Monetary Policy and Macroprudential Policy: New Evidence from a World Panel of Countries

NICHOLAS APERGIS

Department of Banking & Financial Management, University of Piraeus

napergis@unipi.gr

Acknowledgements: The author needs to thank two referees of this journal whose comments and suggestions immensely improved the merit of this work. Special thanks also go to the Editor for giving him the chance to revise his work. Needless to say, the usual disclaimer applies.

Monetary Policy and Macroprudential Policy: New Evidence from a World Panel of Countries

Abstract

The event of the recent financial crisis raises the question of whether policy makers could have done more or something different to prevent the build-up of financial imbalances. This paper contributes to the field of regulatory impact by tackling the debate on whether central banks should 'lean against the wind', while in case the response is positive, how macroprudential policies should be combined with monetary policy. Using an augmented Taylor rule and a sample of 127 global economies, the results provide evidence on the importance of macroprudential issues for the implementation of an effective monetary policy. They also document that the type of adopted macroprudential instrument has a substantial effect on such effectiveness, with this policy mix being less 'integrated' when the monetary rule aims at primarily safeguarding inflation stability. The results survive robustness checks under alternative assets.

Keywords: monetary policy; macroprudential policy; augmented Taylor rule; 127 economies

JEL Classification: E52, E60, G28, **Word Count** = ???

I. Introduction

The goal of this paper is to study the policy mix between monetary and macroprudential policy. More specifically, it explores the role of macroprudential policies through an augmented Taylor policy rule that explicitly considers not only inflation and the output gap, but also the financial gap, i.e. whether the combined actions of monetary and macroprudential policies are considered a complementarity, so as to preserve financial stability. The methodology, after estimating individual (augmented) Taylor rules for 127 global countries, considers the coefficient response to the financial gap as an explanatory variable that is representative of the relationship

between this policy mix. The novelties of this work are threefold: i) the empirical analysis generates estimations of augmented Taylor rules for economies that were never before part of the empirical literature, ii) new evidence on the combined role of monetary and macroprudential policies that ensures overall economic stability is provided, and iii) new evidence on incorporating the housing market, given that asset prices contain information about future inflation, while certain central banks directly try to offset any disequilibria issues in these markets.

Macroprudential policies, i.e. caps on loan-to-value and debt-to-income ratios, limits on credit growth, balance sheet restrictions, capital and reserve requirements, are of primary concern to reduce systemic risks in financial markets. While emerging markets have used them extensively, advanced economies have started only recently to adopt them. A growing literature has documented the use of these policies across countries and analyzed their effects (Freixas et al. 2015; Claessens 2015). In a recent paper, Cerutti et al. (2016) document the use of macroprudential policies for a large number of countries, while covering many instruments. They provide evidence on which policies have been most effective in terms of reducing the growth of credit, covering both household and corporate sector credit, while exploring differences among types of countries (i.e., advanced versus emerging), and whether policies work better in different phases of the financial cycle.

Macroprudential policies should be coordinated with monetary policy to ensure not only the target of price (primarily) and output stability, but also that of financial stability. However, a critical question is whether monetary policy should be more ‘lean’. A number of studies have recommended that augmenting the Taylor rule (1993) with a financial target to allow the interest rate to react to financial stress was the first way researchers and policy makers considered to highlight the end of the so-called ‘separation principle’ (Christiano et al. 2010; Curdia and Woodford, 2010; Issing, 2011). It has been also the event of the recent financial crisis that has shifted the strategic considerations about monetary policy and weakened the strategy of ‘cleaning up afterwards’. The presence of macroprudential instruments has radically heated the debate ‘clean’ versus ‘lean’. The supporters of the augmented Taylor rule are in favor that policy makers need as many instruments as targets. Hence, if interest rates cannot do everything alone, potentially they can be complements to macroprudential instruments, and can provide coordination between monetary and

macroprudential policies. Interest rates primarily target monetary stability, while they act timely on financial stability as complements to macroprudential instruments, giving support to the integrated approach in which monetary and financial stability are integrated into an 'augmented' Taylor rule. In contrast, the separate approach of the policy-mix does not consider that the interest rate can ever respond to financial stability, while the macroprudential policy is targeting financial stability. Within the relevant literature, Adrian and Shin (2009), Mishkin (2011) and Eichengreen et al. (2011) intensively advocate the integrated approach of the policy mix between monetary and macroprudential policies. The argument in favor of the role of the interest rate in financial regulation is that under an augmented Taylor rule, not only banks, but also the whole financial system, experience financial imbalances, while there is inadequate supportive evidence for the effectiveness of macroprudential instruments (Agénor and Pereira da Silva, 2013). By contrast, Svensson (2012) supports the separate approach, while he is against the effectiveness of interest rates to guarantee financial instability. In certain circumstances, such as the 2008 financial crisis, monetary policy may deviate from its traditional objectives to support financial stability.

However, monetary policy, if left alone, may fail to ensure financial stability, potentially when its credibility may suffer because i) crises will most likely occur despite leaning against the wind, and ii) the central bank under delivers on inflation, and thus could destabilize inflation expectations, thus, increasing real debt and real interest payments on debt, undermining financial stability. Most importantly is the limitation of monetary policy to model people's economic behavior, i.e. that towards undertaking risk. Either within a banking or capital market there are waves of optimism and pessimism that move expectations irrationally, giving rise to irrational investment decisions that are neither sustainable nor socially desirable, undermining financial stability with further repercussions to the real economy. Stein (2013) argues that monetary policy is an ineffective and counterproductive way of promoting financial stability, i.e. it has small and uncertain effects on the probability of a financial crisis.

To briefly foreshadow our empirical findings, they document that the type of macroprudential instrument impacts the macroprudential-monetary policy mix. This is expected to have significant policy implications on the effectiveness of certain types

of macroprudential instruments to impact the link between monetary and macroprudential policy that guarantees financial stability. The set up of the paper continues as follows. Section II explains the methodology with respect to the monetary rules estimations and that of the impact of macroprudential policies on the policy mix. Section III describes the data, while Section IV presents the empirical results. Finally, Section V concludes.

II. Methodology

The analysis makes use of a forward-looking Taylor rule which describes how central banks respond both to the expected inflation deviations and to the expected output gap. Among the forward-looking rules (FLR), the most prominent is that proposed by Clarida et al. (1998; 2000):

$$i_t = \alpha + \beta [E(\pi_{t+n}) - \acute{\pi}] + \gamma E(y¿¿t+q)¿$$

(1)

where β and γ are the coefficients for the inflation gap and the output gap, respectively. They also introduce a constant term $\alpha = i^* - \beta\bar{\pi}$, where i* denotes the equilibrium nominal interest rate, and $\bar{\pi}$ is the inflation target. Given the output gap, when the expected inflation rate is higher than the inflation target, the nominal rate increases and this reduces investment and consumption plans, leading to reduced aggregate demand, and to lower inflation. The Taylor rule can provide a nominal anchor for the central bank to react to various shocks, as well as an automatic stabilizer for the macroeconomy.

The forward looking rule is estimated through the Generalized Method of Moment (GMM) methodological approach (Clarida et al., 1998, 2000; Castro, 2011). With the instrument list containing lagged values of inflation, the output gap, and interest rates:

$$i_t = (1-\rho)(\alpha + \beta \pi_{t+1} + \gamma y_{t+1}) + \rho i_{t-1} + \varepsilon_t \quad (2)$$

following Castro (2011) and incorporating the interest rate smoothing process into the model, Equation (2) yields the following reduced form:

$$i_t = \Phi_0 + \Phi_1 \pi_{t+1} + \Phi_2 y_{t+1} + \rho i_{t-1} + \varepsilon_t \quad (3)$$

where $\Phi_0 = (1-\rho)\alpha$, $\Phi_1 = (1-\rho)\beta$, and $\Phi_2 = (1-\rho)\gamma$.

Although we do not restrict the estimates to be strictly positive, we think of as a desirable outcome such findings. Only if monetary policy responds to an increase in both inflation and output growth by systematically raising the policy rate, the central bank is capable of stabilizing the economy and delivering price stability. Moreover, we do not restrict either, but we desire the estimated rules to fulfill the Taylor principle, i.e. the requirement of a more than proportional response of the policy interest rate to movements in the inflation rate.

Equation (3), however, does not explicitly consider the role of asset prices as monetary policy targets. The literature is still uncertain on whether and how asset prices should be taken explicitly into account in formulating monetary policy (Taylor, 2001; Clarida, 2001). Several major central banks have started considering the increase in financial instability, especially after the recent financial crisis. Therefore, we augment the Taylor rule, described by Equation (3), to account for the deviations of asset prices from their target (Gilchrist and Leahy, 2002). However, Bernanke and Gertler (1999) argue that only past asset price disequilibria could affect policy rates, implying that central banks intervene only when asset prices deviate from equilibrium, rather than anticipating potential misalignments. Following Rigobon and Sack (2003), Chadha et al. (2004), Siklos and Bohl (2008) and Fuhrer and Tootell (2008), Equation (3) gives:

$$i_t = \Phi_0 + \Phi_1 \pi_{t+1} + \Phi_2 y_{t+1} + \Phi_3 ap_{t-1} + \rho i_{t-1} + \varepsilon_t \qquad (4)$$

where ap_{t-1} denotes asset prices at period t-1. To stabilize asset prices, $\Phi_3 > 0$, implying that whenever asset prices positively (negatively) deviate from their equilibrium, the monetary authorities increase (decrease) policy rates to offset the anomalous price dynamics. This augmented Taylor policy rule has explicitly considered a financial stability proxy, which can take various forms in the literature, i.e. credit spreads (Curdi and Woodford, 2010), asset prices, credit (Christiano et al., 2010; Agénor and Pereira da Silva, 2013) or money (Issing, 2011).

III. Data

Monetary policy rules

Our sample covers various time spans, depending on data availability (Appendix 1). All data are on a quarterly basis and are obtained from the International Financial

Statistics (IFS) database. Variables subject to analysis include: short-term nominal interest rates, as the three-month interbank market interest rates, the inflation rate measured as changes of the Consumer Price Index (except in the case of the Eurozone where inflation is measured by the Harmonised Index of Consumer Prices (HICP)), all seasonally adjusted using the Census X12 procedure, and the output gap determined as the difference between the actual value log of seasonally adjusted GDP and its trend value obtained by the Hodrick-Prescott (HP) filter. Details on data can been found in Appendix 3.

For the case of OECD countries real-time forecasts are used (Orphanides, 2001) based on the information actually available, reflecting the real-time perception by the central bank and the private sector of the state of the economy. The benefit of using real-time forecasts makes the analysis robust to the Lucas critique, while they allow policy makers to align explicitly the horizon of the inflation forecast and the control lag for monetary policy. Unfortunately, for the remaining countries, policy makers do not have access to inflation or output data of the current period, i.e. they do not have the knowledge about how policymakers form their expectations on inflation and output gaps. To compute the expected output gap and inflation rates the analysis constructs autoregressive models based upon both the AIC and the BIC criteria. The selected models are then used recursively to compute the h-step ahead forecasts for both series (the results are available upon request). To ensure the validity of the forecasts, as well as to investigate forecast rationality, the analysis tests the optimality of such forecasts through the density forecast criterion (Diebold et al., 1998), which allows researchers to test whether their forecasting model is not significantly different from the model that generated the actual data. In this case, the forecasting model is optimal. The findings confirmed the validity of the forecasts (they are also available upon request).

