifying Credit Supply and Credit Demand Shocks*

Over the full sample, changes in credit demand appear to be the best predictor of housing returns. We do find some support for the hypotheses that changing credit standards and current account imbalances affect housing returns. However, we find no support that monetary policy is a primary factor in determining housing prices. Looking into the pre-crisis and post-crisis sub-periods, and accounting for general economic

conditions, we find the strongest predictor of housing prices is still changes in credit demand, as well as sustained current account deficits. Nevertheless, correlation between our variables may mask the importance they play in determining housing prices.

For instance, while credit standards surveys are often used as a proxy for credit supply shocks, credit standards may actually reflect credit demand shocks. For instance, a sudden increase in credit demand, ceteris paribus, may cause banks to ration credit through higher interest rates, increased lending standards, or both. One novelty of our data is that we can use both credit demand and credit standards surveys, along with interest rate data and debt outstanding, to identify credit demand and credit supply shocks. We next identify credit supply and credit demand shocks using central bank surveys on credit standards and credit demand. We then will use these observations (work currently in progress, but nor yet in paper), in combination with the previously identified shocks related to monetary policy and the current account, to investigate if the current account simply reflects changes in demand or causes changes in supply.

To identify demand from supply shocks, first note that when the credit demand survey indicates a change in loan applications, this change may simply be a movement along the credit demand curve due to a credit supply shock. As noted previously, demand shocks result in quantity demanded and price (credit standards) moving in the same direction. Hence, we identify positive (negative) credit supply shocks as observations where credit standards are loosening (tightening) but credit demand is either increasing (decreasing) or constant. We also identify positive (negative) credit demand shocks as observations where the central bank reports an increase (decrease) in credit demand and either no change in credit standards or a tightening (loosening). Figure 15 graphs the average real quarterly housing return for changes in credit standards and credit demand as identified through central bank surveys. While the shorter time series and smaller cross-section of the survey data results in a fewer identified credit supply and demand shocks than when we use the current account, we see a similar pattern as in Figure 8: real housing returns are higher in quarters when credit supply and demand shocks are positive. Unlike Figure 8, however, the quarterly real housing return is negative, not simply lower, when there is a negative credit supply or credit demand shock. This may suggest that the survey data is better at correctly identifying supply shocks for demand shocks.

.... still in progress.

5. CONCLUSIONS

In 2007 the United States and most European countries experienced large losses in the residential housing market. The main competing theories to explain these negative returns include: loose monetary policy, capital inflows financed by current account deficits, or changing credit standards. In particular these first two explanations argue that housing returns prior to the financial crisis were not tied to economic fundamentals, and that these price increases were therefore not sustainable. In particular Taylor (2007) argues that monetary policy left interest rates too low for an extended period, and this credit supply shock results in a housing demand shock. Similarly, Bernanke (2010) and Adam et al. (2011) argue that increased savings rates, driven primarily by a savings glut from Asian countries, resulted in a credit supply shock and subsequent housing demand shock. Under both theories credit standards would likely deteriorate as lending standards function as a non-price mechanism for rationing credit.

Using a sample of 57 countries from 1990 to 2014, we test these theories using Taylor rule deviations to proxy for monetary policy, changes in current account to GDP to measure credit due to foreign financing, and changes in credit standards taken from central bank lending surveys. In addition, we control real GDP and consumption growth, unemployment rates, population density and growth, the spread between long-term and short-term debt, and changes in credit demand taken from central bank surveys. During the full sample period we find some support for the savings glut hypothesis that cash inflows financed by current account deficits lead to increases in housing prices. Nevertheless, some of the change in the current account appear to be driven by demand shocks. That is, current account deficits are not necessarily increasing housing demand through lower borrowing costs, but rather the growing current account deficits simply reflect increased housing demand.

Furthermore, our preliminary results also indicate that changes in credit demand are the best predictor of housing returns. Nevertheless we note that adding the credit standards and credit demand survey data significantly reduces our sample. Survey data is limited to the period from 2000-2014, and is available

for roughly half of the countries in our sample. Furthermore, we contribute to the literature by identifying changes in the current account that simply reflect demand shocks from changes that represent supply shocks. The former are inconsistent with the savings glut hypothesis, but result in the same correlation between housing prices and current account deficits.

Our on-going research, to be included in the final draft, focuses on further isolating supply shocks from demand shocks. This is important since changes in credit standards may in fact reflect a credit demand shock, since standards serve as a non-price mechanism to ration credit. The fact that we have survey data about both credit standards and credit demand, along with price and quantity variables, allows us to add to the literature by identifying supply shocks from demand shocks with greater precision.

REFERENCES

Adam, K., Kuang, P., and Marcet, A. (2011). House price booms and the current account. *NBER Macroeconomics Annual*, 26(1):77–122.

Aizenman, J. and Jinjarak, Y. (2009). Current account patterns and national real estate markets. *Journal of Urban Economics*, 66(2):75–89.

Allen, F. and Hong, J. (2011). Why are there global imbalances? the case of south korea. working paper.

Allen, F. and Rogoff, K. (2011). Asset prices, financial stability and monetary policy. November 12, 2010 Riksbank Workshop on Housing Markets, Monetary Policy and Financial Stability.

Bernanke, B. S. (2010). Monetary policy and the housing bubble. Annual Meeting of the American Economic Association.

Brunnermeier, M. K. and Julliard, C. (2008). Money illusion and housing frenzies. *Review of Financial Studies*, 21(1):135–180.

Caballero, R. J. and Krishnamurthy, A. (2009). Global imbalances and financial fragility. *American Economic Review Papers and Proceedings*, 99:584–588.

Campbell, S. D., Davis, M. A., Gallin, J., and Martin, R. F. (2009). What moves housing markets: A variance decomposition of the rent-price ratio. *Journal of Urban Economics*, 66:90–102.

Cardarelli, R., Igan, D., and Rebucci, A. (2008). *World Economic Outlook: Housing and the Business Cycle*. International Monetary Fund.

Cesa-Bianchi, A., Cespedes, L. F., and Rebucci, A. (2015). Global liquidity, house prices, and the macroeconomy: Evidence from advanced economies. *Journal of Money, Credit and Banking*, 47(1):301–335.

Clarida, R., Gali, J., and Gertler, M. (1998). Monetary policy rules in practice: Some international evidence. *European Economic Review*, 42:1033–1067.

Clarida, R., Gali, J., and Gertler, M. (2000). Monetary policy rules and macroeconomic stability: Evidence and some theory. *The Quarterly Journal of Economics*, 115:147–180.

Estrella, A. and Hardouvelis, G. A. (1991). The term structure as a predictor of real economic activity. *Journal of Finance*, 46(2):555–576.

Favilukis, J., Kohn, D., Ludvigson, S. C., and Nieuwerburgh, S. V. (2013). *Housing and the Financial Crisis*, chapter International Capital Flows and House Prices: Theory and Evidence, pages 235–299. University of Chicago Press.

Ferrero, A. (2015). House price booms, current account deficits, and low interest rates. *Journal of Money, Credit and Banking*, 47:261–293.

Hau, H. and Lai, S. (2016). Asset allocation and monetary policy: Evidence from the eurozone. *Journal of Financial Economics*, Forthcoming.

Jinjarak, Y. and Sheffrin, S. M. (2011). Cuasality, real estate prices, and the current account. *Journal of Macroeconomics*, 33:233–246.

Keys, B. J., Piskorski, T., Seru, A., and Vig, V. (2013). *Housing and the Financial Crisis*, chapter Mortgage Financing in the Housing Boom and Bust, pages 235–299. University of Chicago Press.

Laibson, D. I. and Mollerstrom, J. (2010). Capital flows, consumption booms and asset bubbles: A behavioral alternative to the savings glut hypothesis. *Economic Journal*, 120(544):354–374.

Leamer, E. E. (2015). Housing really is the business cycle: What survives the lessons of 2008-09? *Journal of Money, Credit and Banking*, 47(1):43–50.

Ling, D. C., Ooi, J. T. L., and Le, T. T. T. (2015). Explaining house price dynamics: Isolating the role of nonfundamentals. *Journal of Money, Credit and Banking*, 47(1):88–125.

Lown, C. S., Morgan, D. P., and Rohatgi, S. (2000). Listening to loan officers: The impact of commercial credit standards on lending and output. *FRBNY Economic Policy Review*, 6(2).

Mack, A. and Martínez-García, E. (2011). A cross-country quarterly database of real house prices: A methodological note. *Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute Working Paper no. 99*, (December).

Maddaloni, A. and Peydró, J.-L. (2011). Bank risk-taking, securitization, supervision, and low interest rates: Evidence from the euro-area and the u.s. lending standards. *Review of Financial Studies*, 24(6):2121 – 2165.

Mendocino, C. and Punzi, M. T. (2014). House pirces, capital inflows, and macroprudential policy. *Journal of Banking and Finance*, 49(12):337–355.

Mian, A. and Sufi, A. (2009). The political economy of the us mortgage default crisis. *Quarterly Journal of Economics*, 124(4):1449–1496.

Muellbauer, J. (2015). Housing and the macroeconomy: Inflation and the financial accerlerator. *Journal of Money, Credit and Banking*, 47(1):51–58.

Orphanides, A. (2001). Monetary policy rules based on real-time data. *American Economic Review*, 91(4):964–985.

Reinhart, C. M. and Rogoff, K. (2008). *This Time Is Different: Eight Centuries of Financial Folly*. Princeton University Press.

Reinhart, C. M. and Rogoff, K. S. (2011). From financial crises to debt crises. *American Economic Review*, 101(5):1676–1706.

Sá, F. and Wieladek, T. (2015). Capital inflows and the u.s. housing boom. *Journal of Money, Credit and Banking*, 47(1):221–256.

Stock, J. H. and Watson, M. W. (1989). New indexes of coincident and leading economic indicators. In Blanchard, O. J. and Fischer, S., editors, *NBER Macroeconomics Annual 1989, Volume 4*. MIT Press, Boston.

Taylor, J. B. (1993). Discretion versus policy rules in practice. *Carnegie-Rochester Conference Series on Public Policy*, 39:195–214.

Taylor, J. B. (1999). Monetary policy rules. In *A Historical Analysis of Monetary Policy Rules*, chapter 7. University of Chicago Press, Chicago, Illinois.

Taylor, J. B. (2007). Housing and monetary policy. In *Jackson Hole Symposium*. Federal Reserve Bank of Kansas City.

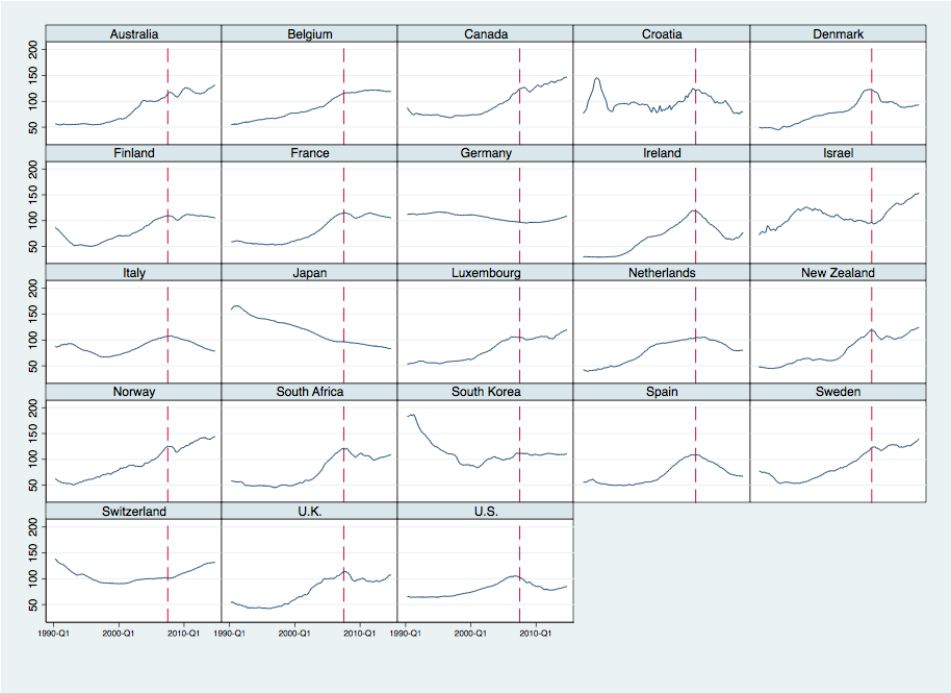
Taylor, J. B. (2014). The role of policy in the great recession and the weak recovery. *American Economic Review*, 104(5):61–66.

Terrones, M. and Otrok, C. (2004). Three current policy issues. *IMF World Economic Outlook*.

Wachter, S. (2015). The housing and credit bubbles in the united states and europe: A comparison. *Journal of Money, Credit and Banking*, 47(1):37–42.

Figure 1: *Real Housing Price Index*

(a) Dallas Fed Data: 1990q1 to 2014q4 (2005 baseline)



(b) Cesa-Bianchi et al. (2015) Data: 1990q1 to 2012q4 (2008 baseline)

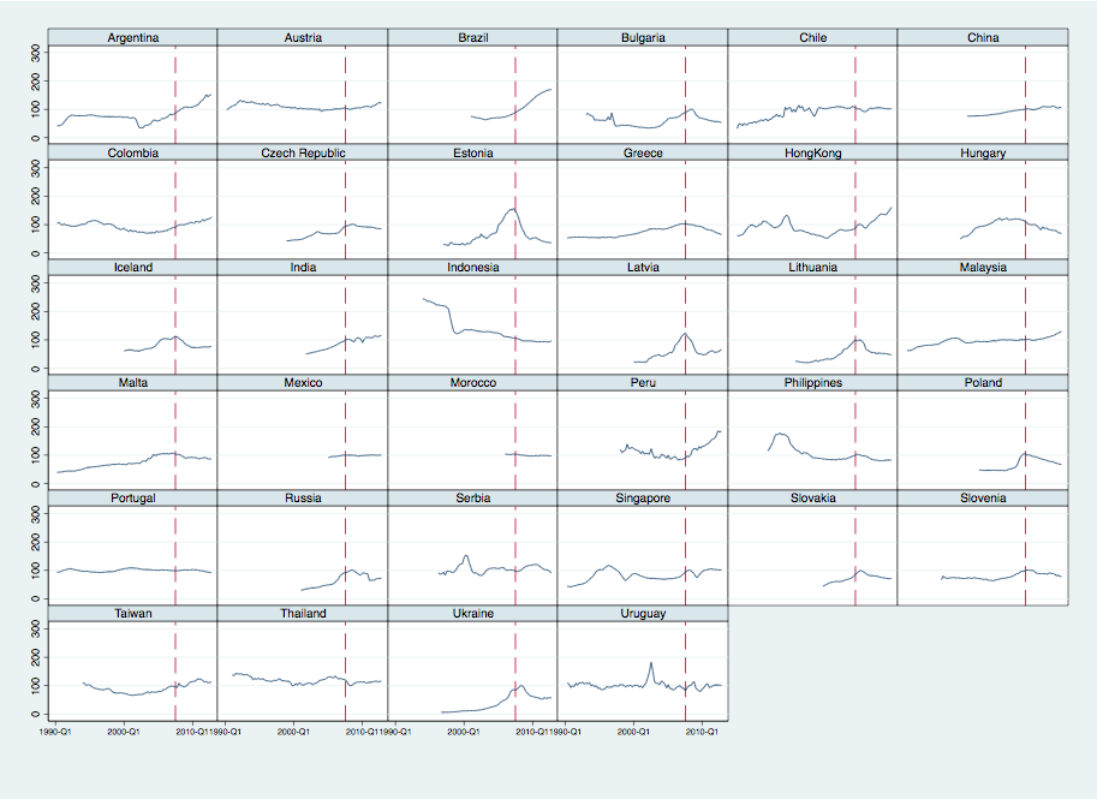
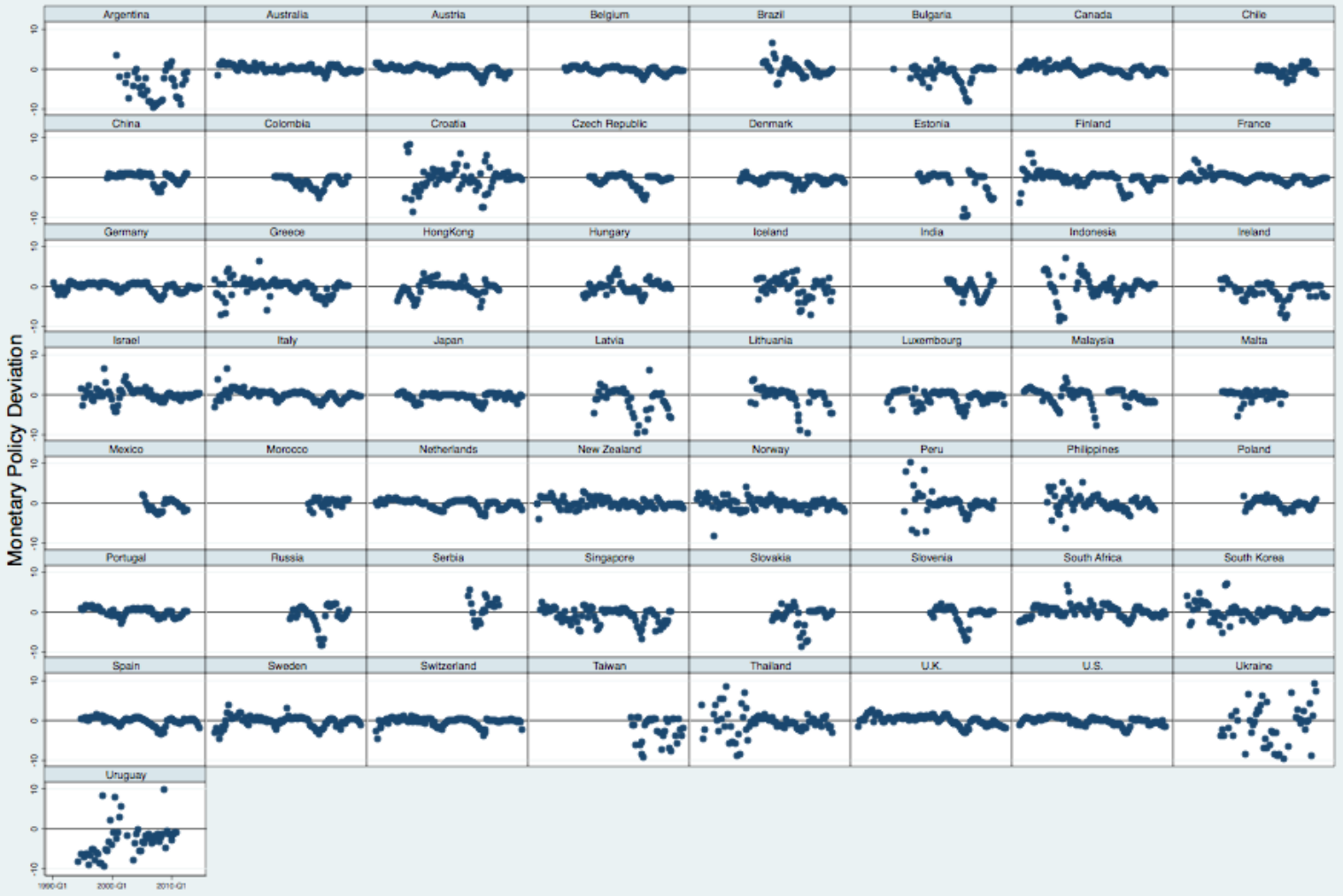