Additionally, a critical aspect of policy rules in the form of Equation (4) is the emphasis they place on a concept of the economy's potential level of economic activity for calculating the output gap (Orphanides, 2003). In theory, various different approaches of potential output exist (e.g., flexible-price-output, the steady-state-output, the Non-Accelerating Inflation Rate of Unemployment (NAIRU), the linear, and HP-filtered-trend) and it is unclear which of the concepts is the most appropriate for estimating the cyclical position of the economy. The choice is not without

consequences (McCallum and Nelson, 2004). They highlight that a mistaken concept of the output gap implies major welfare losses within a class of policy rules that rely upon measures of the gap. To the empirical ends of this analysis, the HP filtering approach is followed. Finally, to measure the financial market touch in Equation (4), the analysis uses the stock price index (Datastream stock price indices for each country). Especially for the Eurozone, the proxy makes use of a weighted average of the Eurozone countries stock indices, with weights being the capitalization of each stock market.

Macroprudential policy tools

The main source of the macroprudential dataset is obtained from the IMF survey on Global Macroprudential Policy Instruments (GMPI), carried out by Luis Jacome, Yitae Kim and Claudia Jadrijevic. The central banks, as well as the Central Bank of West African States (BCEAO) provided responses to more than 100 detailed questions on about 17 key macroprudential policy tools.

The analysis focuses on 12 macroprudential instruments included in the GMPI Survey. The survey covers 18 sections/instruments, while due to lack of adequate data and cross-sectional coverage, the analysis does not include: Sector Specific Capital Buffer/Requirements, Liquidity Requirements/Buffers, Loan-to-Deposit ratios, Margins/Haircuts on Collateralized Financial Market Transactions, Limits on Open FX Positions or Currency Mismatches, and Other policies. The tools include: General Countercyclical Capital Buffer/Requirements (2), Leverage Ratios (1), Dynamic Loan-Loss Provisioning (2), Loan-to-Value (LTV) Ratios (2), Debt-to-Income (DTI) Ratios (1), Limits on Domestic Currency Loans (3), Limits on Foreign Currency Loans (3), Reserve Requirement Ratios (2), Levy/Tax on Financial Institutions (2), Capital Surcharges on Systemically Important Financial Institutions (SIFIs) (2), Limits on Interbank Exposures (2), Concentration Limits (3). The number in parenthesis indicates whether it is in relevance to the borrowers (1), or to the lenders (2), or to capital flows (3). This assignment is substantially important for the main part of the empirical analysis. Details for the countries that have adopted specific macroprudential tools over the relevant time span are provided in Appendix 1. In case

that more than two types of macroprudential tools have been adopted by a single country, the analysis uses the one with the highest prevalence.

IV. Empirical analysis

Monetary policy rules estimates

First, the analysis estimates the monetary policy Taylor rule (Equation (4)) that considers a forward-looking monetary policy and the inertia reflected by the interest rate smoothing. The estimations are achieved with the help of the Generalized Method of Moments (GMM), where the analysis uses the conventional set of instruments, which includes the lags of the variables involved in the rule seen as instrumental factors, as long as they influence the past behavior of the regressors, while uncorrelated with residuals. In particular, instrumental variables considered are a constant, previous values of inflation, interest rates, and GDP potential output changes. In estimating the GMM equations, a heteroscedasticity and serial correlation consistent (HAC) estimator based on the Bartlett kernel with Newey-West fixed bandwidth selection. The reliability of the estimates, along with the validity of instruments, is evaluated by the Sargan–Hansen J test of overidentifying restrictions, asymptotically distributed as χ^2 in the number of restrictions. A rejection of the null hypothesis, i.e. instruments are orthogonal to errors, indicates that the estimates are not consistent. The findings in Table 1 display that across all countries, the Hansen J-statistic supports the validity of instruments.

A number of interesting results stand out from the estimations in Table 1. First, for many cases the estimation of the inflation coefficient is less than unity, except in the cases of: Nepal, Armenia, Kenya, Philippines, China, Dominican Republic, Mexico, Mongolia, Czech Republic, Eurozone, Hungary, Kuwait, New Zealand, Poland, U.K., and U.S. Taylor (1993) points out that inflation stabilization occurs only if the inflation gap coefficient is greater than one. This conclusion, known as the Taylor principle (Woodford, 2001), stresses that a stabilizing monetary policy must increase the interest rate more than proportionally than inflation (Clarida et al., 2000). Therefore, in these countries, the estimates of inflation coefficients are indicative of central banks' strong commitment to anchor medium to longer term

inflation expectations, while a successful stabilization policy requires a more forward-looking approach, given that monetary policy operates with a lag. In terms of the output coefficient, most of the cases provide results less than unity, except in the cases of: Gambia, Haiti, Madagascar, Sierra Leone, Ecuador, Eurozone, and Venezuela.

The estimated coefficients associated with stock price disequilibria are positive (as theoretically expected) for each country examined, albeit they are small in absolute value. Interestingly, the coefficient is not always statistically significant for each country. At face value these results may suggest that the central banks (especially in the countries in which the coefficient turns out to be statistically significant) target asset prices, implying that they attempt to stabilize them in much the same way as they stabilize inflation/output. However, central banks have often been clear that they do not target asset prices, either because they are not necessarily related to the objectives of monetary policy or because they are only important insofar as they provide information about expected inflation. Given the raised interest in the role of financial stability, such prices are expected to more frequently enter the monetary policy target function. Clarida (2001) argues that asset prices play a role in helping to get closer to the central banks' forecasting information set, implying that central banks do not target asset prices per se, but use them as good information since their disequilibria are important in determining interest rate targets at times that are easily recognizable as large misalignments. Finally, the policy smoothing coefficient on the lagged interest-rate indicates a generally high degree of inertia across all countries in the sample.

[Table 1 here]

Monetary policy and macroprudential policy estimates

This part of the empirical analysis explores the policy mix between monetary and macroprudential policy. We have already mentioned two polar cases of this policy mix: the 'separate policy mix', i.e. monetary policy remains focused on monetary and macroeconomic stability, while macroprudential policy focuses on financial stability, and an 'integrated policy mix', i.e. monetary policy assists macroprudential policy in its financial stability goal. Accordingly, the more the interest rate responses to

financial conditions, the greater the probability of adopting an integrated policy mix. The intensity of this response is directly informed through the coefficient $\Phi_3$in Equation (4), where this coefficient constitutes the dependent variable of a new model.

The response coefficients on inflation, Φ_1, and the output gap, Φ_2, are the explanatory variables in this new model. Based on Woodford's hypothesis (2012), the analysis considers the presence of a tradeoff between macroeconomic (i.e., inflation, production) and financial stability. The main argument against the involvement of the central bank in preserving financial stability lies in the possibility of conflicting objectives damaging the credibility of the central bank's price stability goal (Smets, 2013). The analysis expects a negative sign for the explanatory variable Φ_1 and a negative relationship between these two independent variables (Φ_1, Φ_2) and the dependent variable (Φ_3). While the analysis can actually expect a negative coefficient for inflation, the expected sign for output is less clear. If the central bank is more a 'dove' type of a bank than a 'hawk' type, it is more concerned with output and may be more open to other goals than inflation, i.e. financial stability, as an additional goal. As a result, the sign for the output variable is highly ambiguous.

The new model also introduces the variable of interest, in relevance to the macroprudential policy. Based on the approach by Blanchard et al. (2013), the macroprudential instruments are divided into three classifications according to whether they constrain lenders, borrowers or capital flows. To this end, a dummy variable is introduced, mp, which takes the value of 2 when the chosen macroprudential instrument directly affects borrowers, 1 when it directly affects lenders, and 0 when it directly affects capital flows (for more details, see Appendix 1). The sign of this variable can be interpreted as follows: a positive (negative) sign indicates that macroprudential instruments affecting borrowers promote greater (weaker) intensity of the response of monetary policy to financial conditions (i.e., a more integrated (separated) policy-mix) than instruments constraining lenders or restricted capital flows. A statistically significant coefficient identifies that the type of macroprudential influences the policy mix between monetary and macroprudential policy. Conversely, a statistically insignificant coefficient suggests neutrality of the macroprudential instrument type for the policy mix.

Additionally, the regression analysis introduces other control variables as well. First, it introduces the type of the chosen measure of financial stability. Financial stability targets are various, but they can be divided into two broad categories, depending on whether they involve credit (and therefore relate to the regulation of the credit cycle) or involve assets prices (stock or real estate prices); therefore, the analysis uses a dummy variable, denoted Target, taking the value of 1 when the target is with asset prices, 0 if it is linked to credit. The sign is interpreted by considering the influence of the first type of targets (i.e., credit) to the second type (i.e., prices) (the details of the definition of that dummy are in Appendix 1).

Finally, the countries identification can be also a potentially important explanatory variable. There are papers (Turner, 2012; Hahm et al., 2012) on the specificities of the monetary/macroprudential policy mix in emerging economies. These countries have been using more intensively and frequently macroprudential policies than advanced economies, as they are more vulnerable to reversals of capital flows (Lim et al., 2011; Rey, 2013). This issue has gained relevance with unconventional monetary policy measures adopted by the central banks of industrialized countries to cope with the financial crisis. As highlighted by Hahm et al. (2012), unconventional monetary policies have made the combination of monetary and macroprudential policy in emerging countries more important than it was. Similarly, Agénor and Pereira da Silva (2013) propose to combine an augmented Taylor rule and macroprudential policy to better manage systemic risk in emerging markets. To this end, the analysis adds an explanatory variable, names as ‘Country’, based on the IMF classification between advanced and emerging economies. It takes the form of a dummy variable which takes the value of 1 if the country is emerging, and 0 if it is advanced. The regression model takes the following form:

$$\Phi_3 = \text{intercept} + b_1 \Phi_1 + b_2 \Phi_2 + b_3\, mp + b_4\, Target + b_5\, Country$$

where Φ_3 indicates the response to financial conditions in the rule, Φ_1 is the response to the deviation of inflation from its target in the rule, Φ_2 is the response to the output gap in the rule, mp indicates the type of macroprudential instrument, Target denotes the type of financial target in the rule, and Country denotes the type of country represented (emerging vs advanced). The analysis applies the simple ordinary least squares (OLS) methodology (Bineau, 2010), while it standardizes the variables by

subtracting from each observation the mean, and dividing this difference by the standard deviation of all observations.

The results, based on different variants, are reported in Table 2. The first variant does not use any control variables, while the remaining include the two control variables, one at a time. In terms of the macroprudential coefficient, the findings indicate that the type of macroprudential instrument impacts the macroprudential/monetary policy mix. Across all three variants, a statistically significant and negative coefficient is obtained, implying that macroprudential instruments constraining borrowers directly reduce the response of monetary policy to financial stability, vis-à-vis those that constrain lenders or capital flows. Hence, constraining borrowers' instruments, the lower favorable is a Taylor rule augmented for targeting financial stability. In contrast, models that retain macroprudential instruments constraining lenders or capital flows, consider further actions by the central bank to target financial instability along with macroprudential policy.

The response coefficient to inflation appears to influence significantly, albeit to a lesser extent than the macroprudential instrument, the intensity of monetary policy response to financial stability. This coefficient is negative and statistically significant, implying that the inflation/financial stability tradeoff does exist. The more the central bank is 'hawkish', the less it seeks to mix monetary and macroprudential policies via an augmented Taylor rule. In terms of the response to the output gap, the findings favor the presence of a negative and statistically significant case, i.e. the response to the output gap also appears to influence the policy-mix. With respect to the remaining two control variables, the findings indicate that the country variable is positive and statistically significant (at 5%), indicating that the policy mix depends on the specific constraints involved. With respect to the target variable, the results highlight that when asset prices are the primary target of macroprudential policies, the policy mix is directly affected.