Figure 2: Full Sample: 1990Q1 to 2014Q1

(a) *Time Series of Monetary Policy Deviations from Taylor Rule*



(b) *Time Series of Change in Current Account divided by GDP*

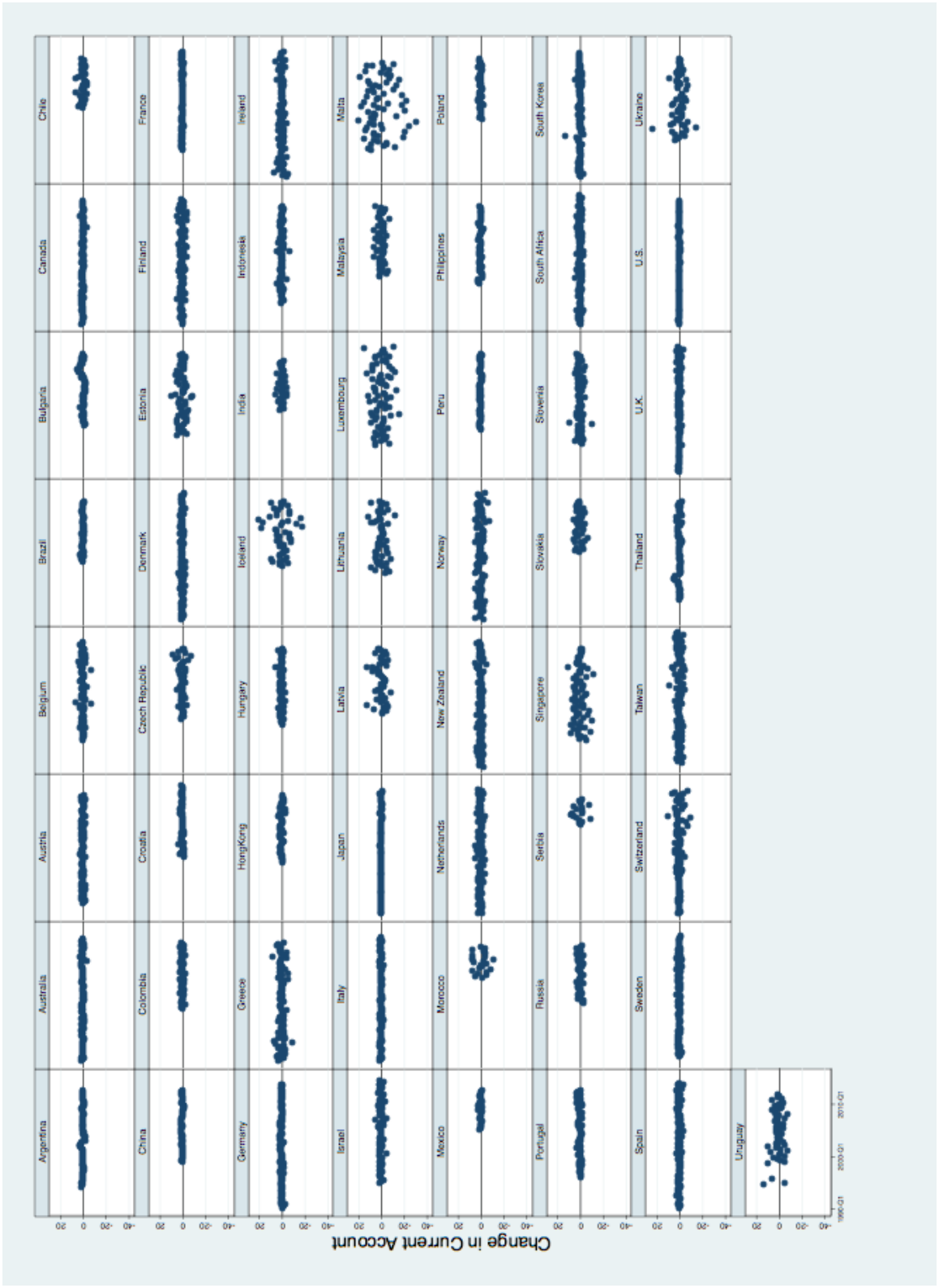


Figure 3: Time Series of Central Bank Surveys

(a) *Time Series of Credit Demand Survey*

(b) *Time Series of Credit Standards Survey*

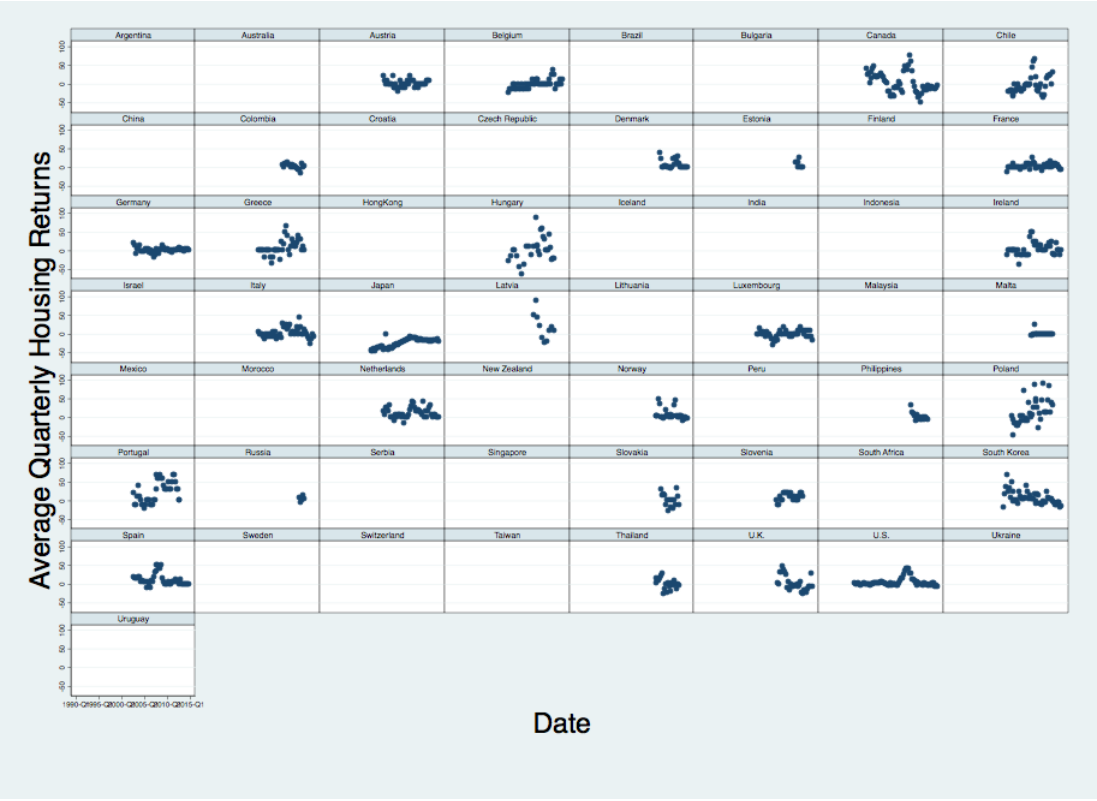


Figure 4: Real Housing Returns

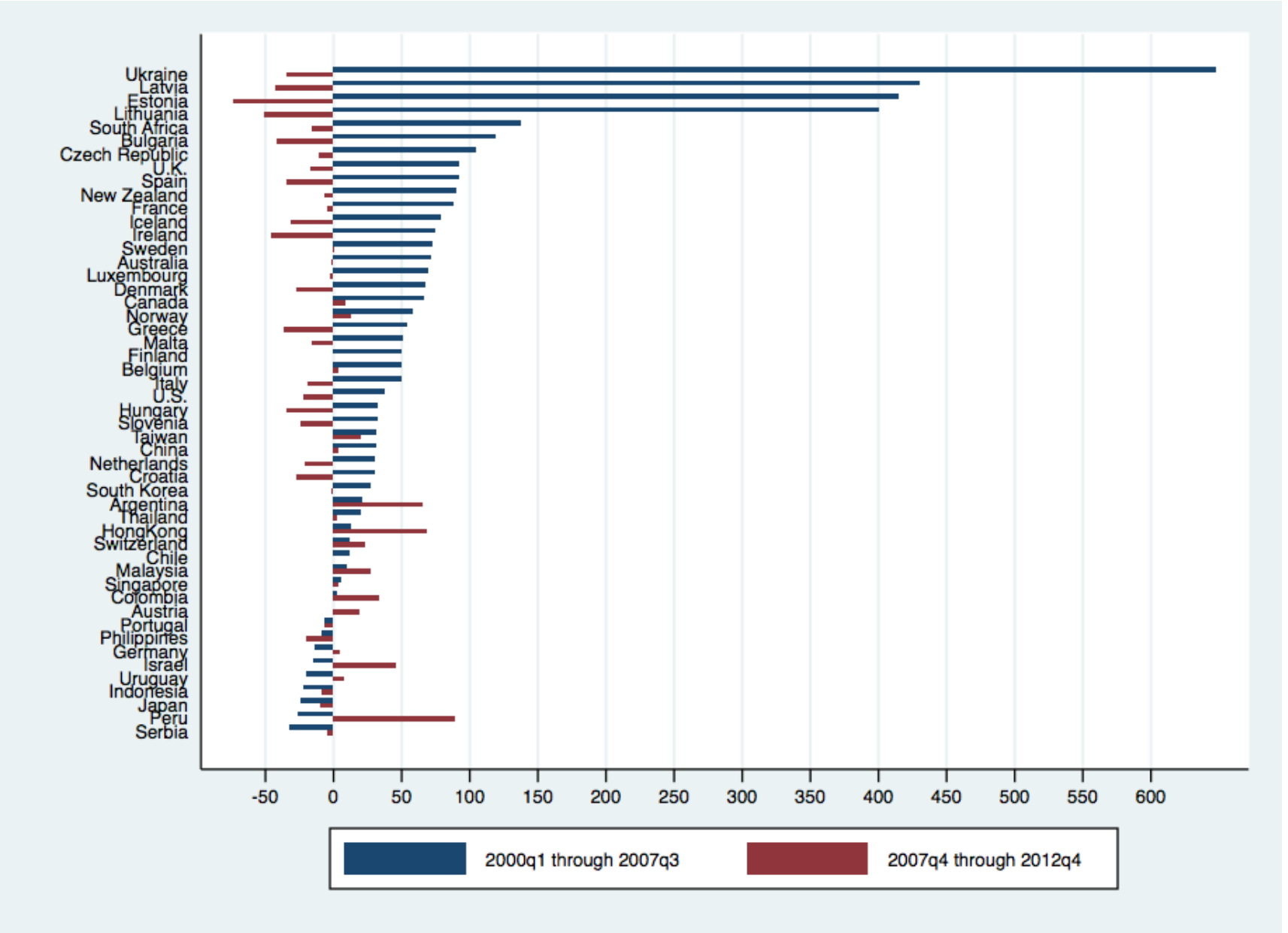
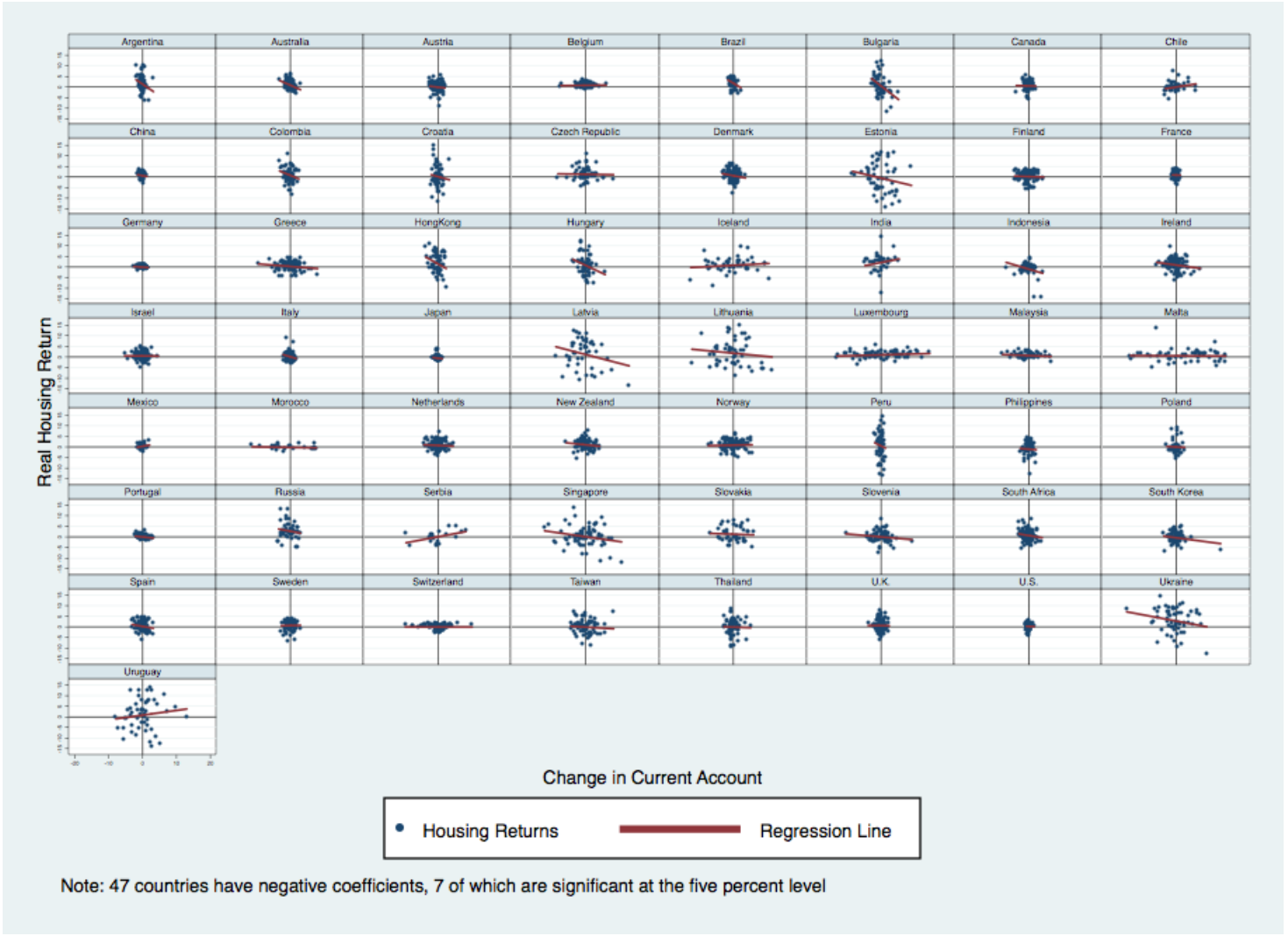


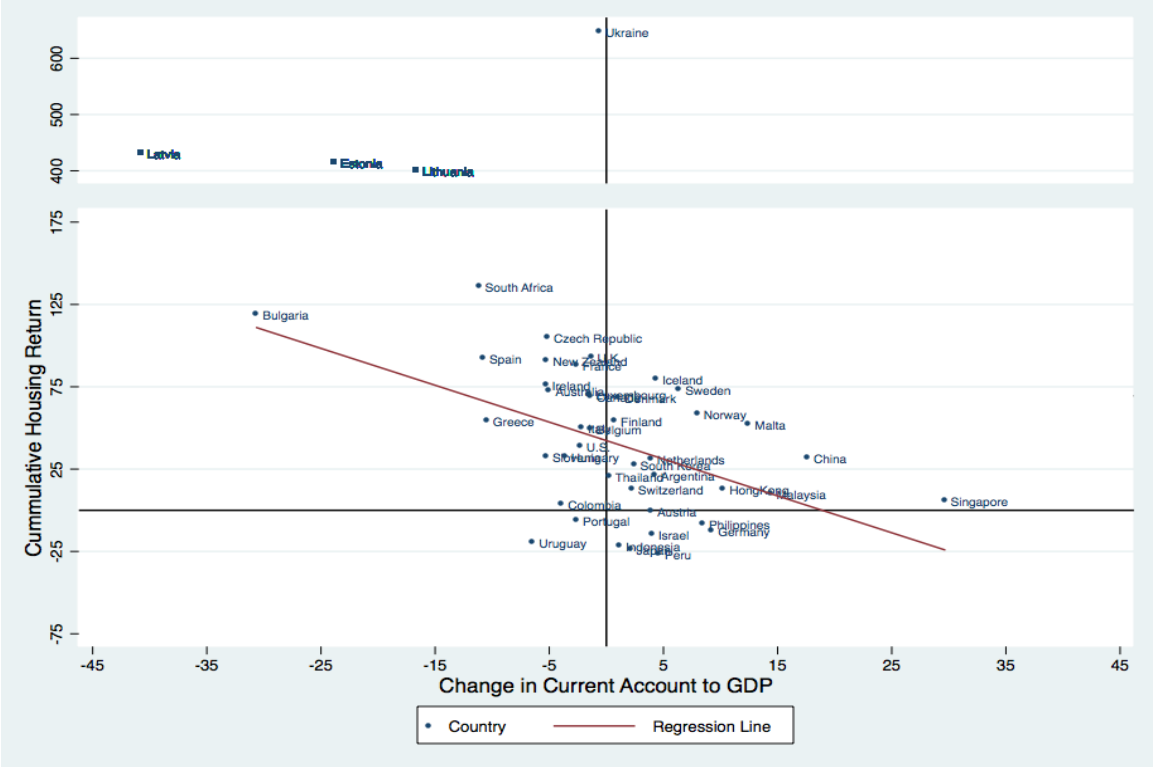
Figure 5: Real Quarterly Housing Return as a Function of Changes in Current Account to GDP



Note: 47 countries have negative coefficients, 7 of which are significant at the five percent level

Figure 6: Housing Returns & Current Accounts: Cumulative Changes

(a) 2000Q1 to 2007Q3



(b) 2007Q4 to 2012Q4

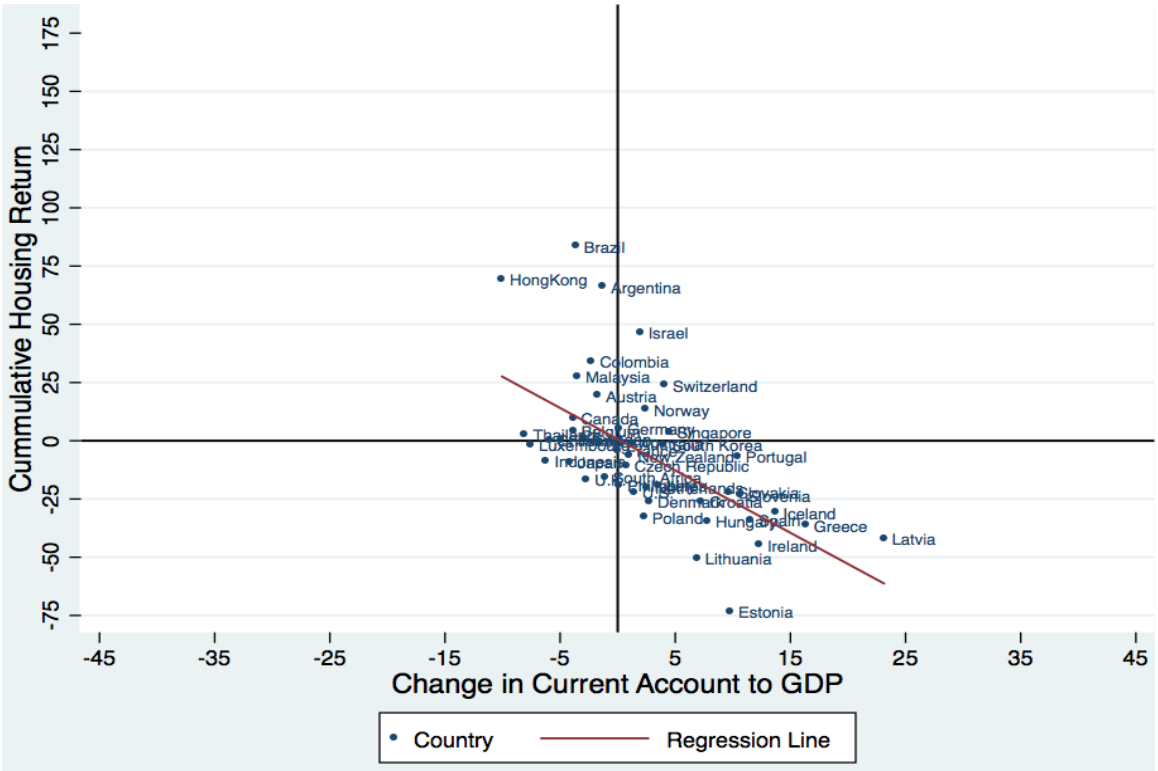
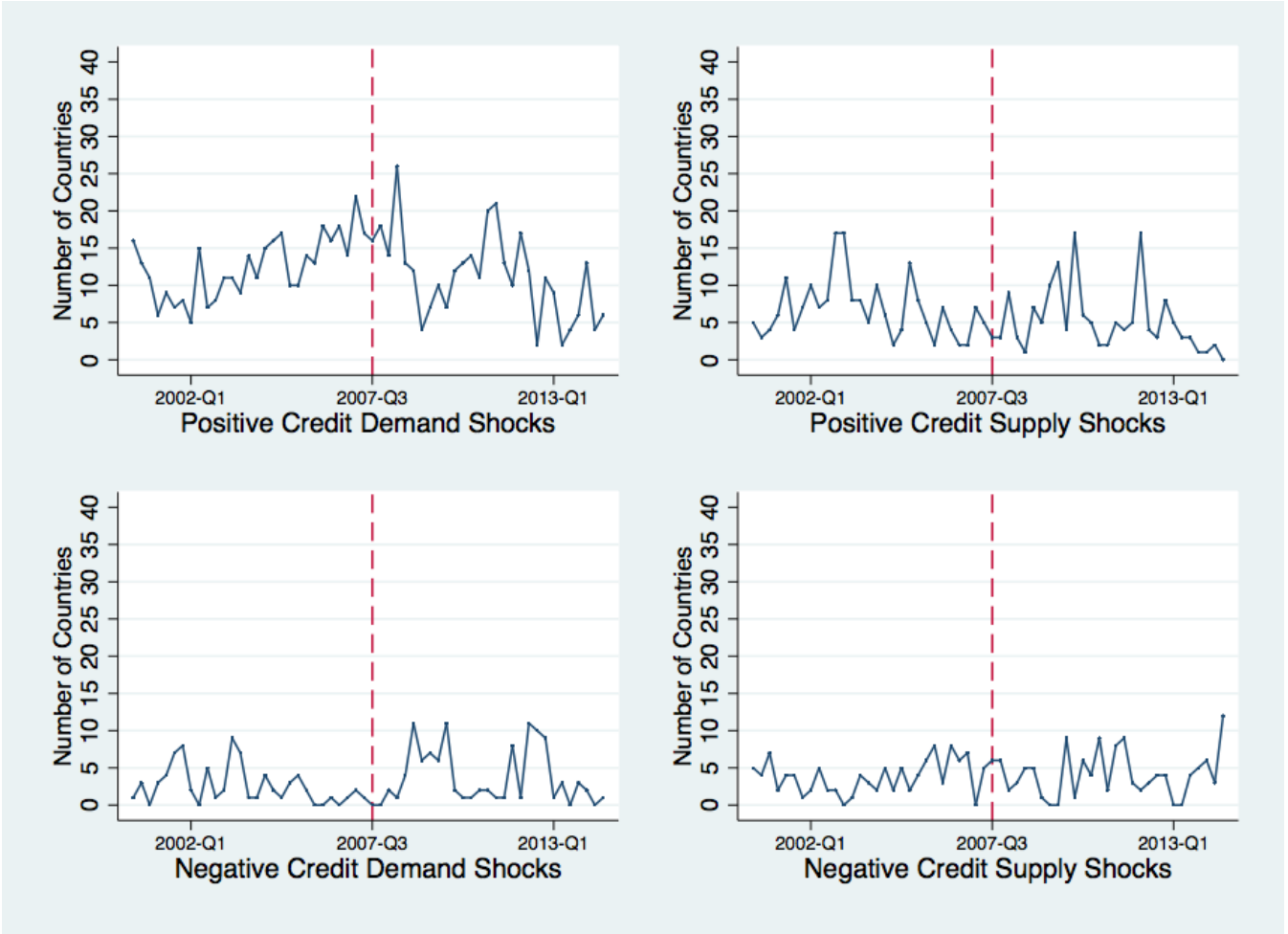


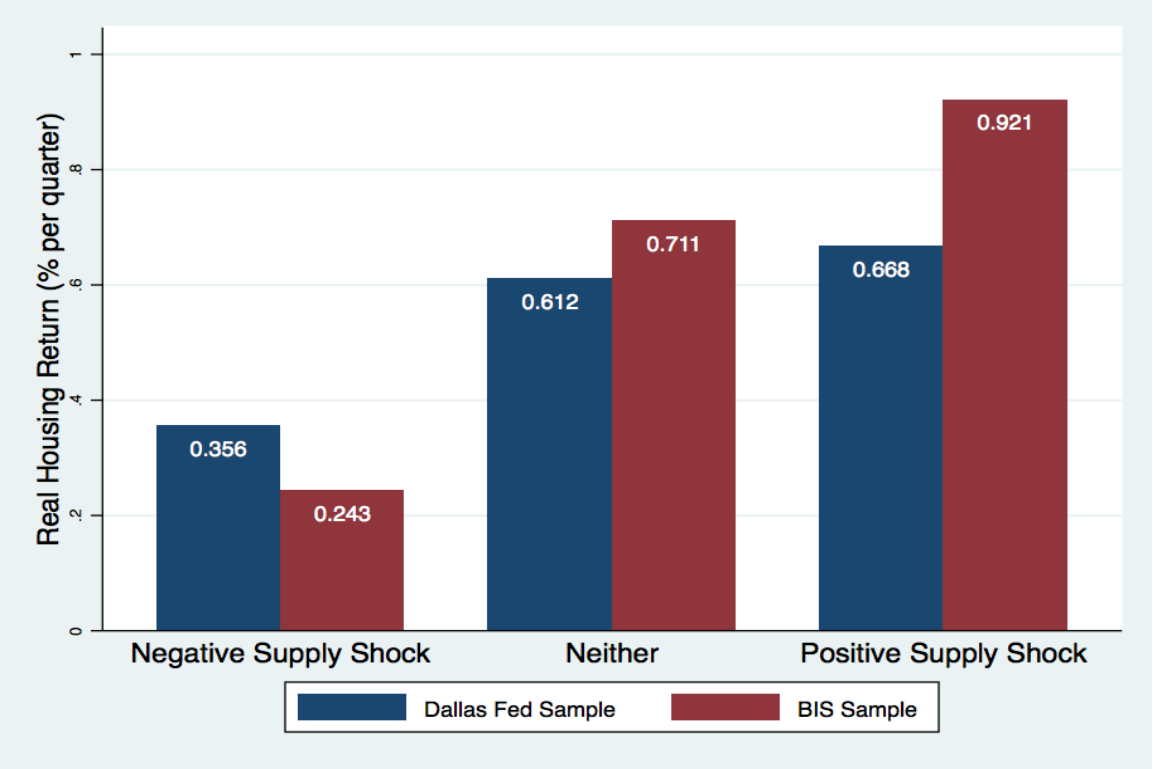
Figure 7: *Credit Supply & Credit Demand Shocks Associated with Changes in the Current Account*



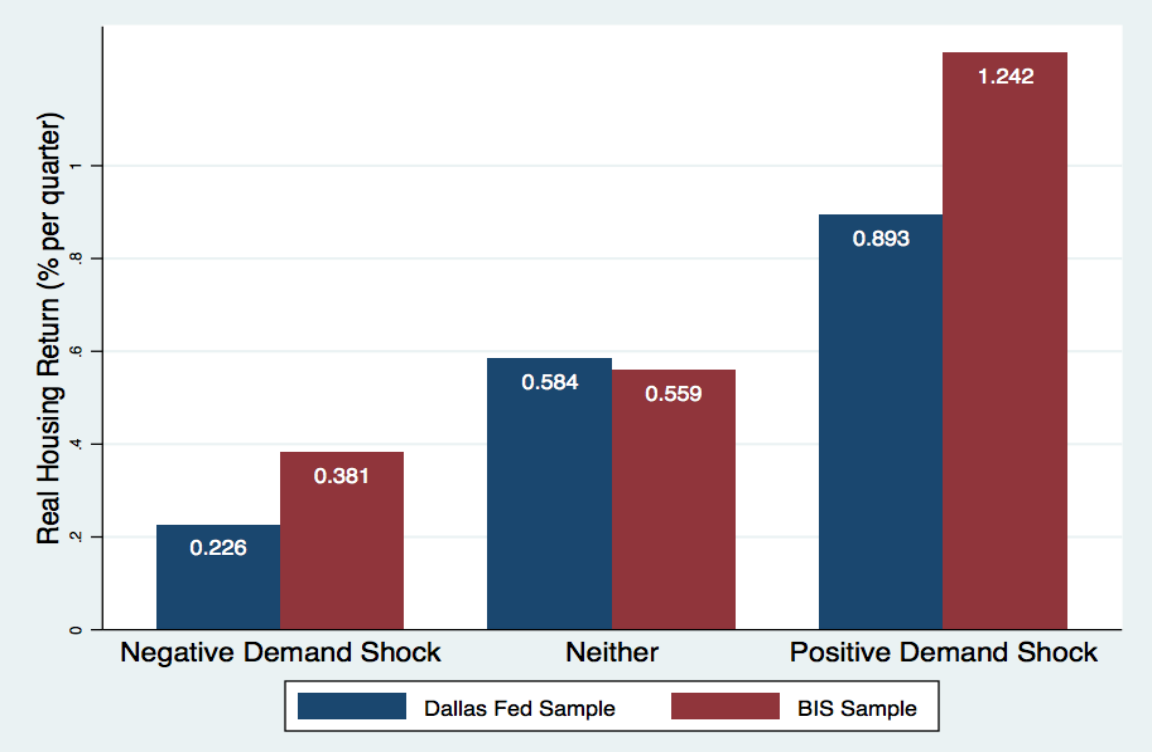
Positive (negative) credit supply shocks related to a country's current account are those observations where the current account deficit and money market issuance increase (decrease) while the 90-day interest rate decreases (increases). That is, credit supply shocks are where quantity and price move in opposite directions. *Positive (negative) credit demand shocks* related to a country's current account are those observations where the current account deficit, money market issuance, and the 90-day interest rate all increase (decrease).That is, where quantity and price move in the same direction.

Figure 8: Housing Returns and Current Account Credit Shocks

(a) Credit Supply Shocks

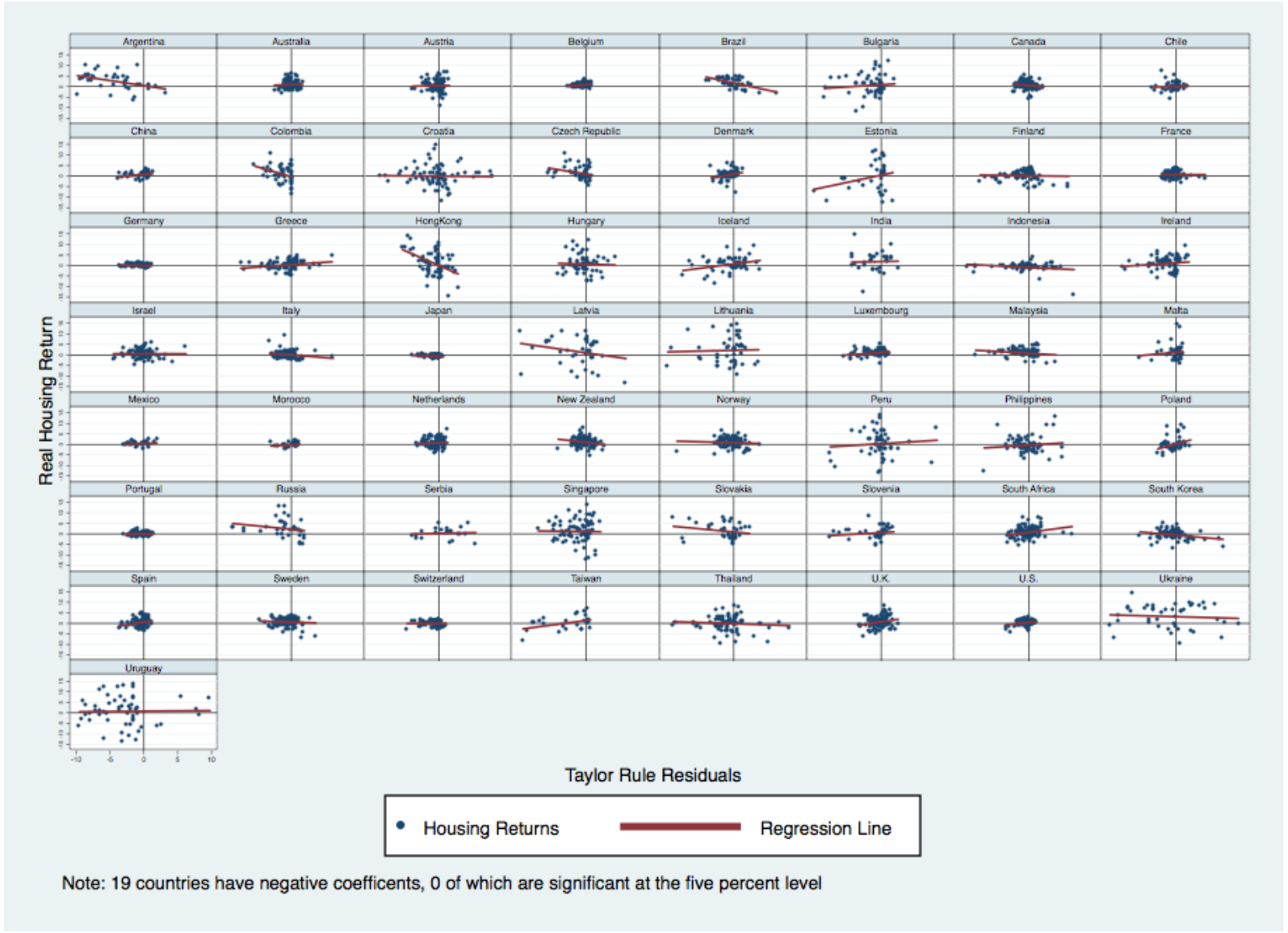


(b) Credit Demand Shocks



Positive (negative) credit supply shocks are when money market issuance and current account deficit increase (decrease) and the 90-day interest rate decreases. *Positive (negative) credit demand shocks* are when money market issuance, the current account deficit, and interest rates all increase (decrease).