[Table 2 here]

Table 3 reports the policy mix results by the type of macroprudential tool applied in each country, i.e. on lenders, on borrowers and on capital flows (based on the

classification in Appendix 1). These findings clearly document that it is the macroprudential tools on lenders that generate the strongest trade-off between macroeconomic and macroprudential policies, followed by tools on capital flows and borrowers (i.e., -0.328, -0.242 and -0.073, respectively). These findings imply that 'leaning against the wind' monetary policy pays closer attention to the course of the interest rate to stabilize both output and inflation, but also takes into account credit, borrowing and capital flows issues. This joint adoption of a triple-mandate Taylor rule and macroprudential regulation allows the policymakers to reduce any conflict between price, output and financial stability (Howitt, 2011; Blanchard et al., 2013). Macroprudential regulation cannot be seen independently from macroeconomic dynamics. Such regulatory issues are complementary to monetary policy in taming macroeconomic instability, while increasing the resilience of the financial system. These results are in line with the results of Jordá et al. (2015) who argue that the joint adoption of 'leaning against the wind' monetary strategies and macroprudential policies allows reduced excessive swings in credit and leverage growth, thus, minimizing the risk of dangerous financially-originated recessions.

[Table 3 here]

These findings align with the arguments that central banks should pay strong attention onto potential trade-offs between the objectives of macroeconomic and financial stability. This happens because price stability is associated with increased risks of financial instability, while low inflation can foster asset price bubbles, due to increased incentives for investors to take on more risk. If central banks realize the economy's macroeconomic course is endangered because financial institutions are unpredictable in assuming financial and investment risk (i.e., higher financial solvencies and deteriorating financial liquidity), may find it hard to fight such undesirable events just by giving emphasis on macroeconomic stability (Woodward, 2000). The imminent event of a financial crisis warrantees the implementation of sound macroprudential policies, otherwise, the costs of potential defaults can be substantially high (Hoshi and Kashyap, 2010). Overall, our empirical findings can infer that we cannot ignore the link between macroeconomic and financial stability as it is reflected through a monetary rule and as it is dictated by the globalization of

financial markets. Nevertheless, the findings need to be interpreted with caution. There are arguments that adding a financial stability objective to monetary policy may confuse markets and jeopardize commitments to price stability, thus, making it more difficult to maintain macroeconomic stability. In addition, macroprudential policy has been also received criticism on the grounds that it is more subject to lobbying and political pressures. Igan and Mishra (2011), for instance, present the case on the worldwide reaction of the financial sector to the new Basel rules for higher capital requirements.

The next part of the empirical analysis, reported in Table 4, repeats the analysis in Table 2, but now the findings are considered across country classifications (the country variable is not included). The results document that although the estimates retain their sign as in the overall case, there are differentiated sizes of the estimated coefficients. In particular, the macroprudential policy coefficient, b_3, turns out to be greater in the case of low income countries (although the low number of observations could jeopardize the validity of the results in this case) that seem to extensively use such policies, mainly as a part of maintaining their exchange rate regime. Similarly, the lower middle income countries coefficient follows, while the high income countries coefficient displays the lowest value, probably indicating the less emphasis these countries put on macroprudential policies to target financial stability. In terms of the inflation coefficient, the size has the greatest value in the case of the high income countries that seem to exercise the most 'hawkish' price stability type of monetary policy, while in terms of the output gap coefficient the largest values come from both the high income and the low income countries that consider welfare losses for their societies, along with their financial stability target.

[Table 4 here]

Robustness checks: Monetary rules with house prices

Given that the literature argues that incorporating stock prices into the monetary rule is subject to the problematic finding that a positive response to stock prices does not necessarily imply the central bank's response to potential bubbles (Lee and Son, 2013), this part subjects the results presented so far to robustness checks by

introducing explicitly into the rule house prices instead of stock prices (the author thanks a reviewer for pointing out this). The theoretical background of this approach lies back to the role of the credit channel as an efficient transmission mechanism of monetary policy (Bernanke and Blinder, 1988; Baum et al., 2003). Frictions in the credit market, i.e. asymmetric information and/or imperfect contract enforceability, generate a wedge between the opportunity cost of internal funds and the cost of external funds, i.e. an external finance premium, both for consumers and firms. Given certain conditions in the housing finance market, such as the depth of the funding system for housing finance, restrictions and regulations on depository institutions, and the sharing of housing credit risk, the workings of credit housing can substantially affect the effectiveness of this channel through its impact on the dependence of housing finance institutions on retail deposits (Iacoviello and Minetti, 2007). Therefore, policy makers should pay a closer attention to housing credit and markets, given that the presence of credit constraints for housing borrowers and house price expectations can significantly affect net worth and borrowing capacity, with real effects on the economy. To this end and following Gelain et al. (2013), Equation (4) yields:

$$i_t = \Phi_0 + \Phi_1 \pi_{t+1} + \Phi_2 y_{t+1} + \Phi_3 ghp_{t-1} + ¿\, \rho\, i_{t-1} + \varepsilon_t \qquad (5)$$

where ghp is the growth rate of house prices. For the empirical estimation of Equation (5) we managed to get data on house prices only for 67 countries in our sample (the new country sample is shown in Appendix 2). The results for the GMM estimates of the new monetary rule are reported in Table 5. They illustrate that while the coefficients on inflation and the output gap retain their previous explanatory size and power, the coefficient on house prices is much greater vis-à-vis that on stock prices in the majority of the countries in the new sample. In addition, diagnostics still confirm the statistical adequacy of estimates.

[Table 5 here]

Next, the robustness check part focuses on the (new) policy mix between monetary and macroprudential policy. The intensity of this mix is directly informed by the coefficient $\Phi_3$that proxies the estimates on house prices in Equation (5), which

constitutes the dependent variable of the new model, with the response coefficients on inflation, Φ_1, and the output gap, Φ_2, are still the explanatory variables in the modeling approach. The robustness analysis retains the three classifications of the macroprudential instruments, as well as the previous control variables considered in the main text of the analysis. The regression model looks like that considered previously:

$$\Phi_3 = \text{intercept} + b_1 \Phi_1 + b_2 \Phi_2 + b_3 \text{ mp} + b_4 \text{ Target} + b_5 \text{ Country}$$

but this time Φ_3 is the response to financial conditions in the Taylor rule with house prices. Following the same estimation methodology and the conventional 'standardization' of the variables, the new results are reported in Table 6. Again, the first variant does not make use of any control variables, while the remaining variants include the two control variables, one at a time. In terms of the macroprudential coefficient, the findings indicate that the type of macroprudential instrument has again an impact on the macroprudential/monetary policy mix. The results remain consistent across all three variants, while they are similar to those in Table 2, indicating again that macroprudential instruments constraining borrowers directly reduce the response of monetary policy to financial stability, and are less favorable to the integrated policy mix in comparison to instruments that constrain lenders and/or capital flows. Only this time, this effect has turned out to be stronger.

[Table 6 here]

V. Conclusion

The empirical literature has found solid evidence that monetary policy is capable of ensuring financial stability. This paper set up an empirical methodology through which it demonstrated that the instrument of the interest rate (in an augmented Taylor rule) could affect not only price and output stability, but also safeguarded financial stability. Using a sample of 127 global economies and the estimations of the Taylor rule, the analysis documented that the type of macroprudential instrument could impact the macroprudential/monetary policy mix. These results survived robustness checks in which stock prices in the monetary rules were replaced by house prices.

These findings have substantial policy implications since they illustrate that certain types of macroprudential instruments can be more favorable than others to a strong link between monetary and macroprudential policy to ensure financial stability. The findings could also influence the direction in which monetary policy can guide macroprudential regulation. Should monetary policy internalize the regulator's problem and therefore, 'lean against financial imbalances', or what really matters is the merit of coordination of monetary and macroprudential policies? The recent trend of central banks acquiring macroprudential portfolios is a reflection of these potential merits.

In addition, the results seem to also have implications for institutional strategies. In particular, the interaction between the two policies recommends the coordination which will improve outcomes, making it advantageous to assign both policies to a single authority, usually the central bank. Given that the results exemplified the strength of that policy mix in the case of lenders, i.e. banks, the institutional design should be built in a manner that prevent such institutions from excessive risk-taking or bubbles, motivated by persistently expansionary monetary policies and expected bailouts, while easing the burden on monetary policy. Such findings emphasize the importance of factors in relevance to bank balance sheet capacity and competition pressures. Without the coordination of the two policies may increase the likelihood of a financial crisis originating by the accumulation of bank risk. The findings shed light on the combined role of monetary policy and bank lending conditions. Monetary policy should pay more attention to financial stability, while banking prudential policies should take into account the risk-taking incentives possibly induced by low interest rates. The combined role of monetary policy and macroprudential tools can be buffers that ease the conduct of monetary policy, especially, during periods of financial stress. The attention to macroprudential policy can enhance monetary policy's credibility and transparency, while the central banks can enjoy new responsibilities on macroprudential supervision and regulation to monitor banking/lending risks.

Further research could explore whether nonlinearities and potential breaks in Taylor monetary rules affect the policy mix investigated here under that central banks have asymmetric preferences for both inflation and the output gap.

Appendix 1. Countries and macroprudential tools

Full Sample: 127 countries

Low Income Countries: 19 countries

Burkina Faso	(3)	1980-2015	Credit
Burundi	(3)	1980-2015	Credit
Central African Republic	(3)	1980-2015	Credit
Chad	(3)	1985-2015	Credit
Ethiopia	(3)	1984-2015	Credit
Gambia	(3)	1985-2015	Credit
Haiti	(3)	1990-2015	Credit
Liberia	(3)	1985-2015	Credit
Madagascar	(3)	1986-2015	Credit
Mali	(3)	1985-2015	Credit
Mozambique	(3)	1988-2015	Credit
Nepal	(2)	1990-2015	Credit
Niger	(3)	1988-2015	Credit
Rwanda	(3)	1990-2015	Credit
Sierra Leone	(3)	1988-2015	Credit
Tanzania	(3)	1985-2015	Credit
Togo	(3)	1988-2015	Credit
Uganda	(3)	1990-2015	Credit
Zimbabwe	(3)	1985-2015	Credit

Lower Middle Income Countries: 30 countries

Armenia	(3)	1991-2015	Asset
Bolivia	(3)	1990-2015	Credit
Cameroon	(3)	1988-2015	Credit
Cape Verde	(3)	1990-2015	Credit
Cote d'Ivoire	(3)	1985-2015	Credit
Egypt	(3)	1985-2015	Credit
El Salvador	(2)	1986-2015	Asset
Georgia	(2)	1991-2015	Credit
Ghana	(2)	1985-2015	Credit
Guatemala	(2)	1991-2015	Asset
Honduras	(3)	1993-2015	Asset
India	(2)	1985-2015	Asset
Indonesia	(2)	1985-2015	Asset
Kenya	(2)	1985-2015	Credit
Mauritania	(3)	1985-2015	Credit
Moldova	(2)	1992-2015	Asset
Morocco	(2)	1988-2015	Credit
Nicaragua	(3)	1990-2015	Asset
Nigeria	(3)	1986-2015	Credit
Pakistan	(2)	1985-2015	Credit
Philippines	(3)	1983-2015	Credit
Senegal	(3)	1986-2015	Credit
Sri Lanka	(3)	1985-2015	Credit
Sudan	(3)	1985-2015	Credit
Tajikistan	(2)	1993-2015	Credit
Ukraine	(2)	1992-2015	Asset

Uzbekistan	(2)	1993-2015	Credit
Vietnam	(3)	1990-2015	Asset
Yemen	(3)	1992-2015	Credit
Zambia	(3)	1985-2015	Credit