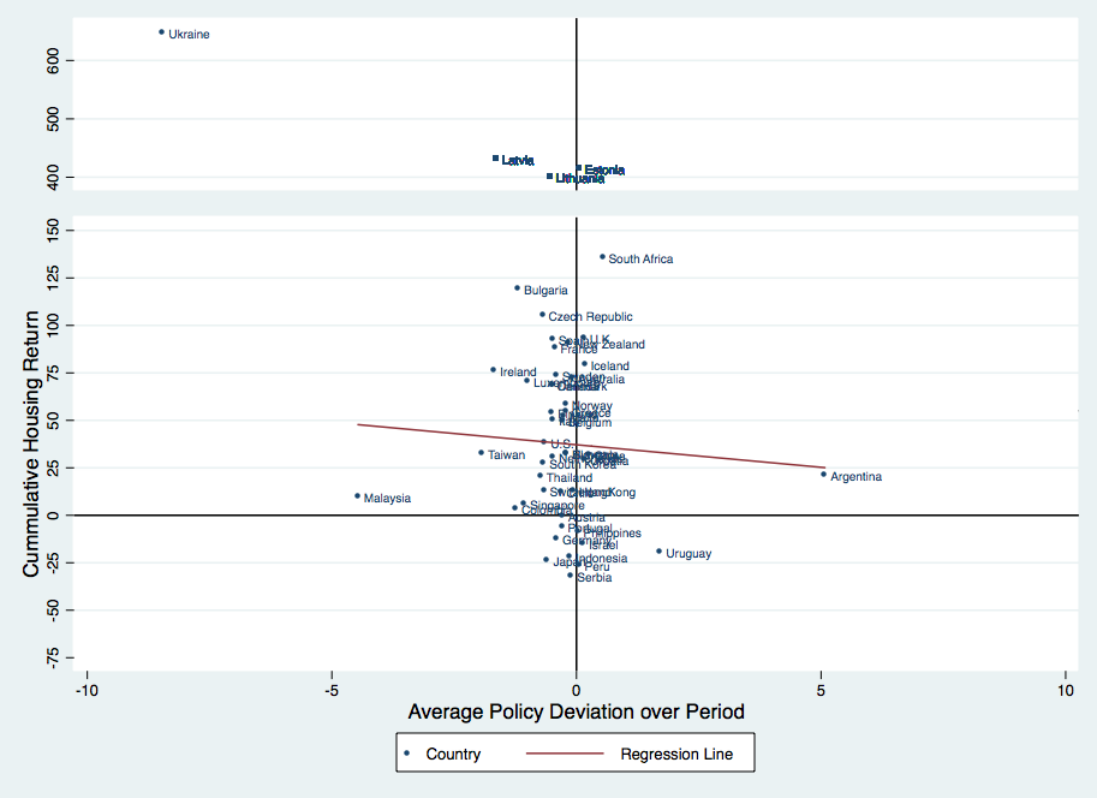
Figure 9: *Real Quarterly Housing Returns and Prior Quarter's Taylor Rule Residual*



Note: 19 countries have negative coefficents, 0 of which are significant at the five percent level

Figure 10: Housing Returns & Monetary Policy Deviations from Taylor Rule: Cumulative Changes

Panel A: 2000Q1 to 2007Q3



Panel B: 2007Q4 to 2012Q4

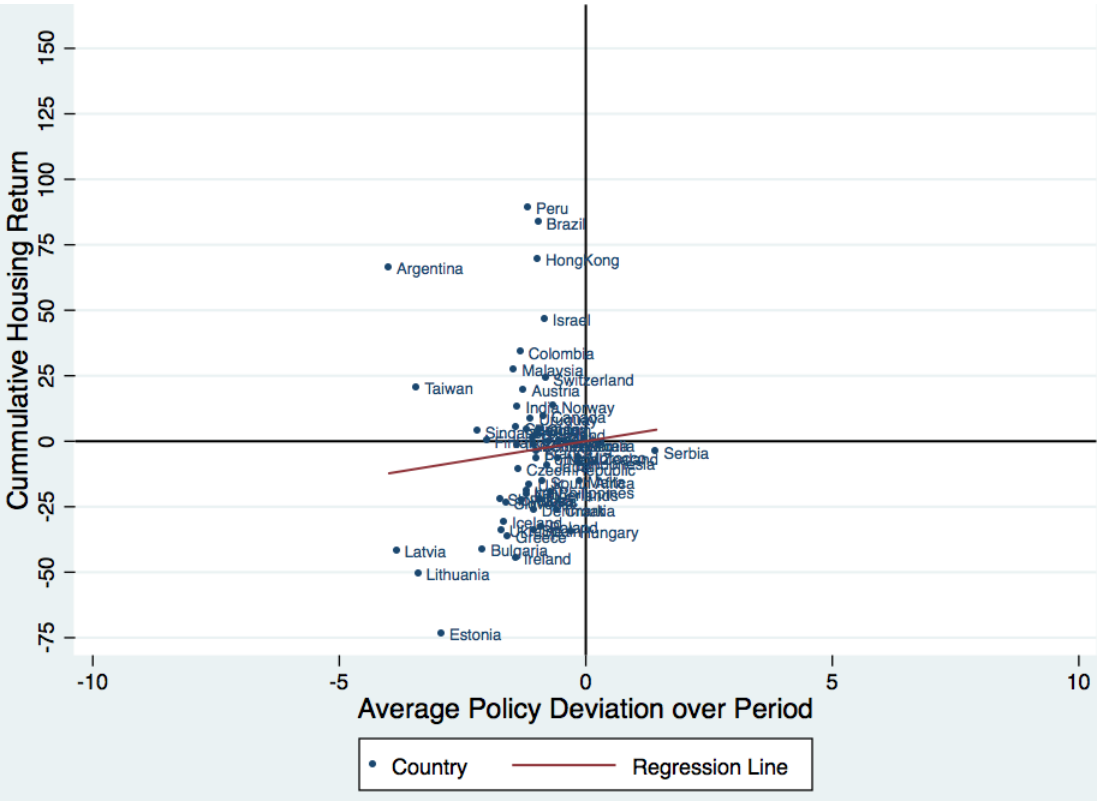
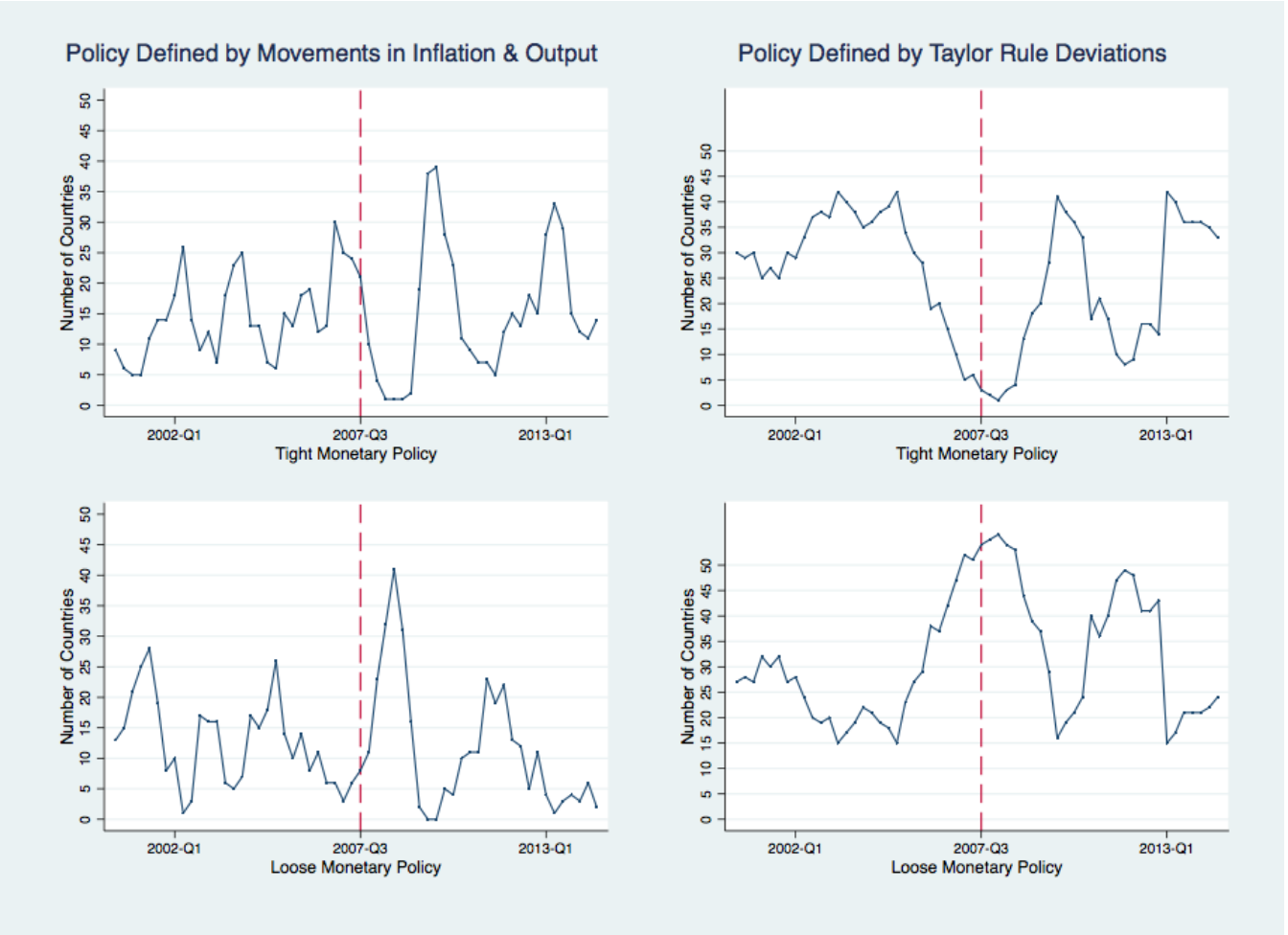


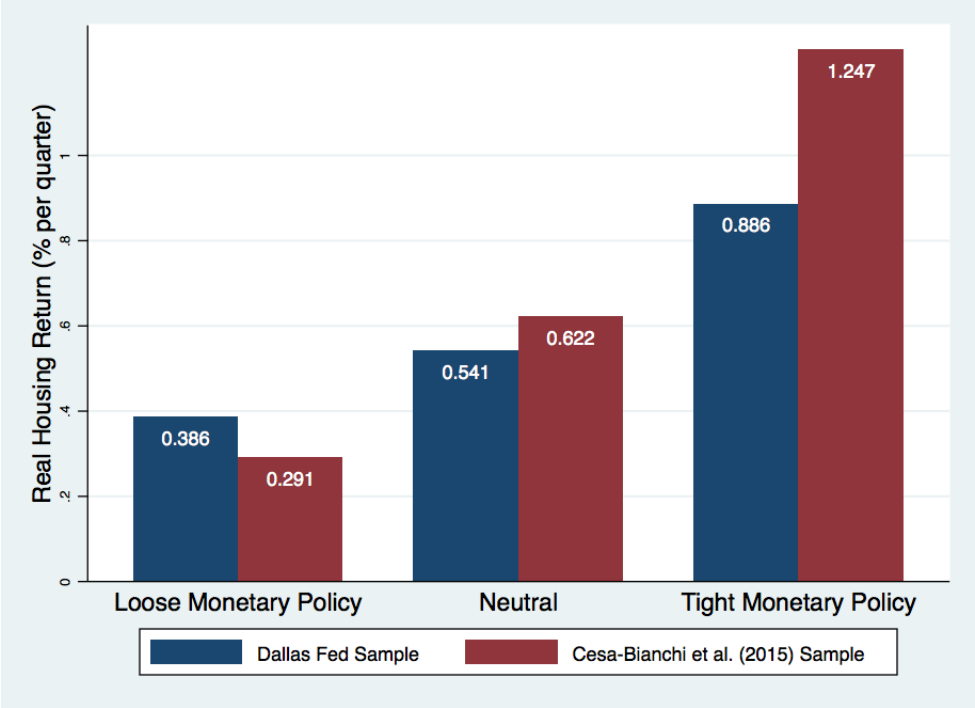
Figure 11: *Number of Countries with Tight versus Loose Monetary Policy*



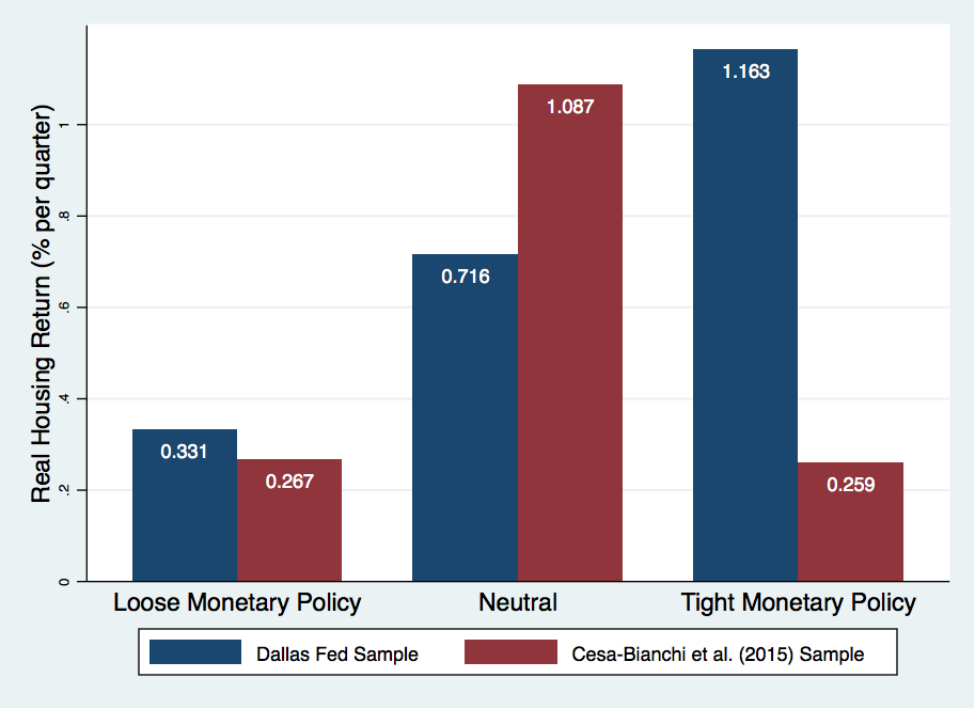
Tight (loose) policy in the left column is when both inflation decreases (increases) and the output gap increases (decreases).
Tight (loose) policy in the right column is when the observed overnight rate is above (below) the rate prescribed by the Taylor rule.

Figure 12: *Average Quarterly Real Housing Returns for Monetary Policy Shocks*

(a) Monetary Policy Stance in Prior Quarter: Data-Defined



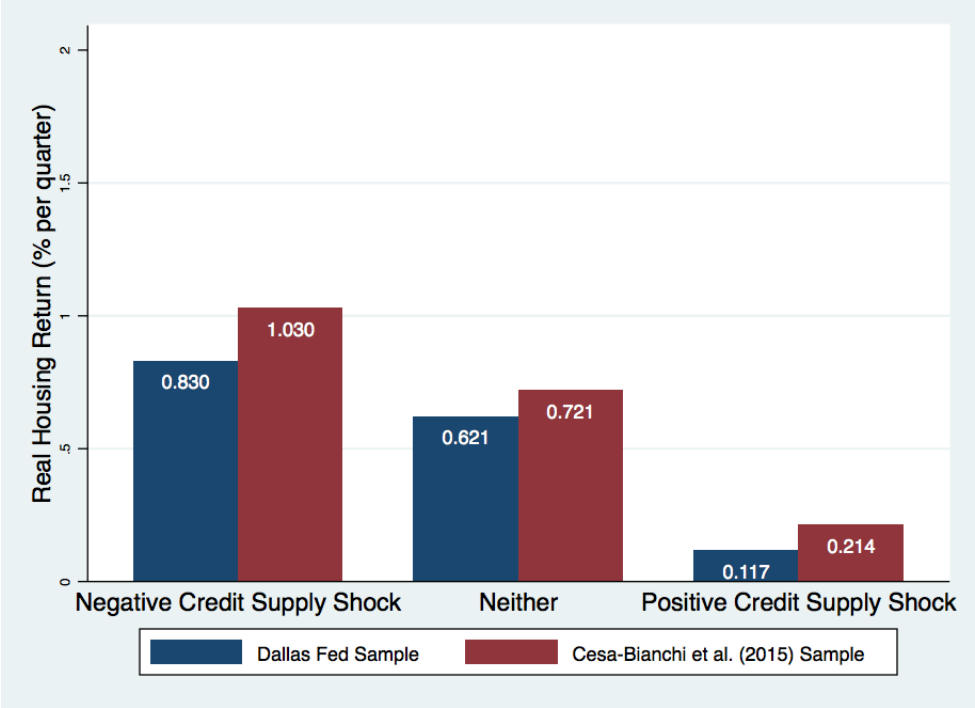
(b) Monetary Policy Stance in Prior Quarter: Taylor Rule Deviation



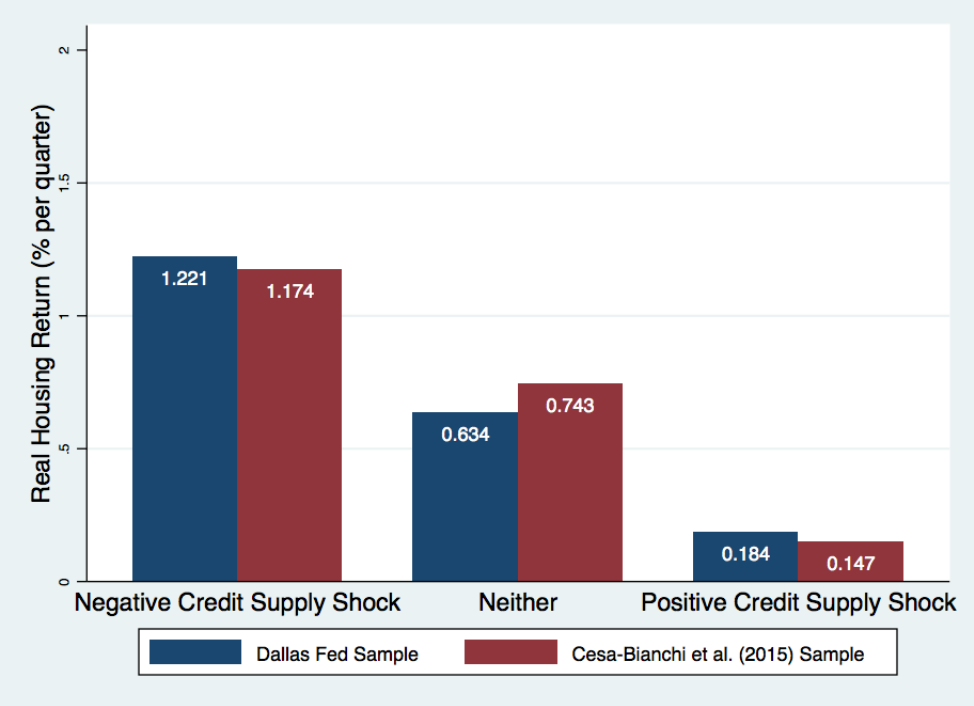
Tight (loose) policy in the top graph indicates inflation decreases (increases) and the output gap increases (decreases).
Tight (loose) policy in the bottom graph indicates the observed policy rate is more than 0.5 standard deviations above (below) the target rate prescribed by the Taylor rule.

Figure 13: *Average Quarterly Real Housing Returns Conditional on Credit Supply Shocks Associated with Monetary Policy*

(a) Monetary Policy Stance in Prior Quarter: Data-Defined



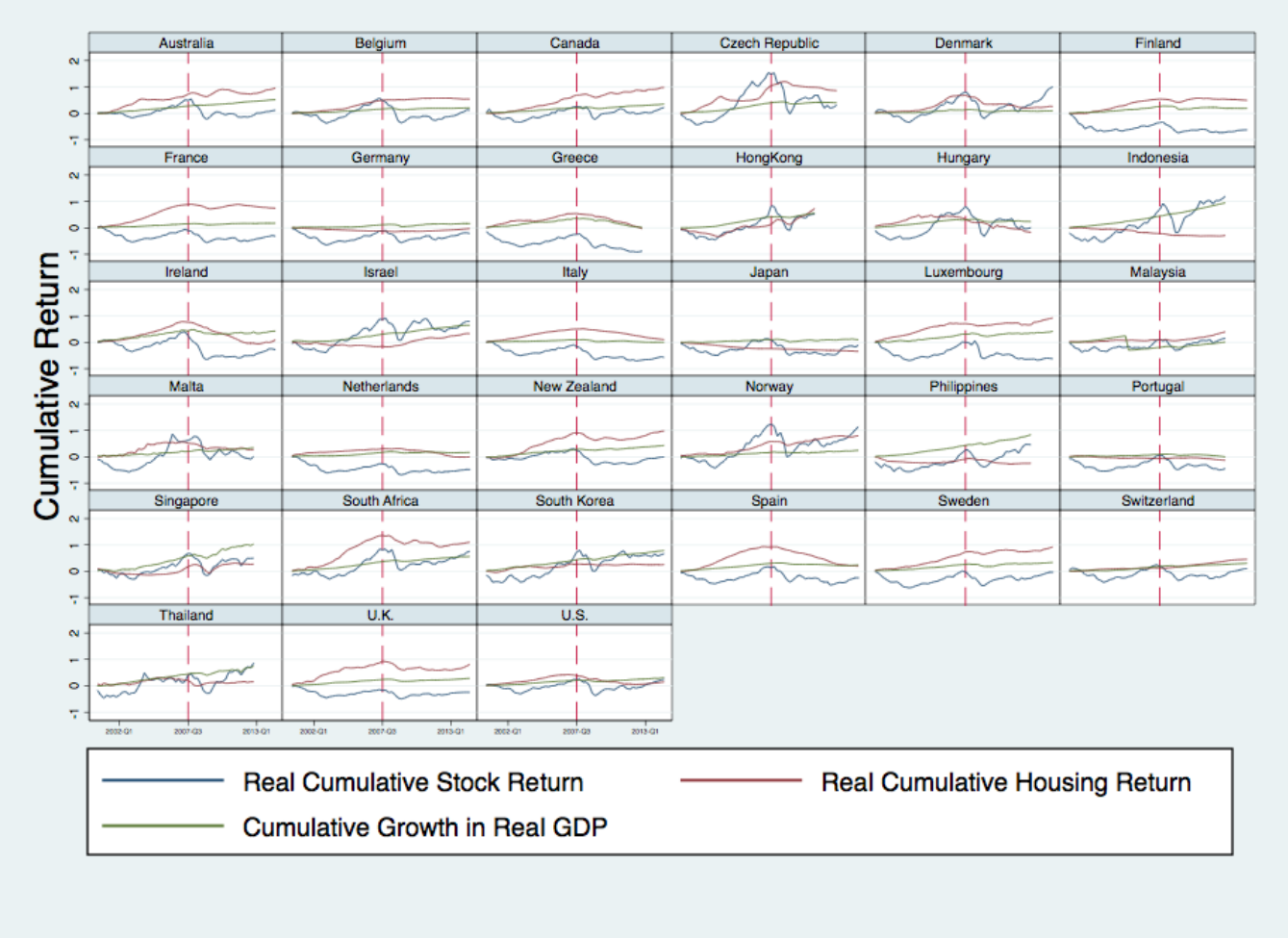
(b) Monetary Policy Stance in Prior Quarter: Taylor Rule Deviation



Negative (positive) credit supply shocks related to monetary policy are those observations where monetary policy in the previous quarter is classified as tight (loose) and money market issuance decreases (increases) and the 90-day bank rate increases (decreases). An observation is not classified as a credit supply shock related to monetary policy if monetary policy is neutral, or if money market issuance and bank rates move in the same direction.

Figure 14: *Time Series of Cumulative Real Returns to GDP & Stock Index*

(a) Countries with Cumulative Stock Returns under 200%



(b) Countries with Cumulative Stock Returns over 200%

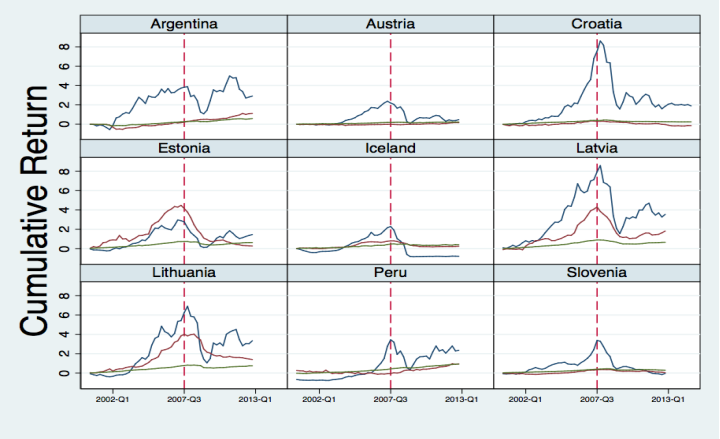


Figure 15: *Real Quarterly Housing Return Conditional on Credit Supply and Credit Demand Shocks Identified through Central Bank Surveys*

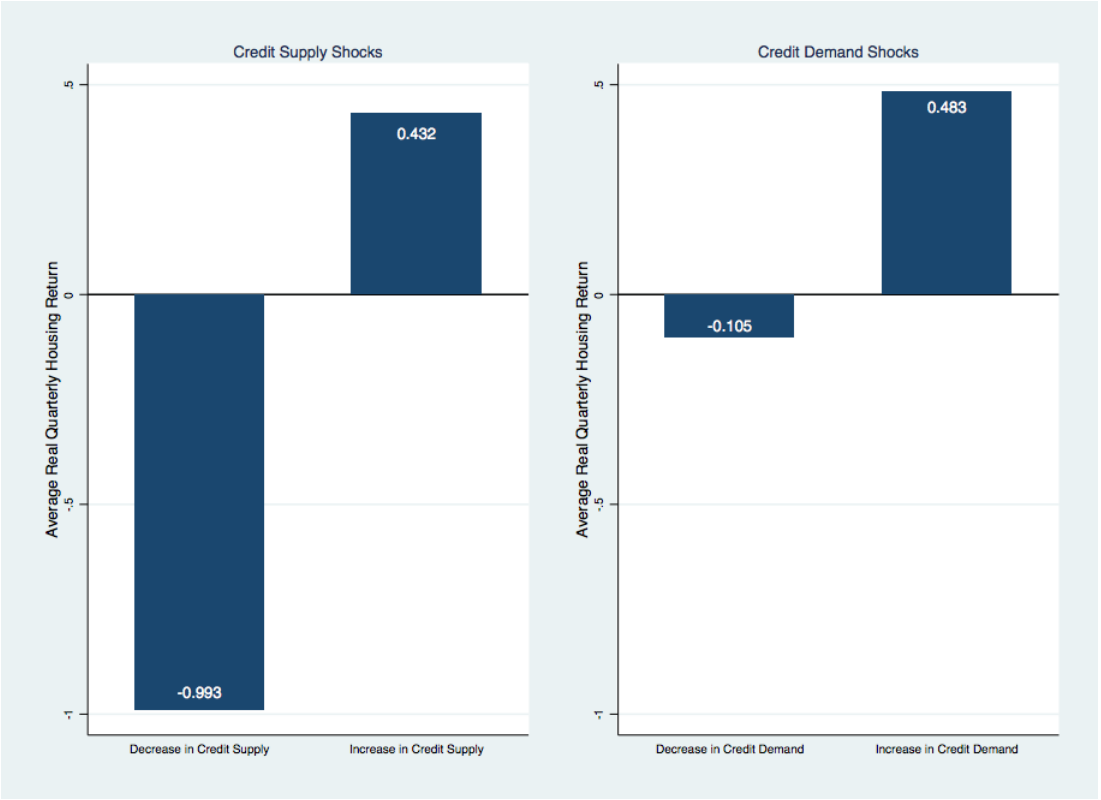


Table 1: Regress Cumulative Housing Return onto Cumulative Policy Deviation & Cumulative Δ in Current Account to GDP