Upper Middle Income Countries: 42 countries

Albania	(2)	1990-2015	Credit
Algeria	(3)	1985-2015	Credit
Angola	(3)	1985-2015	Credit
Azerbaijan	(2)	1992-2015	Credit
Belarus	(2)	1993-2015	Asset
Bosnia-Herzegovina	(2)	1995-2015	Credit
Botswana	(3)	1985-2015	Credit
Brazil	(3)	1983-2015	Asset
Bulgaria	(2)	1992-2015	Asset
China	(2)	1993-2015	Asset
Colombia	(2)	1987-2015	Credit
Costa Rica	(2)	1985-2015	Asset
Cuba	(3)	1995-2015	Credit
Dominican Republic	(3)	1990-2015	Asset
Ecuador	(3)	1990-2015	Credit
Fiji	(3)	1991-2015	Credit
Gabon	(3)	1985-2015	Credit
Grenada	(3)	1990-2015	Credit
Iran	(3)	1993-2015	Credit
Jamaica	(2)	1990-2015	Credit
Jordan	(2)	1989-2015	Credit

Kazakhstan	(3)	1993-2015	Credit
Lebanon	(2)	1990-2015	Credit
Libya	(3)	1988-2013	Credit
Malaysia	(3)	1982-2015	Asset
Maldives	(3)	1985-2015	Credit
Marshall Islands	(3)	1985-2015	Credit
Mauritius	(3)	1985-2015	Credit
Mexico	(3)	1981-2015	Asset
Mongolia	(3)	1995-2015	Credit
Namibia	(3)	1985-2015	Credit
Panama	(2)	1984-2015	Asset
Paraguay	(2)	1988-2015	Credit
Peru	(2)	1987-2015	Credit
Romania	(1)	1993-2015	Asset
South Africa	(3)	1982-2015	Asset
Suriname	(3)	1990-2015	Credit
Thailand	(3)	1983-2015	Credit
Tonga	(3)	1985-2015	Credit
Tunisia	(2)	1985-2013	Credit
Turkey	(2)	1982-2015	Asset
Turkmenistan	(2)	1993-2015	Credit

High Income Countries: 36 countries

Andorra	(2)	1985-2015	Credit
Argentina	(3)	1988-2015	Asset
Australia	(1)	1982-2015	Asset
Bahamas	(1)	1985-2015	Credit

Bahrain	(2)	1985-2015	Credit
Barbados	(2)	1987-2015	Credit
Brunei	(2)	1990-2015	Credit
Canada	(2)	1982-2015	Asset
Chile	(3)	1985-2015	Asset
Croatia	(2)	1993-2015	Credit
Czech Republic	(2)	1993-2015	Credit
Denmark	(2)	1982-2015	Asset
Eurozone	(2)	2001-2015	Credit
Hungary	(1)	1993-2015	Credit
Iceland	(2)	1990-2015	Credit
Israel	(2)	1985-2015	Credit
Japan	(2)	1981-2015	Credit
Kuwait	(2)	1992-2015	Asset
New Zealand	(2)	1983-2015	Asset
Norway	(2)	1982-2015	Asset
Oman	(3)	1985-2015	Credit
Poland	(1)	1991-2015	Asset
Qatar	(2)	1985-2015	Credit
Russia	(2)	1993-2015	Credit
Saudi Arabia	(2)	1985-2015	Credit
Singapore	(2)	1983-2015	Asset
South Korea	(2)	1981-2015	Credit
Sweden	(2)	1983-2015	Asset
Switzerland	(2)	1982-2015	Asset
Taiwan	(2)	1985-2015	Credit
Trinidad & Tobago	(2)	1990-2015	Credit

United Arab Emirates	(2)	1989-2015	Credit
United Kingdom	(2)	1981-2015	Asset
United States	(2)	1980-2015	Asset
Uruguay	(2)	1986-2015	Credit
Venezuela	(2)	1985-2015	Credit

Notes: The number in parenthesis denotes whether the macroprudential policy is in relevance to restrictions on borrowers (1), lenders (2), or on capital flows (3). The period indicates the time span on which the monetary rule has been estimated. The last column indicates whether the country is a capital-based or bank-based economy.

Appendix 2. New (limited) country sample

Low Income Countries = Haiti, Rwanda, Tanzania, Zimbabwe

Lower Middle Income Countries **=** Armenia, Egypt, El Salvador, Georgia, Ghana, India, Indonesia, Morocco, Nicaragua, Nigeria, Pakistan, Philippines, Ukraine, Uzbekistan, Vietnam

Upper Middle Income Countries **=** Albania, Belarus, Brazil, Bulgaria, China, Colombia, Jamaica, Jordan, Kazakhstan, Malaysia, Mexico, Paraguay, Peru, Romania, South Africa, Thailand, Tunisia, Turkey

High Income Countries **=** Argentina, Australia, Bahamas, Bahrain, Canada, Chile, Croatia, Czech Republic, Denmark, Eurozone, Hungary, Iceland, Israel, Japan, Kuwait, New Zealand, Norway, Poland, Qatar, Russia, Saudi Arabia, Singapore, South Korea, Sweden, Switzerland, Taiwan, U.K., U.S., Uruguay, Venezuela

Appendix 3. Data description (quarterly)

Countries	Output (constant-2010)	Prices (2010)	Interest rates
Burkina Faso	GDP	CPI	Official

Burundi	GDP	CPI	Refinance
Central African Republic	GDP	CPI	Prime lending
Chad	GDP	CPI	Prime lending
Ethiopia	GDP	CPI	Benchmark
Gambia	GDP	CPI	Policy rate
Haiti	GDP	CPI	Benchmark
Liberia	GDP	CPI	Liberia interest
Madagascar	GDP	CPI	Official
Mali	GDP	CPI	Official
Mozambique	GDP	CPI	Standing Lending Facility
Nepal	GDP	CPI	Bank
Niger	GDP	CPI	Official
Rwanda	GDP	CPI	Key Repo
Sierra Leone	GDP	CPI	BSL’s official
Tanzania	GDP	CPI	Official
Togo	GDP	CPI	Official
Uganda	GDP	CPI	Central Bank
Zimbabwe	GDP	CPI	Weighted Lending
Armenia	GDP	CPI	Refinancing
Bolivia	GDP	CPI	Bolivia Interest
Cameroon	GDP	CPI	Prime Lending
Cape Verde	GDP	CPI	Rediscount
Cote d’Ivoire	GDP	CPI	Official
Egypt	GDP	CPI	Overnight Deposit
El Salvador	GDP	CPI	El Salvador Money
Georgia	GDP	CPI	7-day Refinancing
Ghana	GDP	CPI	Monetary Policy
Guatemala	GDP	CPI	Official

Honduras	GDP	CPI	Monetary Policy
India	GDP	CPI	Benchmark Repurchase
Indonesia	GDP	CPI	Official Discount
Kenya	GDP	CPI	Central Bank to August 2005 and 91-day Treasury Bill afterwards
Mauritania	GDP	CPI	Discount
Moldova	GDP	CPI	Base
Morocco	GDP	CPI	Official
Nicaragua	GDP	CPI	Overnight
Nigeria	GDP	CPI	Monetary Policy
Pakistan	GDP	CPI	Discount Ceiling
Philippines	GDP	CPI	Reverse Repo
Senegal	GDP	CPI	Central Bank of West African States
Sri Lanka	GDP	CPI	Standing Lending Facility
Sudan	GDP	CPI	Murabaha Profits Margin
Tajikistan	GDP	CPI	Refinancing
Ukraine	GDP	CPI	Discount
Uzbekistan	GDP	CPI	Refinancing
Vietnam	GDP	CPI	Refinancing
Yemen	GDP	CPI	Benchmark Deposit
Zambia	GDP	CPI	Official
Albania	GDP	CPI	1-Week Repo
Algeria	GDP	CPI	Discount
Angola	GDP	CPI	Discount to October 2011 and Taxa Básica de Juro afterwards
Azerbaijan	GDP	CPI	Refinancing

Belarus	GDP	CPI	Refinancing
Bosnia-Herzegovina	GDP	CPI	1 euro to 1.95583 KM
Botswana	GDP	CPI	Bank
Brazil	GDP	CPI	Overnight Lending
Bulgaria	GDP	CPI	Base Interest
China	GDP	CPI	One-Year Lending
Colombia	GDP	CPI	Intervention
Costa Rica	GDP	CPI	Monetary Policy
Cuba	GDP	CPI	1-month
Dominican Republic	GDP	CPI	Overnight
Ecuador	GDP	CPI	Benchmark Lending
Fiji	GDP	CPI	Overnight Policy
Gabon	GDP	CPI	Bank of Central African States' official
Grenada	GDP	CPI	Primary Lending
Iran	GDP	CPI	Bank Profit
Jamaica	GDP	CPI	30-day Certificate of Deposit
Jordan	GDP	CPI	Re-discount
Kazakhstan	GDP	CPI	Overnight Policy
Lebanon	GDP	CPI	Repo
Libya	GDP	CPI	Rediscount
Malaysia	GDP	CPI	Overnight Policy
Maldives	GDP	CPI	1-Week reverse Repo
Marshall Islands	GDP	CPI	Primary Loans
Mauritius	GDP	CPI	Repo
Mexico	GDP	CPI	Overnight Interbank
Mongolia	GDP	CPI	Policy

Namibia	GDP	CPI	Repo
Panama	GDP	CPI	Money Market
Paraguay	GDP	CPI	14-Day Interest
Peru	GDP	CPI	Reference
Romania	GDP	CPI	Policy
South Africa	GDP	CPI	Repo
Suriname	GDP	CPI	Discount
Thailand	GDP	CPI	1-day repurchase
Tonga	GDP	CPI	Base
Tunisia	GDP	CPI	Call for Tender
Turkey	GDP	CPI	1-Week Repo Lending
Turkmenistan	GDP	CPI	Refinance
Andorra	GDP	CPI	Re-deposit
Argentina	GDP	CPI	Reverse Repo
Australia	GDP	CPI	Cash
Bahamas	GDP	CPI	Discount
Bahrain	GDP	CPI	1-Week Deposit
Barbados	GDP	CPI	3-Month T-Bill
Brunei	GDP	CPI	Prime Lending
Canada	GDP	CPI	Target On
Chile	GDP	CPI	Monetary Policy
Croatia	GDP	CPI	Lombard
Czech Republic	GDP	CPI	Repo
Denmark	GDP	CPI	Lending
Eurozone	GDP	Harmonized	Key
Hungary	GDP	CPI	Base
Iceland	GDP	CPI	7-Day Deposit
Israel	GDP	CPI	Benchmark

Japan	GDP	CPI	Call
Kuwait	GDP	CPI	Discount
New Zealand	GDP	CPI	Cash
Norway	GDP	CPI	Key Policy
Oman	GDP	CPI	Repo
Poland	GDP	CPI	Reference
Qatar	GDP	CPI	Repo
Russia	GDP	CPI	Key
Saudi Arabia	GDP	CPI	Repurchase
Singapore	GDP	CPI	Effective Exchange Rate
South Korea	GDP	CPI	Base
Sweden	GDP	CPI	Repo
Switzerland	GDP	CPI	SNB-Target Range
Taiwan	GDP	CPI	10-Day Loans
Trinidad & Tobago	GDP	CPI	Repo
United Arab Emirates	GDP	CPI	Overnight Repurchase
United Kingdom	GDP	CPI	Bank
United States	GDP	CPI	Funds
Uruguay	GDP	CPI	Monetary Policy
Venezuela	GDP	CPI	Discount

References

Adrian, T. and Shin, H. (2009). ‘Money, liquidity, and monetary policy’, *American*

Economic Review, Vol. 99, pp. 600-605.

Agénor P.R. and Pereira Da Silva L.A. (2013). 'Inflation targeting and financial stability: a perspective from the developing world', Inter-American Development Bank and CEMLA.