Panel (a): 2000Q1 to 2007Q3

	(1)	(2)	(3)	(4)
Change in Current Account to GDP	-6.1942***		-6.0580***	-4.3594
	(1.5738)		(1.6181)	(2.8276)
Average Monetary Policy Deviation		-41.0667**	-40.7433**	-43.9582**
		(19.5151)	(19.5886)	(17.9376)
Average Monetary Policy Deviation × Change in Current Account to GDP				1.7587
				(1.6604)
Constant	71.7172***	51.6073***	50.9530***	49.3670***
	(16.3251)	(16.1295)	(14.4185)	(14.3274)
Observations	46	50	46	46
R2	0.289	0.262	0.548	0.571
R2-Adjusted	0.273	0.247	0.527	0.540
F-statistic	15.491	4.428	9.596	8.660
P-value	0.000	0.041	0.000	0.000

F-Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (b): 2007Q4 to 2012Q4

	(1)	(2)	(3)	(4)
Change in Current Account to GDP	-2.6794***		-2.8946***	-2.2465**
	(0.4977)		(0.5775)	(0.9590)
Average Monetary Policy Deviation		3.0712	-4.5732	-6.7182
		(6.3107)	(7.3385)	(8.2641)
Change in Current Account to GDP × Average Monetary Policy Deviation				0.3911
				(0.5775)
Constant	0.6688	0.0073	-4.7227	-6.9120
	(4.1242)	(7.3100)	(8.3094)	(9.3463)
Observations	46	57	46	46
R2	0.363	0.008	0.376	0.385
R2-Adjusted	0.349	-0.010	0.347	0.341
F-statistic	28.979	0.237	15.651	9.069
P-value	0.000	0.628	0.000	0.000

F-Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Panel (a): Regress Housing Return on Changes in Credit Standards & Credit Demand - Full Sample

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
L.Change in Current-Account-to-GDP	-0.0734*				-0.0545
	(0.0413)				(0.0354)
L.Monetary Policy Deviation		0.0011			0.1180
		(0.0014)			(0.0766)
L.Bank Survey - Credit Supply			-0.0345***		-0.0195**
			(0.0082)		(0.0090)
L.Bank Survey - Credit Demand				0.0266***	0.0195***
				(0.0056)	(0.0049)
Constant	0.5974***	0.6204***	0.0390	-0.2627	-0.0227
	(0.1020)	(0.1047)	(0.1770)	(0.1844)	(0.2067)
Observations	4006	3976	1064	1019	953
Countries	57	57	30	30	28
R2-between	0.023	0.005	0.031	0.011	0.060
Wald Test	3.159	0.565	17.478	22.388	27.825
Wald P-value	0.076	0.452	0.000	0.000	0.000
Rho	0.027	0.025	0.193	0.182	0.185

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (b): Regress Housing Return on Changes in Credit Standards & Credit Demand - 2000Q1 to 2007Q3

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
L.Change in Current-Account-to-GDP	-0.0180				-0.0092
	(0.0358)				(0.0311)
L.Monetary Policy Deviation		-0.0043***			0.1302
		(0.0012)			(0.1059)
L.Bank Survey - Credit Supply			0.0095		0.0225
			(0.0245)		(0.0294)
L.Bank Survey - Credit Demand				0.0101**	0.0121***
				(0.0051)	(0.0024)
Constant	1.5404***	1.5733***	1.2503***	1.1288***	1.1596**
	(0.2219)	(0.2387)	(0.4017)	(0.3844)	(0.4582)
Observations	1621	1574	369	339	337
Countries	57	57	20	20	19
R2-between	0.117	0.083	0.070	0.065	0.187
Wald Test	0.253	13.142	0.150	3.875	47.293
Wald P-value	0.615	0.000	0.698	0.049	0.000
Rho	0.093	0.121	0.309	0.330	0.279

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (c): Regress Housing Return on Changes in Credit Standards & Credit Demand - 2007Q4 to 2014Q4

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
L.Change in Current-Account-to-GDP	-0.0813				-0.0314
	(0.0570)				(0.0484)
L.Monetary Policy Deviation		0.0318			0.0147
		(0.1025)			(0.0789)
L.Bank Survey - Credit Supply			-0.0296***		-0.0212***
			(0.0112)		(0.0076)
L.Bank Survey - Credit Demand				0.0193**	0.0133**
				(0.0084)	(0.0065)
Constant	-0.3437	-0.2848	-0.4722**	-0.7381***	-0.5200*
	(0.2164)	(0.2138)	(0.2073)	(0.2140)	(0.2675)
Observations	1183	1159	561	556	520
Countries	57	57	30	30	28
R2-between	0.452	0.043	0.158	0.045	0.117
Wald Test	2.034	0.097	6.972	5.256	10.373
Wald P-value	0.154	0.756	0.008	0.022	0.035
Rho	0.086	0.161	0.229	0.264	0.242

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Panel (a): Regress Housing Return on Average Credit Supply & Credit Demand Shocks - Full Sample

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
Change in Current-Account-to-GDP, 8 quarter average	-0.2927**				-0.1081
	(0.1314)				(0.7760)
Monetary Policy Deviation, 8 quarter average		-0.0106**			0.4259***
		(0.0047)			(0.1472)
Bank Survey - Credit Supply, 8 quarter average			-0.0640***		-0.0309
			(0.0210)		(0.0220)
Bank Survey - Credit Demand, 8 quarter average				0.0488***	0.0278***
				(0.0104)	(0.0105)
Constant	0.6194***	0.6052***	0.2448	-0.3298*	0.3666
	(0.1069)	(0.1052)	(0.2313)	(0.1817)	(0.2617)
Observations	4079	4029	1085	1042	1014
Countries	57	57	30	30	29
R2-between	0.004	0.000	0.062	0.060	0.138
Wald Test	4.965	5.155	9.340	21.891	96.774
Wald P-value	0.026	0.023	0.002	0.000	0.000
Rho	0.032	0.027	0.152	0.152	0.137

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (b): Regress Housing Return on Average Credit Supply & Credit Demand Shocks - 2000Q1 to 2007Q3

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
Change in Current-Account-to-GDP, 8 quarter average	0.1208				-0.4860
	(0.3144)				(0.3033)
Monetary Policy Deviation, 8 quarter average		-0.0206			0.4343
		(0.0559)			(0.3096)
Bank Survey - Credit Supply, 8 quarter average			-0.0168		0.0133
			(0.0165)		(0.0192)
Bank Survey - Credit Demand, 8 quarter average				0.0189**	0.0258***
				(0.0091)	(0.0068)
Constant	1.5583***	1.5549***	1.1908***	0.9496**	0.8728**
	(0.2302)	(0.2347)	(0.3378)	(0.4155)	(0.3660)
Observations	1623	1581	378	348	346
Countries	57	57	20	20	19
R2-between	0.069	0.028	0.020	0.087	0.337
Wald Test	0.148	0.136	1.036	4.318	29.330
Wald P-value	0.701	0.713	0.309	0.038	0.000
Rho	0.105	0.121	0.317	0.313	0.213

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (c): Regress Housing Return on Average Credit Supply & Credit Demand Shocks - 2007Q4 to 2013Q4

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
Change in Current-Account-to-GDP, 8 quarter average	-0.0922				0.3277
	(0.2440)				(1.0014)
Monetary Policy Deviation, 8 quarter average		0.5524***			0.4129
		(0.1854)			(0.2783)
Bank Survey - Credit Supply, 8 quarter average			-0.0554**		-0.0465*
			(0.0276)		(0.0266)
Bank Survey - Credit Demand, 8 quarter average				0.0329**	0.0031
				(0.0145)	(0.0090)
Constant	-0.3503	0.4444	-0.2484	-0.6912***	0.1328
	(0.2186)	(0.2826)	(0.3027)	(0.2142)	(0.5524)
Observations	1197	1189	573	570	544
Countries	57	57	30	30	29
R2-between	0.398	0.075	0.170	0.051	0.176
Wald Test	0.143	8.878	4.040	5.104	87.371
Wald P-value	0.706	0.003	0.044	0.024	0.000
Rho	0.098	0.167	0.161	0.188	0.172

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Summary Statistics

Panel (a): Full Sample, 1990Q1 to 2014Q4

	count	mean	sd	max	min
Housing Returns	4622	0.61	4.29	52.20	-32.60
Growth in Real GDP	4290	2.89	5.09	33.55	-55.98
Term Spread on Government Debt	3377	1.24	2.33	24.70	-13.99
Unemployment Rate	3636	7.52	4.48	29.33	0.40
Growth in Real Consumption	3770	2.79	5.77	118.33	-41.20
Population Growth, Annualized	4367	0.72	0.93	6.20	-5.90
Population per Sq. Km.	4026	390.51	1230.75	7732.75	2.22
Coastline to Total Area	4263	0.04	0.11	0.68	0.00
Change in Current-Account-to-GDP	4043	0.03	2.79	24.09	-30.51
Monetary Policy Deviation	4036	-1.48	43.78	1070.64	-1865.82
Bank Survey - Credit Supply	1094	3.42	19.25	89.67	-62.50
Bank Survey - Credit Demand	1049	3.17	30.58	100.00	-100.00
Observations	4773				

Panel (b): Pre-financial Crisis, 2000Q1 to 2007Q3

	count	mean	sd	max	min
Housing Returns	1685	1.48	4.52	43.82	-29.42
Growth in Real GDP	1641	3.89	5.06	15.48	-55.98
Term Spread on Government Debt	1248	1.13	2.13	16.10	-11.23
Unemployment Rate	1368	7.41	4.50	29.33	1.17
Growth in Real Consumption	1386	3.38	3.84	18.19	-18.24
Population Growth, Annualized	1651	0.64	0.88	5.47	-2.87
Population per Sq. Km.	1498	380.06	1229.04	6861.72	2.49
Coastline to Total Area	1532	0.04	0.11	0.68	0.00
Change in Current-Account-to-GDP	1635	-0.01	2.81	20.46	-30.51
Monetary Policy Deviation	1589	-0.49	27.25	897.00	-585.00
Bank Survey - Credit Supply	386	-3.20	17.57	70.57	-62.50
Bank Survey - Credit Demand	356	10.57	26.07	100.00	-66.70
Observations	1694				

Panel (c): Post-financial Crisis, 2007Q4 to 2014Q4

	count	mean	sd	max	min
Housing Returns	1197	-0.35	3.59	16.94	-26.99
Growth in Real GDP	1176	1.78	4.80	20.08	-19.56
Term Spread on Government Debt	969	1.80	2.87	24.70	-13.33
Unemployment Rate	999	7.62	4.62	26.29	0.48
Growth in Real Consumption	1008	2.00	4.40	16.16	-20.24
Population Growth, Annualized	1077	0.60	0.87	5.32	-3.18
Population per Sq. Km.	966	388.61	1302.98	7732.75	2.75
Coastline to Total Area	1071	0.04	0.10	0.68	0.00
Change in Current-Account-to-GDP	1177	0.05	3.00	20.46	-17.83
Monetary Policy Deviation	1156	-1.28	2.51	17.28	-21.52
Bank Survey - Credit Supply	572	9.21	20.15	89.67	-49.64
Bank Survey - Credit Demand	568	-2.66	33.29	82.20	-100.00
Observations	1197				

Table 5: Panel (a): Regress Housing Return on Credit Supply & Demand Shocks - Full Sample