Baum, C.F. (2000). 'A re-evaluation of empirical tests of the Fisher hypothesis', Boston College Working Paper, No. 472.

Baum, C.F., Caglayan, M. and Ozkan, N. (2003). 'Re-examining the transmission of monetary policy: What more do a million observations have to say', Boston College Working Paper, No. 760.

Bernanke, B.S. and Gertler, M. (1999). 'Monetary policy and asset price volatility', *Federal Reserve Bank of Kansas City, Economic Review,* Vol. 84, pp. 17-51.

Bernanke, B. and Blinder, A. (1988). 'Credit, money, and aggregate demand', *American Economic Review*, Vol. 78, pp. 435-439.

Bineau, Y. (2010). 'Renminbi's misalignment: a meta-analysis', *Economic Systems*, Vol. 34, pp. 259-269.

Blanchard, O., Dell'Ariccia, G. and Mauro, P. (2013). 'Rethinking macro policy 2: getting granular', IMF Staff Discussion Note, No.13/03.

Bunzel, H. and Enders, W. (2010). 'The Taylor rule and opportunistic monetary policy crisis?', CREATES Research Paper, No. 4.

Castro, V. (2011). 'Can central banks' monetary policy be described by a linear (augmented) Taylor rule or by a nonlinear rule?', *Journal of Financial Stability*, Vol. 7, pp. 228-246.

Cerutti, E., Claessens, S. and Laeven, L. (2016). 'The use and effectiveness of macroprudential policies: new evidence', *Journal of Financial Stability*, (forthcoming).

Chadha, J.S., Sarno, L. and Valente, G. (2004). 'Monetary Policy Rules, Asset Prices and Exchange Rates', IMF Staff Papers, Vol. 51, pp. 529-552.

Christiano L., Ilut C. L., Motto R. and Rostagno M. (2010). 'Monetary policy and stock market booms', NBER Working Paper, No. 16402.

Claessens, S. (2015). 'An overview of macroprudential policy tools', IMF Working Paper, No. 14/214.

Clarida, R.H. (2001). 'The empirics of monetary policy rules in open economies', *International Journal of Finance and Economics,* Vol. 6, pp. 315-323.

Clarida, R.H., Gali J. and Gertler, M. (1998). 'Monetary policy rules in practice:

Some international evidence', *European Economic Review,* Vol. 42, pp. 1033-1067.

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

Crowder, W.J., Hoffman, D.L. (1996). 'The long-run relationship between nominal interest rates and inflation: the Fisher equation revisited', *Journal of Money, Credit and Banking*, Vol. 28, pp. 102-118.

Curdia, V. and Woodford, M. (2010). 'Credit spreads and monetary policy', *Journal of Money, Credit and Banking,* Vol. 42, pp. 3-35.

Diebold, F.X., Gunther, T.A. and Tay, A.S. (1998). 'Evaluating density forecasts with applications to financial risk management', *International Economic Review,* Vol. 39, pp. 863-883.

Eichengreen, B., El-Erian, M., Fraga, A., Ito, T., Pisani-Ferry, J., Prasad, E., Rajan, R., Ramos, M., Reinhart, C., Rey, H., Rodrik, D., Rogoff, K., Song, S.H., Velasco, A., Weder, M.B. and Yongding, Y.Y. (2011). *Rethinking Central Banking*, Brookings Institution: Washington.

Freixas, X., Laeven, L. and Peydró, J.L. (2015). *Systemic Risk, Crises, and Macroprudential Regulation*. MIT Press, Boston, Massachusetts.

Fuhrer, J. and Tootell, G. (2008). 'Eyes on the prize: how did the Fed respond to the stock market?' *Journal of Monetary Economics*, Vol. 55, pp. 796-805.

Garcia, R. and Perron, P. (1996). 'An analysis of the interest rates under regime shifts', *Review of Economics and Statistics*, Vol. 78, pp. 111-125.

Gelain, P., Lansing, K.J. and Mendicino, C. (2013). 'House prices, credit growth, and excess volatility: Implications for monetary and macroprudential policy', *International Journal of Central Banking,* Vol. 9, pp. 219-286.

Gil-Alana, L.A. (2004). 'Long memory in the U.S. interest rate', *International Review of Financial Analysis*, Vol. 13, pp. 265-276.

Gilchrist, S. and Leahy, J.V. (2002). 'Monetary policy and asset prices', *Journal of Monetary Economics*, Vol. 49, pp. 75-97.

Hahm, J., Mishkin, F., Shin, H. and Shin, K. (2012). 'Macroprudential policies in open emerging economies', NBER Working Paper, No. 17780.

Hoshi, T. and Kashyap, K. (2010). 'Why did Japan stop growing?', NBER Working Paper, National Bureau of Economic Research, Cambridge, MA.

Howitt, P. (2011). 'What have central bankers learned from modern macroeconomic theory?', *Journal of Macroeconomics*, Vol. 34, pp. 11-22.

Huizinga, J. and Mishkin, F.S. (1986). 'Monetary regime shifts and the unusual behavior of interest rates', *Carnegie-Rochester Conference Series on Public Policy*, Vol. 24, pp. 231-274.

Iacoviello, M. and Minetti, R. (2007). 'The credit channel of monetary policy: Evidence from the housing market', *Journal of Macroeconomics*, Vol. 30, pp. 69-96.

Igan, D. and Mishra, P. (2011). 'Making friends', *Finance and Development*, Vol. 48, pp. 27-29.

Issing, O. (2011). 'Lessons for monetary policy: what should the consensus be?', IMF Working Paper, No. 11/97.

Jordá, O., Schularick, M., Taylor, A.M. (2015). 'Leveraged bubbles', NBER Working Paper, No. 21486.

Lee, D.J. and Son, J.C. (2013). 'Nonlinearity and structural breaks in monetary policy rules with stock prices', *Economic Modelling*, 31, 1-11.

Lim, C., Columba, F. Costa, A., Kongsamut, P., Otani, A., Saiyid, M., Wezel, T. and Wu, X. (2011). 'Macroprudential policy: what instruments and how to use them? Lessons from country experiences', IMF Working Paper, No. 11/238.

Malliaropulos, D. (2000). 'A note on nonstationarity, structural breaks, and the Fisher effect', *Journal of Banking and Finance*, Vol. 24, 695-707.

McCallum, B.T. and Nelson, E. (2004). 'Timeless perspective vs discretionary monetary policy in forward looking models', *Federal Reserve Bank of St. Louis Review*, Vol. 86, pp. 43-56.

Mishkin, F. (2011). 'How should central banks respond to asset-price bubbles? The lean versus clean debate', Banque de Réserve d'Australie, Bulletin, June Quarter, 59-69.

Newbold, P., Leybourne, S., Soleis, R.,Wohar, M.E. (2001). 'U.S. and U.K. interest rates, 1890–1934: new evidence on structural breaks', *Journal of Money, Credit and Banking*, Vol. 33, pp. 235-250.

Newey, W.K. and West, K.D. (1987). 'A simple, positive semi-definite heteroskedasticity and autocorrelation consistent covariance matrix',

Econometrica, Vol. 55, pp. 703-708.

Nunes, L.C., Newbold, P., Kuan, C.M. (1997). "Testing for unit roots with breaks: evidence on the Great Crash and the unit root hypothesis reconsidered', *Oxford Bulletin of Economics and Statistics*, Vol. 59, pp. 435-448.

Orphanides, A. (2001). 'Monetary policy rules based on real-time data', *American Economic Review*, Vol. 91, pp. 964-985.

Orphanides, A. (2003). 'The quest for prosperity without inflation', *Journal of Monetary Economics*, pp. 633-663.

Rey, H. (2013). 'Dilemma not trilemma: the global financial cycle and monetary policy independence', Working Paper presented at the 25th Jackson Hole Symposium.

Rigobon, R. and Sack, B. (2003). Measuring the reaction of monetary policy to the stock market', *The Quarterly Journal of Economics*, 118, pp. 639-669.

Siklos, P. and Bohl, M. (2008). 'Asset prices as indicators of Euro area monetary policy: an empirical assessment of their role in a Taylor rule', *Open Economies Review*, 20, pp. 39-59.

Smets, F. (2013). 'Financial stability and monetary policy: how closely interlinked?', *Riksbank Economic Review*, Vol. 3, pp. 121-160.

Stein, J.C. (2013). 'Overheating in credit markets: origins, measurement, and policy responses', Speech in St. Louise, February 7, 2013, available at www.federalreserve.gov.

Svensson, L. (2012). 'Comment on Michael Woodford, 'inflation targeting and financial stability', *Riksbank Economic Review*, Vol. 1, pp. 33-39.

Taylor, J.B. (2001). 'The role of the exchange rate in monetary-policy rules', *American Economic Review*, Vol.91, pp. 263-267.

Taylor, J.B. (1993). 'Discretion vs policy rules in practice', *Carnegie-Rochester Conference Series on Public Politics,* Vol. 39, pp. 195-214.

Turner, P. (2012). 'Macroprudential policies in EMEs: theory and practice', BIS Working Paper, No. 62.

Woodford, M. (2012). 'Inflation targeting and financial stability', *Riksbank Economic Review,* Vol. 1, pp. 7-32.

Woodford, M. (2001). 'The Taylor rule and optimal monetary policy', *American Economic Review*, Vol. 9, pp. 232-237.

Woodward, B. (2000). *Maestro: Greenspan's Fed and the American Boom*, Simon and Schuster, New York.

Wu, J.L., Chen, S.L. (2001). 'Mean reversion of interest rates in the Eurocurrency market', *Oxford Bulletin of Economics and Statistics*, Vol. 63, pp. 459-473.

Wu, Y., Zhang, H. (1996). 'Mean reversion in interest rates: new evidence from a panel of OECD countries', *Journal of Money, Credit and Banking*, Vol. 28, pp. 604-621.

TABLE 1

Forward-looking Taylor rule estimates (with stock prices)

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Low Income Countries							
Burkina Faso	0.963	0.003	0.614	0.229	0.809	[0.32]	0.86
	[0.01]	[0.19]	[0.01]	[0.01]	[0.00]		
Burundi	0.411	0.005	0.446	0.253	0.826	[0.58]	0.72
	[0.29]	[0.07]	[0.04]	[0.05]	[0.00]		
Central African Republic	0.329	0.004	0.594	0.268	0.861	[0.52]	0.66
	[0.28]	[0.19]	[0.03]	[0.05]	[0.00]		
Chad	0.334	0.005	0.607	0.308	0.869	[0.53]	0.61
	[0.34]	[0.20]	[0.01]	[0.05]	[0.00]		
Ethiopia	0.483	0.000	0.504	0.058	0.657	[0.40]	0.52
	[0.24]	[0.35]	[0.05]	[0.05]	[0.01]		
Gambia	0.408	0.000	0.028	23.139	0.725	[0.33]	0.56
	[0.29]	[0.26]	[0.05]	[0.00]	[0.00]		
Haiti	0.342	0.006	0.048	1.326	0.811	[0.40]	0.61
	[0.29]	[0.10]	[0.08]	[0.03]	[0.00]		
Liberia	0.412	0.005	0.033	0.492	0.785	[0.32]	0.60
	[0.27]	[0.15]	[0.05]	[0.05]	[0.00]		
Madagascar	0.339	0.002	0.417	1.682	0.839	[0.41]	0.65
	[0.36]	[0.29]	[0.07]	[0.04]	[0.00]		

Mali	0.458	0.001	0.044	0.837	0.852	[0.50]	0.70
	[0.31]	[0.26]	[0.06]	[0.01]	[0.00]		
Mozambique	0.430	0.000	0.038	0.745	0.805	[0.57]	0.69
	[0.29]	[0.46]	[0.07]	[0.05]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Nepal	0.361	0.009	1.174	0.031	0.765	[0.49]	0.61
	[0.37]	[0.10]	[0.01]	[0.20]	[0.00]		
Niger	0.358	0.004	0.032	0.774	0.702	[0.50]	0.68
	[0.30]	[0.27]	[0.10]	[0.05]	[0.00]		
Rwanda	0.552	0.001	0.929	0.233	0.605	[0.42]	0.57
	[0.04]	[0.30]	[0.01]	[0.01]	[0.00]		
Sierra Leone	0.436	0.002	0.031	6.784	0.813	[0.36]	0.68
	[0.29]	[0.25]	[0.08]	[0.02]	[0.00]		
Tanzania	0.554	0.009	0.128	0.602	0.746	[0.51]	0.70
	[0.31]	[0.10]	[0.10]	[0.01]	[0.00]		
Togo	0.430	0.000	0.151	0.628	0.774	[0.50]	0.63
	[0.34]	[0.40]	[0.09]	[0.01]	[0.00]		
Uganda	0.365	0.004	0.045	0.538	0.842	[0.60]	0.68
	[0.36]	[0.24]	[0.08]	[0.01]	[0.00]		
Zimbabwe	0.352	0.013	0.040	0.351	0.754	[0.52]	0.55
	[0.39]	[0.09]	[0.10]	[0.04]	[0.00]		
Lower Middle Income Countries							
Armenia	0.432	0.007	1.152	0.041	0.863	[0.60]	0.71
	[0.39]	[0.10]	[0.01]	[0.10]	[0.00]		
Bolivia	0.582	0.005	0.849	0.038	0.801	[0.55]	0.66

	[0.37]	[0.19]	[0.02]	[0.10]	[0.00]		
Cameroon	0.351	0.000	0.038	0.502	0.856	[0.53]	0.71
	[0.39]	[0.38]	[0.10]	[0.04]	[0.00]		
Cape Verde	0.426	0.000	0.035	0.379	0.814	[0.51]	0.64
	[0.32]	[0.37]	[0.10]	[0.05]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Cote d'Ivoire	0.352	0.001	0.033	0.319	0.759	[0.52]	0.54
	[0.38]	[0.43]	[0.10]	[0.08]	[0.00]		
Egypt	0.224	0.007	0.038	0.006	0.652	[0.60]	0.71
	[0.02]	[0.10]	[0.05]	[0.24]	[0.01]		
El Salvador	0.493	0.008	0.464	0.009	0.723	[0.50]	0.72
	[0.34]	[0.10]	[0.05]	[0.28]	[0.00]		
Georgia	0.461	0.005	0.051	0.588	0.886	[0.62]	0.77
	[0.40]	[0.10]	[0.10]	[0.01]	[0.00]		
Ghana	0.918	0.000	0.785	0.581	0.855	[0.32]	0.80
	[0.10]	[0.27]	[0.01]	[0.05]	[0.00]		
Guatemala	0.363	0.005	0.288	0.095	0.742	[0.41]	0.60
	[0.36]	[0.22]	[0.03]	[0.05]	[0.01]		
Honduras	0.421	0.000	0.245	0.071	0.659	[0.41]	0.62
	[0.37]	[0.40]	[0.05]	[0.09]	[0.01]		
India	0.563	0.010	0.178	0.354	0.920	[0.51]	0.77
	[0.39]	[0.10]	[0.05]	[0.03]	[0.00]		
Indonesia	0.935	0.005	0.491	0.004	0.928	[0.65]	0.76
	[0.02]	[0.10]	[0.01]	[0.39]	[0.00]		
Kenya	0.927	0.000	2.593	0.585	0.849	[0.68]	0.65
	[0.04]	[0.41]	[0.01]	[0.07]	[0.00]		

Mauritania	0.811	0.000	0.925	0.239	0.746	[0.51]	0.77
	[0.05]	[0.46]	[0.05]	[0.05]	[0.01]		
Moldova	0.460	0.002	0.165	0.148	0.637	[0.49]	0.58
	[0.44]	[0.31]	[0.01]	[0.28]	[0.01]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Morocco	0.429	0.005	0.926	0.038	0.916	[0.50]	0.69
	[0.32]	[0.26]	[0.01]	[0.06]	[0.00]		
Nicaragua	0.358	0.001	0.646	0.000	0.752	[0.47]	0.66
	[0.32]	[0.39]	[0.01]	[0.29]	[0.01]		
Nigeria	2.361	0.000	0.812	0.029	0.828	[0.24]	0.60
	[0.01]	[0.53]	[0.01]	[0.41]	[0.01]		
Pakistan	2.005	0.003	0.424	0.529	0.938	[0.58]	0.68
	[0.29]	[0.10]	[0.01]	[0.01]	[0.00]		
Philippines	0.453	0.000	1.185	0.034	0.994	[0.71]	0.70
	[0.48]	[0.10]	[0.01]	[0.30]	[0.00]		
Senegal	0.314	0.000	0.228	0.337	0.701	[0.58]	0.59
	[0.41]	[0.57]	[0.05]	[0.05]	[0.01]		
Sri Lanka	0.883	0.001	0.269	0.634	0.755	[0.51]	0.52
	[0.40]	[0.42]	[0.08]	[0.01]	[0.00]		
Sudan	0.256	0.000	0.085	0.336	0.639	[0.38]	0.41
	[0.32]	[0.58]	[0.33]	[0.05]	[0.01]		
Tajikistan	0.425	0.000	0.719	0.048	0.759	[0.44]	0.50
	[0.48]	[0.42]	[0.01]	[0.26]	[0.00]		
Ukraine	0.808	0.003	0.506	0.033	0.784	[0.51]	0.55
	[0.25]	[0.10]	[0.01]	[0.29]	[0.00]		

Uzbekistan	0.514	0.000	0.314	0.031	0.752	[0.46]	0.50
	[0.32]	[0.49]	[0.05]	[0.31]	[0.00]		
Vietnam	3.209	0.004	0.098	0.408	0.954	[0.48]	0.67
	[0.07]	[0.10]	[0.14]	[0.04]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Yemen	0.326	0.000	0.030	0.391	0.659	[0.41]	0.52
	[0.44]	[0.38]	[0.35]	[0.09]	[0.01]		
Zambia	0.485	0.000	0.048	0.257	0.636	[0.40]	0.49
	[0.34]	[0.45]	[0.30]	[0.05]	[0.01]		
Upper Middle Income Countries							
Albania	0.263	0.000	0.438	0.031	0.685	[0.46]	0.53
	[0.60]	[0.19]	[0.05]	[0.27]	[0.00]		
Algeria	0.349	0.000	0.216	0.041	0.796	[0.58]	0.47
	[0.38]	[0.52]	[0.05]	[0.20]	[0.00]		
Angola	0.361	0.000	0.032	0.303	0.610	[0.42]	0.41
	[0.45]	[0.49]	[0.30]	[0.05]	[0.01]		
Azerbaijan	0.514	0.000	0.051	0.325	0.683	[0.49]	0.40
	[0.30]	[0.42]	[0.27]	[0.05]	[0.00]		
Belarus	0.618	0.001	0.032	0.339	0.662	[0.50]	0.41
	[0.31]	[0.38]	[0.27]	[0.05]	[0.00]		
Bosnia-Herzegovina	0.526	0.000	0.034	0.387	0.639	[0.41]	0.43
	[0.32]	[0.44]	[0.38]	[0.05]	[0.01]		
Botswana	0.325	0.002	0.021	0.411	0.805	[0.52]	0.60
	[0.39]	[0.43]	[0.38]	[0.01]	[0.00]		
Brazil	-4.994	0.008	0.122	0.618	0.724	[0.69]	0.51

	[0.40]	[0.10]	[0.05]	[0.01]	[0.00]		
Bulgaria	-0.109	0.003	0.101	0.194	0.415	[0.47]	0.42
	[0.30]	[0.17]	[0.05]	[0.10]	[0.01]		
China	1.647	0.010	2.452	0.774	0.826	[0.64]	0.77
	[0.07]	[0.09]	[0.01]	[0.05]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Colombia	0.549	0.000	0.365	0.137	0.348	[0.51]	0.45
	[0.30]	[0.28]	[0.05]	[0.17]	[0.05]		
Costa Rica	0.440	0.000	0.762	0.174	0.551	[0.32]	0.60
	[0.40]	[0.31]	[0.01]	[0.08]	[0.01]		
Cuba	-0.411	0.000	0.049	0.418	0.454	[0.36]	0.51
	[0.40]	[0.54]	[0.42]	[0.01]	[0.04]		
Dominican Republic	-1.291	0.000	2.139	0.134	0.205	[0.58]	0.78
	[0.04]	[0.62]	[0.01]	[0.40]	[0.07]		
Ecuador	-4.962	0.000	0.260	5.452	0.225	[0.54]	0.57
	[0.42]	[0.40]	[0.37]	[0.01]	[0.05]		
Fiji	0.416	0.000	0.319	0.642	0.525	[0.41]	0.58
	[0.42]	[0.39]	[0.05]	[0.01]	[0.04]		
Gabon	0.347	0.000	0.074	0.595	0.615	[0.56]	0.69
	[0.40]	[0.53]	[0.10]	[0.01]	[0.01]		
Grenada	0.330	0.001	0.022	0.303	0.538	[0.41]	0.42
	[0.51]	[0.44]	[0.36]	[0.01]	[0.02]		
Iran	0.250	0.000	0.736	0.411	0.586	[0.52]	0.80
	[0.30]	[0.41]	[0.00]	[0.05]	[0.01]		
Jamaica	1.452	0.000	0.140	0.736	0.826	[0.58]	0.25
	[0.35]	[0.40]	[0.20]	[0.03]	[0.00]		

Jordan	0.173	0.000	0.875	0.657	0.949	[0.58]	0.81
	[0.38]	[0.58]	[0.01]	[0.04]	[0.00]		
Kazakhstan	0.356	0.004	0.240	0.452	0.949	[0.71]	0.73
	[0.33]	[0.51]	[0.08]	[0.01]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Lebanon	0.436	0.002	0.117	0.460	0.581	[0.47]	0.60
	[0.36]	[0.49]	[0.08]	[0.01]	[0.01]		
Libya	0.340	0.000	0.159	0.527	0.693	[0.48]	0.69
	[0.45]	[0.59]	[0.10]	[0.01]	[0.00]		
Malaysia	-0.060	0.004	0.072	0.227	0.841	[0.50]	0.78
	[0.39]	[0.18]	[0.45]	[0.05]	[0.00]		
Maldives	0.385	0.000	0.307	0.040	0.642	[0.44]	0.61
	[0.39]	[0.62]	[0.02]	[0.28]	[0.01]		
Marshall Islands	0.324	0.000	0.409	0.032	0.683	[0.55]	0.67
	[0.42]	[0.65]	[0.01]	[0.32]	[0.00]		
Mauritius	0.573	0.000	0.506	0.134	0.601	[0.49]	0.60
	[0.27]	[0.44]	[0.01]	[0.05]	[0.00]		
Mexico	0.389	0.005	1.142	0.226	0.939	[0.48]	0.63
	[0.38]	[0.10]	[0.01]	[0.30]	[0.00]		
Mongolia	0.385	0.000	2.185	0.774	0.702	[0.45]	0.61
	[0.46]	[0.58]	[0.01]	[0.05]	[0.00]		
Namibia	1.386	0.000	0.735	0.202	0.515	[0.52]	0.49
	[0.04]	[0.41]	[0.01]	[0.04]	[0.01]		
Panama	0.536	0.002	0.454	0.032	0.619	[0.58]	0.54
	[0.35]	[0.28]	[0.01]	[0.36]	[0.00]		