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
L.Growth in Real GDP	0.1483***	0.1632***	0.0574	0.0658*	0.0798*
	(0.0433)	(0.0461)	(0.0432)	(0.0394)	(0.0458)
L.Term Spread on Government Debt	0.0966*	0.0981*	-0.0200	-0.0321	-0.0698
	(0.0566)	(0.0546)	(0.0874)	(0.0906)	(0.0969)
L.Unemployment Rate	-0.0205	-0.0305	-0.0408	-0.0275	-0.0500
	(0.0459)	(0.0436)	(0.1135)	(0.1002)	(0.0803)
L.Growth in Real Consumption	0.1340***	0.1281***	0.0372	0.0379	0.0084
	(0.0446)	(0.0431)	(0.0520)	(0.0582)	(0.0582)
L.Population Growth, Annualized	0.1645	0.1956	0.6856*	0.7370**	0.5982**
	(0.1299)	(0.1305)	(0.3509)	(0.3260)	(0.2714)
L.Population per Sq. Km.	-0.0001	-0.0001	-0.0023*	-0.0010	-0.0011
	(0.0001)	(0.0001)	(0.0013)	(0.0014)	(0.0012)
L.Coastline to Total Area	-0.1611	-0.2273	-6.7394*	-6.3006*	-5.5787*
	(1.6926)	(1.6614)	(3.6395)	(3.8011)	(3.3639)
L.Change in Current-Account-to-GDP	-0.0194				-0.0104
	(0.0169)				(0.0298)
L.Monetary Policy Deviation		0.0943*			0.2743**
		(0.0551)			(0.1357)
L.Bank Survey - Credit Supply			-0.0249***		-0.0105
			(0.0061)		(0.0095)
L.Bank Survey - Credit Demand				0.0196***	0.0121***
				(0.0045)	(0.0041)
Constant	-0.2533	-0.1762	0.5082	0.0033	0.5995
	(0.3836)	(0.3668)	(1.1052)	(1.0181)	(0.8249)
Observations	2554	2564	887	827	825
Countries	41	41	25	24	24
R2-between	0.006	0.002	0.254	0.200	0.112
Wald Test	52.140	55.547	58.218	29.361	41.735
Wald P-value	0.000	0.000	0.000	0.000	0.000
Rho	0.069	0.066	0.161	0.143	0.060

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (b): Regress Housing Return on Credit Supply & Demand Shocks - 2000Q1 to 2007Q3

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
L.Growth in Real GDP	0.0532*	0.0480*	0.0385	0.0993	0.1959
	(0.0293)	(0.0277)	(0.1447)	(0.1360)	(0.1746)
L.Term Spread on Government Debt	0.0999	0.1127	0.4962**	0.5336**	0.4066
	(0.0742)	(0.0769)	(0.2101)	(0.2648)	(0.2691)
L.Unemployment Rate	0.0104	-0.0019	-0.0172	-0.0015	0.1139**
	(0.0508)	(0.0589)	(0.0828)	(0.0869)	(0.0486)
L.Growth in Real Consumption	0.0752	0.0752	0.1504	0.1000	0.0559
	(0.0562)	(0.0571)	(0.1075)	(0.1186)	(0.1623)
L.Population Growth, Annualized	0.3200	0.3871*	0.1306	0.1973	0.4320
	(0.2526)	(0.2353)	(0.6515)	(0.6970)	(0.5736)
L.Population per Sq. Km.	-0.0001	-0.0000	-0.0005	-0.0004	0.0012
	(0.0002)	(0.0002)	(0.0020)	(0.0026)	(0.0017)
L.Coastline to Total Area	-1.2113	-1.8621	-11.6714	-14.3727	-8.8968
	(1.9870)	(2.1091)	(8.3032)	(10.3612)	(6.1373)
L.Change in Current-Account-to-GDP	-0.0143				-0.0144
	(0.0232)				(0.0366)
L.Monetary Policy Deviation		-0.0100			0.0864
		(0.0376)			(0.1766)
L.Bank Survey - Credit Supply			0.0151		0.0328
			(0.0279)		(0.0326)
L.Bank Survey - Credit Demand				0.0078*	0.0120***
				(0.0047)	(0.0020)
Constant	0.6286	0.6678	0.7182	0.2725	-1.0931
	(0.5781)	(0.6417)	(1.3925)	(1.5262)	(0.8843)
Observations	1049	1050	339	308	308
Countries	41	41	18	17	17
R2-between	0.028	0.007	0.019	0.052	0.292
Wald Test	25.204	24.774	10.101	24.422	149.002
Wald P-value	0.001	0.002	0.258	0.002	0.000
Rho	0.210	0.262	0.276	0.223	0.091

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (c): Regress Housing Return on Credit Supply & Demand Shocks - 2007Q4 to 2014Q4

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
L.Growth in Real GDP	0.0162	0.0253	-0.0641*	-0.0476	-0.0531*
	(0.0469)	(0.0496)	(0.0364)	(0.0336)	(0.0313)
L.Term Spread on Government Debt	0.0945	0.0844	0.0528	0.0436	0.0397
	(0.0759)	(0.0834)	(0.0730)	(0.0730)	(0.0724)
L.Unemployment Rate	-0.0074	-0.0066	-0.1383***	-0.1063**	-0.1442***
	(0.0470)	(0.0501)	(0.0487)	(0.0514)	(0.0458)
L.Growth in Real Consumption	0.1184**	0.1183**	0.0384	0.0515	0.0350
	(0.0464)	(0.0459)	(0.0534)	(0.0516)	(0.0533)
L.Population Growth, Annualized	0.2534	0.2343	0.2950	0.3090	0.2827
	(0.2804)	(0.2810)	(0.2436)	(0.2510)	(0.2386)
L.Population per Sq. Km.	0.0001	0.0002	-0.0021	-0.0010	-0.0019
	(0.0002)	(0.0002)	(0.0014)	(0.0016)	(0.0014)
L.Coastline to Total Area	0.1028	0.0361	-6.5777**	-5.6867*	-6.2622**
	(3.1050)	(3.0398)	(2.7133)	(3.1497)	(2.7062)
L.Change in Current-Account-to-GDP	0.0083				0.0112
	(0.0219)				(0.0416)
L.Monetary Policy Deviation		0.0627			0.0400
		(0.1198)			(0.1165)
L.Bank Survey - Credit Supply			-0.0236***		-0.0212***
			(0.0044)		(0.0058)
L.Bank Survey - Credit Demand				0.0106***	0.0044
				(0.0035)	(0.0045)
Constant	-0.9329**	-0.8430	0.9750	0.2957	1.0195
	(0.4520)	(0.5506)	(0.6860)	(0.7666)	(0.6984)
Observations	778	778	450	429	429
Countries	40	40	25	24	24
R2-between	0.291	0.303	0.470	0.387	0.433
Wald Test	25.638	26.042	79.111	46.393	79.960
Wald P-value	0.001	0.001	0.000	0.000	0.000
Rho	0.123	0.148	0.263	0.259	0.230

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Panel (a): Regress Housing Return on Cumulative Credit Supply & Demand Shocks - Full Sample

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
Growth in Real GDP, 8 quarter average	0.2981***	0.2715***	0.2180	0.1301	0.0424
	(0.0715)	(0.0668)	(0.1447)	(0.1050)	(0.1236)
Term Spread on Government Debt, 8 quarter average	0.1210*	0.1271**	-0.0133	-0.0532	-0.0467
	(0.0643)	(0.0625)	(0.1601)	(0.1419)	(0.1176)
Unemployment Rate, 8 quarter average	0.0771*	0.0530	0.0532	0.0482	0.0313
	(0.0397)	(0.0373)	(0.1235)	(0.1041)	(0.0860)
Growth in Real Consumption, 8 quarter average	0.0424	0.0801	-0.0531	0.0185	0.0218
	(0.0653)	(0.0627)	(0.0894)	(0.1203)	(0.0978)
Population Growth, Annualized, 8 quarter average	-0.0836	-0.0342	0.3240	0.3077	0.3257
	(0.1688)	(0.1792)	(0.4531)	(0.3559)	(0.3387)
Population per Sq. Km., 8 quarter average	-0.0001	-0.0000	-0.0017	0.0003	-0.0007
	(0.0002)	(0.0002)	(0.0014)	(0.0017)	(0.0014)
Coastline to Total Area, 8 quarter average	1.2907	-0.4390	-3.2788	-3.8080	-4.6985
	(1.6009)	(1.5170)	(3.7302)	(3.6707)	(3.3917)
Change in Current-Account-to-GDP, 8 quarter average	-0.3204				-0.8215***
	(0.2104)				(0.3151)
Monetary Policy Deviation, 8 quarter average		0.2897**			0.4117***
		(0.1414)			(0.1258)
Bank Survey - Credit Supply, 8 quarter average			-0.0413**		-0.0172
			(0.0173)		(0.0204)
Bank Survey - Credit Demand, 8 quarter average				0.0395***	0.0262***
				(0.0099)	(0.0091)
Constant	-1.0299**	-0.7279**	-0.2742	-0.7772	0.1406
	(0.4063)	(0.3566)	(0.9932)	(1.1197)	(0.7735)
Observations	2713	2737	959	897	897
Countries	41	41	25	24	24
R2-between	0.199	0.173	0.074	0.072	0.203
Wald Test	65.896	74.663	28.862	37.998	81.305
Wald P-value	0.000	0.000	0.000	0.000	0.000
Rho	0.031	0.030	0.103	0.096	0.086

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (b): Regress Housing Return on Cumulative Credit Supply & Demand Shocks - 2000Q1 to 2007Q3

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
Growth in Real GDP, 8 quarter average	0.1769	0.1872	0.3806	0.5003	0.5185
	(0.1115)	(0.1142)	(0.3929)	(0.4263)	(0.4169)
Term Spread on Government Debt, 8 quarter average	0.1547*	0.1746*	1.1184*	1.0229*	0.9834
	(0.0909)	(0.0966)	(0.6079)	(0.6174)	(0.6499)
Unemployment Rate, 8 quarter average	0.0926**	0.1004**	0.1330	0.1166	0.1079
	(0.0395)	(0.0426)	(0.0944)	(0.1057)	(0.1098)
Growth in Real Consumption, 8 quarter average	-0.0156	-0.0364	0.2190	0.1477	0.1587
	(0.0923)	(0.1000)	(0.2752)	(0.2868)	(0.2804)
Population Growth, Annualized, 8 quarter average	-0.1893	-0.1546	-0.5103	-0.5198	-0.5666
	(0.3556)	(0.3468)	(0.7832)	(0.8045)	(0.7658)
Population per Sq. Km., 8 quarter average	-0.0001	-0.0001	0.0012	0.0026	0.0032
	(0.0001)	(0.0002)	(0.0031)	(0.0027)	(0.0026)
Coastline to Total Area, 8 quarter average	-0.6644	-0.7532	-23.9351*	-23.4849**	-22.4414*
	(1.7261)	(1.8511)	(12.8841)	(10.9523)	(13.1741)
Change in Current-Account-to-GDP, 8 quarter average	0.1671				-0.7652
	(0.3545)				(0.4684)
Monetary Policy Deviation, 8 quarter average		-0.1083			0.0912
		(0.0998)			(0.2476)
Bank Survey - Credit Supply, 8 quarter average			-0.0107		0.0137
			(0.0134)		(0.0193)
Bank Survey - Credit Demand, 8 quarter average				0.0178	0.0194
				(0.0139)	(0.0138)
Constant	0.2008	0.0832	-1.9349	-2.4146	-2.4138
	(0.5178)	(0.5380)	(2.3061)	(2.1576)	(2.1326)
Observations	1083	1084	348	317	317
Countries	41	41	18	17	17
R2-between	0.256	0.237	0.033	0.099	0.155
Wald Test	34.454	31.200	10.422	17.629	99.262
Wald P-value	0.000	0.000	0.237	0.024	0.000
Rho	0.160	0.192	0.185	0.142	0.130

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel (c): Regress Housing Return on Cumulative Credit Supply & Demand Shocks - 2007Q4 to 2013Q4

	(1) Housing Returns	(2) Housing Returns	(3) Housing Returns	(4) Housing Returns	(5) Housing Returns
Growth in Real GDP, 8 quarter average	-0.0751	-0.0584	-0.2396*	-0.1923*	-0.2536**
	(0.1151)	(0.1122)	(0.1281)	(0.1096)	(0.1180)
Term Spread on Government Debt, 8 quarter average	0.0729	0.0237	-0.0512	-0.0627	-0.0385
	(0.0918)	(0.0914)	(0.0830)	(0.0835)	(0.0764)
Unemployment Rate, 8 quarter average	-0.0037	-0.0236	-0.1372**	-0.1200**	-0.1370***
	(0.0429)	(0.0424)	(0.0545)	(0.0511)	(0.0473)
Growth in Real Consumption, 8 quarter average	0.1377	0.1527*	0.1112	0.1227	0.1347
	(0.0891)	(0.0903)	(0.0852)	(0.0925)	(0.0845)
Population Growth, Annualized, 8 quarter average	0.2751	0.1946	0.2220	0.2205	0.1312
	(0.2883)	(0.2911)	(0.3867)	(0.3243)	(0.3279)
Population per Sq. Km., 8 quarter average	0.0002	0.0003	-0.0015	-0.0004	-0.0013
	(0.0003)	(0.0002)	(0.0012)	(0.0013)	(0.0012)
Coastline to Total Area, 8 quarter average	0.2624	-0.6902	-7.7611***	-7.0363**	-7.9441***
	(3.3062)	(3.0482)	(2.9356)	(2.9626)	(2.7303)
Change in Current-Account-to-GDP, 8 quarter average	-0.1283				-0.6733**
	(0.2146)				(0.3206)
Monetary Policy Deviation, 8 quarter average		0.4578**			0.1458
		(0.1816)			(0.1296)
Bank Survey - Credit Supply, 8 quarter average			-0.0321***		-0.0257**
			(0.0112)		(0.0121)
Bank Survey - Credit Demand, 8 quarter average				0.0169**	0.0039
				(0.0081)	(0.0075)
Constant	-0.7938*	-0.0404	1.2140*	0.5899	1.3262**
	(0.4436)	(0.3966)	(0.6243)	(0.6991)	(0.6116)
Observations	850	850	485	464	464
Countries	41	41	25	24	24
R2-between	0.252	0.382	0.386	0.347	0.469
Wald Test	28.242	32.788	24.251	26.102	64.982
Wald P-value	0.000	0.000	0.002	0.001	0.000
Rho	0.097	0.135	0.216	0.223	0.187

Standard errors in parentheses

R2-between is the squared correlation between the predicted values and the within-country means of the dependent variable.

Rho is fraction of variance due to country fixed effect, and Wald Test is that all slope coefficients are equal to zero.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$