Paraguay	0.585	0.000	0.511	0.476	0.750	[0.68]	0.60
	[0.32]	[0.24]	[0.01]	[0.01]	[0.00]		
Peru	0.733	0.001	0.560	0.172	0.784	[0.65]	0.73
	[0.29]	[0.19]	[0.01]	[0.10]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Romania	1.143	0.000	0.783	0.619	0.860	[0.22]	0.65
	[0.10]	[0.29]	[0.01]	[0.01]	[0.01]		
South Africa	0.104	0.005	0.041	0.311	0.839	[0.49]	0.79
	[0.48]	[0.19]	[0.41]	[0.04]	[0.00]		
Suriname	0.426	0.000	0.032	0.410	0.742	[0.51]	0.70
	[0.39]	[0.48]	[0.34]	[0.01]	[0.00]		
Thailand	0.254	0.002	0.257	0.006	0.748	[0.43]	0.81
	[0.28]	[0.41]	[0.01]	[0.72]	[0.00]		
Tonga	0.514	0.000	0.022	0.011	0.188	[0.23]	0.16
	[0.33]	[0.42]	[0.45]	[0.62]	[0.14]		
Tunisia	0.138	0.000	0.124	0.051	0.918	[0.55]	0.82
	[0.30]	[0.45]	[0.01]	[0.10]	[0.00]		
Turkey	-1.002	0.006	0.011	0.153	0.954	[0.58]	0.78
	[0.26]	[0.15]	[0.50]	[0.05]	[0.00]		
Turkmenistan	0.583	0.000	0.015	0.219	0.516	[0.40]	0.48
	[0.35]	[0.45]	[0.41]	[0.05]	[0.02]		
High Income Countries							
Andorra	0.514	0.000	0.492	0.021	0.585	[0.58]	0.61
	[0.18]	[0.49]	[0.01]	[0.46]	[0.01]		
Argentina	2.458	0.001	0.513	0.338	0.721	[0.58]	0.40

	[0.27]	[0.35]	[0.05]	[0.05]	[0.01]		
Australia	-0.245	0.010	0.335	0.411	0.608	[0.55]	0.80
	[0.30]	[0.11]	[0.05]	[0.36]	[0.00]		
Bahamas	0.962	0.000	0.048	0.446	0.642	[0.41]	0.52
	[0.15]	[0.31]	[0.30]	[0.01]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Bahrain	0.784	0.000	0.035	0.324	0.559	[0.49]	0.61
	[0.28]	[0.45]	[0.40]	[0.04]	[0.01]		
Barbados	0.606	0.000	0.032	0.354	0.559	[0.51]	0.55
	[0.36]	[0.52]	[0.29]	[0.04]	[0.01]		
Brunei	0.748	0.000	0.445	0.041	0.692	[0.54]	0.70
	[0.30]	[0.43]	[0.02]	[0.30]	[0.00]		
Canada	-0.241	0.010	0.051	0.303	0.884	[0.68]	0.78
	[0.35]	[0.11]	[0.44]	[0.01]	[0.00]		
Chile	-2.361	0.002	0.427	0.319	0.624	[0.51]	0.40
	[0.32]	[0.19]	[0.01]	[0.06]	[0.01]		
Croatia	1.562	0.000	0.213	0.519	0.364	[0.48]	0.68
	[0.10]	[0.42]	[0.10]	[0.05]	[0.05]		
Czech Republic	1.052	0.002	1.046	0.284	0.901	[0.15]	0.64
	[0.10]	[0.18]	[0.01]	[0.01]	[0.01]		
Denmark	-0.204	0.005	0.302	0.194	0.825	[0.38]	0.77
	[0.34]	[0.20]	[0.01]	[0.05]	[0.00]		
Eurozone	3.084	0.010	2.137	1.005	0.899	[0.27]	0.78
	[0.01]	[0.10]	[0.01]	[0.01]	[0.00]		
Hungary	1.016	0.000	1.146	0.362	0.835	[0.20]	0.69
	[0.10]	[0.10]	[0.01]	[0.01]	[0.01]		

Iceland	-0.784	0.003	0.337	0.260	0.801	[0.55]	0.82
	[0.29]	[0.10]	[0.01]	[0.04]	[0.00]		
Israel	0.015	0.006	0.314	0.050	0.838	[0.62]	0.83
	[0.30]	[0.00]	[0.01]	[0.10]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Japan	0.035	0.007	0.426	0.010	0.918	[0.69]	0.63
	[0.41]	[0.09]	[0.05]	[0.41]	[0.00]		
Kuwait	1.275	0.000	0.031	0.227	0.630	[0.46]	0.53
	[0.09]	[0.45]	[0.41]	[0.05]	[0.00]		
New Zealand	-0.023	0.008	1.114	0.104	0.856	[0.67]	0.79
	[0.63]	[0.09]	[0.01]	[0.05]	[0.00]		
Norway	0.835	0.000	0.229	0.137	0.714	[0.53]	0.72
	[0.05]	[0.14]	[0.01]	[0.05]	[0.00]		
Oman	0.635	0.000	0.022	0.287	0.612	[0.46]	0.51
	[0.26]	[0.49]	[0.39]	[0.04]	[0.01]		
Poland	0.856	0.000	1.358	0.730	0.916	[0.17]	0.65
	[0.19]	[0.28]	[0.01]	[0.09]	[0.01]		
Qatar	0.712	0.000	0.031	0.335	0.684	[0.55]	0.62
	[0.19]	[0.44]	[0.39]	[0.05]	[0.00]		
Russia	0.558	0.000	0.264	0.223	0.902	[0.51]	0.73
	[0.03]	[0.48]	[0.05]	[0.01]	[0.00]		
Saudi Arabia	1.894	0.001	0.023	0.144	0.683	[0.63]	0.81
	[0.03]	[0.54]	[0.46]	[0.02]	[0.00]		
Singapore	-0.286	0.002	0.118	0.337	0.901	[0.58]	0.72
	[0.02]	[0.16]	[0.30]	[0.01]	[0.00]		

South Korea	0.245	0.005	0.051	0.217	0.925	[0.70]	0.78
	[0.10]	[0.19]	[0.39]	[0.04]	[0.00]		
Sweden	-0.314	0.003	0.103	0.078	0.825	[0.55]	0.80
	[0.28]	[0.34]	[0.05]	[0.10]	[0.00]		

TABLE 1 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Switzerland	-0.210	0.004	0.353	0.440	0.916	[0.68]	0.78
	[0.39]	[0.19]	[0.05]	[0.01]	[0.00]		
Taiwan	0.172	0.000	0.094	0.312	0.874	[0.61]	0.60
	[0.04]	[0.55]	[0.10]	[0.03]	[0.00]		
Trinidad & Tobago	1.056	0.000	0.041	0.706	0.652	[0.48]	0.59
	[0.02]	[0.51]	[0.05]	[0.01]	[0.00]		
United Arab Emirates	0.886	0.000	0.031	0.325	0.581	[0.50]	0.52
	[0.14]	[0.53]	[0.41]	[0.04]	[0.00]		
United Kingdom	2.352	0.010	1.487	0.735	0.919	[0.70]	0.73
	[0.10]	[0.05]	[0.01]	[0.01]	[0.00]		
United States	1.003	0.006	1.426	0.443	0.867	[0.68]	0.78
	[0.06]	[0.06]	[0.01]	[0.01]	[0.00]		
Uruguay	0.745	0.000	0.023	0.617	0.490	[0.50]	0.51
	[0.19]	[0.52]	[0.48]	[0.01]	[0.00]		
Venezuela	0.775	0.000	0.158	1.004	0.820	[0.43]	0.47
	[0.19]	[0.58]	[0.46]	[0.01]	[0.00]		

Notes: The estimations are based on errors corrected for heteroskedasticity and serial correlation using the Newey and West (1987) procedure. J-statistic is the minimized value of the objective function that tests the null hypothesis of the over-identification restriction. Figures in parentheses denote p-values.

TABLE 2

Monetary and macroprudential policy model estimates (monetary rules with stock prices): $\Phi_3 = intercept + b_1 \Phi_1 + b_2 \Phi_2 + b_3\, mp + b_4\, target + b_5\, country$

Coefficient	Model 1	Model 2	Model 3
Intercept	6.636	6.215	5.938
	[0.00]	[0.00]	[0.00]
b_1	-0.149	-0.142	-0.136
	[0.00]	[0.00]	[0.00]
b_2	-0.071	-0.064	-0.060
	[0.04]	[0.02]	[0.03]
b_3	-0.553	-0.525	-0.502
	[0.00]	[0.00]	[0.00]
b_4		-0.070	-0.059
		[0.00]	[0.00]
b_5			0.074
			[0.03]
R^2-adjusted	0.42	0.50	0.54
D-W	1.99	1.98	1.98
No. of countries	127	127	127

Notes: D-W is the Durbin-Watson statistic. Figures in brackets denote p-values.

TABLE 3

Monetary and macroprudential policy model estimates (monetary rules with stock prices): $\Phi_3 = intercept + b_1 \Phi_1 + b_2 \Phi_2 + b_3\, mp + b_4\, target + b_5\, country$

Country classification based on the type of macroprudential tool adopted

Coefficient	Lenders	Borrowers	Capital flows
Intercept	2.573	1.218	3.085
	[0.01]	[0.03]	[0.00]
b_1	-0.119	-0.075	-0.107
	[0.00]	[0.01]	[0.00]
b_2	-0.047	-0.029	-0.052
	[0.02]	[0.05]	[0.02]
b_3	-0.328	-0.073	-0.242
	[0.00]	[0.03]	[0.00]
b_4	-0.064	-0.030	-0.047
	[0.01]	[0.04]	[0.02]
b_5	0.052	0.021	0.044
	[0.01]	[0.04]	[0.01]
R^2-adjusted	0.52	0.27	0.45
D-W	1.99	1.96	1.98
No. of countries	60	5	62

Notes: Similar to Table 2.

TABLE 4

Monetary policy and macroprudential policy model estimates (country classifications)

Country classification: Coefficient	***Low Income***	***Lower Middle Income***	***Upper Middle Income***	***High Income***
Intercept	4.149	3.266	5.239	5.705
	[0.00]	[0.01]	[0.00]	[0.00]
b_1	-0.063	-0.089	-0.119	-0.140
	[0.03]	[0.03]	[0.00]	[0.00]
b_2	-0.055	-0.038	-0.052	-0.096
	[0.01]	[0.06]	[0.04]	[0.00]
b_3	-0.692	-0.506	-0.396	-0.285
	[0.00]	[0.00]	[0.00]	[0.01]
b_4	-0.097	-0.074	-0.079	-0.056
	[0.00]	[0.00]	[0.00]	[0.01]
R^2-adjusted	0.41	0.38	0.56	0.60
D-W	1.94	1.96	1.96	1.99
No. of countries	19	30	42	36

Notes: Similar to those in Table 1.

TABLE 5

Forward-looking Taylor rule estimates (with house prices)

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Low Income Countries							
Haiti	0.251	0.047	1.118	0.024	0.574	[0.39]	0.67
	[0.18]	[0.01]	[0.02]	[0.00]	[0.00]		
Rwanda	0.368	0.019	0.961	0.245	0.629	[0.53]	0.69
	[0.09]	[0.05]	[0.00]	[0.00]	[0.00]		
Tanzania	0.526	0.022	0.138	0.594	0.719	[0.55]	0.87
	[0.14]	[0.04]	[0.10]	[0.00]	[0.00]		
Zimbabwe	0.316	0.028	0.037	0.442	0.737	[0.60]	0.71
	[0.33]	[0.03]	[0.06]	[0.02]	[0.00]		
Lower Middle Income Countries							
Armenia	0.406	0.028	1.175	0.063	0.885	[0.68]	0.85
	[0.35]	[0.01]	[0.00]	[0.05]	[0.00]		
Egypt	0.194	0.027	0.068	0.015	0.647	[0.64]	0.88
	[0.05]	[0.05]	[0.05]	[0.13]	[0.01]		
El Salvador	0.493	0.036	0.439	0.029	0.711	[0.53]	0.86
	[0.18]	[0.03]	[0.05]	[0.15]	[0.00]		
Georgia	0.385	0.038	0.074	0.692	0.883	[0.66]	0.87
	[0.39]	[0.05]	[0.05]	[0.00]	[0.00]		
Ghana	0.683	0.024	0.736	0.677	0.825	[0.31]	0.90
	[0.10]	[0.09]	[0.00]	[0.02]	[0.00]		

India	0.396	0.048	0.162	0.502	0.903	[0.50]	0.89
	[0.37]	[0.01]	[0.02]	[0.00]	[0.00]		
Indonesia	0.734	0.042	0.486	0.062	0.925	[0.68]	0.85
	[0.04]	[0.03]	[0.01]	[0.15]	[0.00]		
Morocco	0.392	0.041	0.916	0.069	0.920	[0.52]	0.87
	[0.32]	[0.05]	[0.01]	[0.02]	[0.00]		

TABLE 5 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Nicaragua	0.338	0.049	0.582	0.019	0.711	[0.51]	0.83
	[0.35]	[0.01]	[0.02]	[0.14]	[0.00]		
Nigeria	2.364	0.035	0.774	0.056	0.824	[0.25]	0.78
	[0.01]	[0.04]	[0.01]	[0.18]	[0.00]		
Pakistan	1.952	0.051	0.416	0.604	0.928	[0.65]	0.88
	[0.19]	[0.01]	[0.01]	[0.00]	[0.00]		
Philippines	0.426	0.058	1.185	0.053	0.904	[0.70]	0.84
	[0.29]	[0.05]	[0.00]	[0.11]	[0.00]		
Ukraine	0.684	0.064	0.512	0.053	0.816	[0.64]	0.70
	[0.20]	[0.00]	[0.02]	[0.11]	[0.00]		
Uzbekistan	0.489	0.033	0.314	0.062	0.726	[0.51]	0.68
	[0.28]	[0.06]	[0.05]	[0.14]	[0.00]		
Vietnam	2.894	0.004	0.073	0.652	0.925	[0.58]	0.83
	[0.06]	[0.38]	[0.19]	[0.01]	[0.00]		
Upper Middle Income Countries							
Albania	0.239	0.058	0.592	0.037	0.685	[0.52]	0.69
	[0.44]	[0.01]	[0.01]	[0.26]	[0.00]		
Belarus	0.518	0.038	0.034	0.405	0.652	[0.54]	0.58
	[0.27]	[0.05]	[0.30]	[0.04]	[0.00]		
Brazil	-3.429	0.074	0.126	0.749	0.715	[0.69]	0.66
	[0.21]	[0.00]	[0.06]	[0.00]	[0.00]		

Bulgaria	-0.106	0.029	0.149	0.346	0.406	[0.46]	0.53
	[0.23]	[0.05]	[0.03]	[0.05]	[0.01]		
China	1.458	0.079	2.457	0.784	0.816	[0.61]	0.85
	[0.08]	[0.00]	[0.00]	[0.05]	[0.00]		
Colombia	0.542	0.019	0.355	0.184	0.325	[0.47]	0.57
	[0.28]	[0.18]	[0.05]	[0.09]	[0.05]		

TABLE 5 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Jamaica	1.262	0.025	0.171	0.804	0.813	[0.62]	0.38
	[0.31]	[0.10]	[0.10]	[0.01]	[0.00]		
Jordan	0.147	0.021	0.825	0.699	0.924	[0.58]	0.87
	[0.30]	[0.09]	[0.00]	[0.01]	[0.00]		
Kazakhstan	0.341	0.033	0.294	0.528	0.931	[0.73]	0.89
	[0.29]	[0.05]	[0.05]	[0.00]	[0.00]		
Malaysia	-0.057	0.048	0.106	0.315	0.820	[0.51]	0.90
	[0.28]	[0.01]	[0.28]	[0.02]	[0.00]		
Mexico	0.384	0.056	1.175	0.293	0.919	[0.49]	0.80
	[0.22]	[0.00]	[0.00]	[0.13]	[0.00]		
Paraguay	0.547	0.024	0.511	0.583	0.725	[0.68]	0.78
	[0.28]	[0.06]	[0.01]	[0.01]	[0.00]		
Peru	0.736	0.028	0.614	0.208	0.773	[0.70]	0.89
	[0.20]	[0.06]	[0.00]	[0.05]	[0.00]		
Romania	1.135	0.048	0.837	0.624	0.825	[0.21]	0.79
	[0.14]	[0.01]	[0.01]	[0.01]	[0.01]		
South Africa	0.128	0.073	0.039	0.395	0.814	[0.48]	0.91
	[0.23]	[0.00]	[0.31]	[0.01]	[0.00]		
Thailand	0.240	0.039	0.266	0.027	0.725	[0.51]	0.90
	[0.20]	[0.05]	[0.01]	[0.41]	[0.00]		
Tunisia	0.144	0.041	0.135	0.084	0.903	[0.55]	0.93

	[0.22]	[0.05]	[0.01]	[0.07]	[0.00]		
Turkey	-0.935	0.066	0.084	0.264	0.914	[0.60]	0.90
	[0.27]	[0.01]	[0.15]	[0.03]	[0.00]		
High Income Countries							
Argentina	2.258	0.042	0.711	0.324	0.715	[0.62]	0.53
	[0.19]	[0.05]	[0.01]	[0.08]	[0.01]		

TABLE 5 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Australia	-0.248	0.104	0.436	0.477	0.606	[0.61]	0.90
	[0.21]	[0.00]	[0.01]	[0.12]	[0.00]		
Bahamas	0.935	0.019	0.058	0.496	0.624	[0.40]	0.61
	[0.16]	[0.08]	[0.20]	[0.01]	[0.00]		
Bahrain	0.744	0.045	0.035	0.382	0.526	[0.53]	0.78
	[0.18]	[0.01]	[0.27]	[0.02]	[0.01]		
Canada	-0.239	0.040	0.094	0.382	0.910	[0.70]	0.91
	[0.23]	[0.00]	[0.14]	[0.00]	[0.00]		
Chile	-2.341	0.019	0.584	0.340	0.613	[0.59]	0.52
	[0.23]	[0.07]	[0.00]	[0.05]	[0.01]		
Croatia	1.481	0.039	0.258	0.602	0.415	[0.42]	0.83
	[0.10]	[0.10]	[0.05]	[0.01]	[0.02]		
Czech Republic	1.026	0.020	1.113	0.349	0.911	[0.15]	0.79
	[0.11]	[0.05]	[0.01]	[0.01]	[0.01]		
Denmark	-0.192	0.036	0.307	0.385	0.886	[0.41]	0.92
	[0.24]	[0.04]	[0.02]	[0.01]	[0.00]		
Eurozone	2.938	0.051	2.162	0.914	0.904	[0.24]	0.89
	[0.00]	[0.01]	[0.00]	[0.01]	[0.00]		
Hungary	0.918	0.017	1.201	0.428	0.912	[0.21]	0.85
	[0.19]	[0.06]	[0.01]	[0.00]	[0.00]		
Iceland	-0.725	0.023	0.325	0.439	0.835	[0.48]	0.92

	[0.20]	[0.06]	[0.03]	[0.01]	[0.00]		
Israel	0.058	0.039	0.358	0.105	0.864	[0.60]	0.92
	[0.31]	[0.05]	[0.01]	[0.07]	[0.00]		
Japan	0.061	0.043	0.336	0.074	0.918	[0.69]	0.81
	[0.24]	[0.01]	[0.07]	[0.10]	[0.00]		

TABLE 5 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
Kuwait	1.261	0.018	0.031	0.204	0.691	[0.44]	0.68
	[0.10]	[0.13]	[0.35]	[0.02]	[0.00]		
New Zealand	-0.021	0.062	1.214	0.105	0.911	[0.69]	0.91
	[0.45]	[0.00]	[0.00]	[0.05]	[0.00]		
Norway	0.685	0.016	0.237	0.266	0.788	[0.50]	0.86
	[0.29]	[0.05]	[0.03]	[0.02]	[0.00]		
Poland	0.756	0.020	1.647	0.813	0.918	[0.16]	0.82
	[0.19]	[0.05]	[0.01]	[0.04]	[0.01]		
Qatar	0.584	0.016	0.031	0.411	0.782	[0.47]	0.79
	[0.22]	[0.18]	[0.29]	[0.02]	[0.00]		
Russia	0.525	0.046	0.259	0.291	0.913	[0.50]	0.86
	[0.03]	[0.05]	[0.05]	[0.00]	[0.00]		
Saudi Arabia	1.762	0.010	0.035	0.194	0.748	[0.61]	0.90
	[0.03]	[0.13]	[0.31]	[0.01]	[0.00]		
Singapore	-0.295	0.037	0.165	0.402	0.937	[0.53]	0.86
	[0.02]	[0.02]	[0.12]	[0.01]	[0.00]		
South Korea	0.238	0.048	0.082	0.385	0.947	[0.72]	0.91
	[0.14]	[0.01]	[0.13]	[0.01]	[0.00]		
Sweden	-0.312	0.037	0.125	0.186	0.893	[0.55]	0.90
	[0.22]	[0.05]	[0.05]	[0.05]	[0.00]		
Switzerland	-0.213	0.052	0.406	0.485	0.971	[0.69]	0.92

	[0.31]	[0.00]	[0.02]	[0.01]	[0.00]		
Taiwan	0.158	0.038	0.142	0.402	0.925	[0.63]	0.89
	[0.07]	[0.05]	[0.05]	[0.00]	[0.00]		
United Kingdom	2.261	0.074	1.613	0.791	0.965	[0.72]	0.94
	[0.11]	[0.00]	[0.00]	[0.00]	[0.00]		

TABLE 5 *Continued*

Country	Φ_0	Φ_3	Φ_1	Φ_2	ρ	J	$\bar{R}^2$
United States	1.115	0.057	1.436	0.482	0.924	[0.58]	0.94
	[0.03]	[0.00]	[0.00]	[0.01]	[0.00]		
Uruguay	0.645	0.008	0.063	0.678	0.563	[0.54]	0.60
	[0.20]	[0.27]	[0.10]	[0.00]	[0.00]		
Venezuela	0.684	0.016	0.252	1.172	0.874	[0.44]	0.59
	[0.21]	[0.10]	[0.13]	[0.00]	[0.00]		

Notes: Similar to Table 1.

TABLE 6

Monetary policy and macroprudential policy model estimates (monetary rules with house prices):

$$\Phi_3 = intercept + b_1 \Phi_1 + b_2 \Phi_2 + b_3\, mp + b_4\, target + b_5\, country$$

Coefficient	Model 1	Model 2	Model 3
Intercept	6.328	6.214	6.075
	[0.00]	[0.00]	[0.00]
b_1	-0.138	-0.133	-0.131
	[0.00]	[0.00]	[0.00]
b_2	-0.069	-0.064	-0.060
	[0.04]	[0.04]	[0.05]
b_3	-0.606	-0.571	-0.544
	[0.00]	[0.00]	[0.00]
b_4		-0.089	-0.077
		[0.00]	[0.00]
b_5			0.091
			[0.00]
R^2-adjusted	0.47	0.55	0.60
D-W	1.99	1.98	1.97
No. of countries	67	67	67

Notes: Similar to those in Table 2.