How do Central Banks React to Wealth Composition and Asset Prices?

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Outline

1 Motivation
2 Literature
3 Methodology
4 Does the Monetary Authority React to Wealth Composition?
5 Does the Monetary Authority React to Asset Prices?
6 Conclusion
Motivation

Recent developments in asset markets have renewed the interest of academics, central bankers and governments on the role that fiscal and/or monetary policy decisions can play in order to prevent and minimize the (negative) consequences of financial turmoils.
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Therefore, understanding the dynamics of financial and housing markets and how economic policies can affect them is of crucial importance.
Motivation

- Recent developments in asset markets have renewed the interest of academics, central bankers and governments on the role that fiscal and/or monetary policy decisions can play in order to prevent and minimize the (negative) consequences of financial turmoils.

- Therefore, understanding the dynamics of financial and housing markets and how economic policies can affect them is of crucial importance.

- However, the literature has neglected the impact that monetary policy decisions may have on financial and housing wealth, through the so called "wealth effects".
The present work looks at the relationship between monetary policy and asset wealth.
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We compare the formulation of the monetary policy in the context of "quantity" effects (i.e. central bank’s response to financial and housing wealth) and "price" effects (i.e. central bank’s reaction to stock and housing prices), using quarterly data for the Euro Area, the US and the UK.
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We start by estimating the monetary policy reaction function using a fully simultaneous system approach in a Bayesian framework, therefore, allowing for simultaneity between the monetary aggregate and the interest rate.
Next, we assess the existence of nonlinearities in the monetary policy reaction function using a **smooth transition regression (STR)** model.
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However, this may not always be the case and central banks can have asymmetric preferences.

Allow for a nonlinear monetary policy reaction function (Martin & Milas, 2004; Petersen, 2007; Surico, 2007a, b; Castro, 2010b).
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Different versions of the reaction function:

- current situation regarding inflation and the business cycle (Taylor, 1993);
- a lagged interest rate term - policy inertia or interest rate smoothing (Woodford, 1999), data uncertainty (Orphanides, 1998), or a misspecification (Rudebusch, 2002);
- features of forward-looking behavior - inflation targeting (Clarida et al., 1998) or real-time data in the information set of the monetary authority (Orphanides, 2001);
- exchange rate deviations from average (Chadha et al., 2004);
- money supply - good instrument to predict inflation (Surico, 2007b).
Monetary policy and stock prices:

- **Cecchetti et al. (2000) and Chadha et al. (2004)**: evidence suggesting that central banks target asset prices.

- **Bernanke and Gertler (2001) and Bullard and Schaling (2002)**: central banks should act only if asset prices are expected to affect inflation forecasts or after the burst of a financial bubble (to avoid damages in the real economy).
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- **Monetary policy and housing prices:**
  - Aoki et al. (2004): transmission mechanism to consumption.
  - Chirinko et al. (2008): the role of housing shocks vis-a-vis equity shocks in the formulation of monetary policy.
  - Iacoviello and Neri (2010): residential investment and housing prices are sensitive to monetary policy; wealth effects from housing on consumption are positive and significant.
Monetary policy and financial stability:

- Drifill et al. (2006): evidence supporting the inclusion of futures prices.
- Castro (2010b): ECB targets financial conditions.
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Monetary policy rules and wealth:

- Christiano et al. (1996): monetary contractions lead to an increase of the net funds raised by non-financial corporations.
- Sousa (2010b, 2010c): a monetary contraction generates a negative wealth effect: quick adjustment in financial wealth and gradual, persistent response by housing wealth.
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Monetary policy rules in multivariate time-series models:

- **Sims & Zha (1999, 2006a, 2006b); Leeper & Zha (2003).**
Money policy rules under a nonlinear framework:

- Nonlinear macroeconomic models (Dolado et al., 2005), or asymmetric central bank preferences (Nobay and Peel, 2003; Surico, 2007a), or both (Surico, 2007b).
- Martin and Milas (2004): BoE tries to keep inflation within a range rather than pursuing a point target (STR model).
- Taylor and Davradakis (2006): nonlinearity is important (threshold autoregressive model).
- Surico (2007b): output contractions imply larger ECB responses than output expansions (linear GMM model).
- Castro (2010b): evidence of central banks' asymmetric response with regards to developments in inflation (forward-looking STR model): nonlinearities for ECB and BoE.
While assessing the linkages between monetary policy and asset markets, we improve and extend the existing literature in several directions:

1. We distinguish between the linear response of monetary policy to wealth composition (that is, the reaction to financial and housing wealth, which captures the "quantity" effects) and asset prices (that is, the adjustment to stock and housing prices, which tracks the "price" effects).
2. We explore the presence of nonlinearities in the monetary policy, while controlling for the possibility that central banks react differently to wealth composition and asset prices and conditioning the effect on the "state" of the inflation rate.
3. We compare the empirical evidence for the Euro Area, the US, and the UK.
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I. Linear Approach: The Fully Simultaneous System

Structural VAR (\textbf{S-VAR}):

\[
\begin{align*}
\left( \begin{array}{c}
\Gamma(L) X_t \\
\end{array} \right) & = \left( \begin{array}{c}
\Gamma_0 X_t + \Gamma_1 X_{t-1} + \ldots \\
\end{array} \right) = c + \varepsilon_t \\
\end{align*}
\]

where the fundamental economic shocks $\varepsilon_t \sim N(0, \Lambda)$.

The \textit{“reduced form”}:

\[
\begin{align*}
\Gamma_0^{-1} \Gamma(L) X_t & = B(L) X_t = a + \nu_t \sim N(0, \Sigma) \\
\end{align*}
\]

where $\nu_t \sim N(0, \Sigma)$; $\Sigma = \Gamma_0^{-1} \Lambda (\Gamma_0^{-1})'$; and $\nu_t = \Gamma_0^{-1} \varepsilon_t$. 

\[ \]
The economy is divided into three sectors:

1. **Financial sector** – reacts contemporaneously to all new information; proxied by commodity prices index ($cp$).

2. **Monetary sector** – allows for simultaneous effects and comprises: “money demand” that links money reserves ($m$), with the short term interest rate ($i$), GDP ($y$), and the GDP deflator ($p$); and “money supply”, where monetary policy is assumed to react only to money reserves and interest rate.

3. **Production sector** – consists of log real GDP ($y$), unemployment rate ($u$), and the GDP deflator ($p$).
To estimate the monetary policy rule, we consider several specifications, by linking the interest rate \( (i) \) with:

- money reserves (Leeper & Zha, 2003);
- money reserves, aggregate wealth (Sousa, 2010c);
- money reserves, financial wealth (Sousa, 2010b);
- money reserves, financial wealth, housing wealth;
- money reserves, commodity prices (Sims & Zha, 2006);
- money reserves, aggregate wealth, commodity prices;
- money reserves, exchange rate (Lubik & Schorfheide, 2007);
- money reserves, aggregate wealth, commodity prices.
The fully simultaneous identification ⇒ estimates of $\Gamma_0$ obtained by **numerical maximization of the integrated likelihood**.

The confidence bands for the impulse-response functions constructed by drawing jointly from the posterior distribution of $B(L)$ and $\Gamma_0$.

Take draws for $\Gamma_0$ using an **importance sampling approach**, that combines the posterior distribution with the asymptotic distribution of $\Gamma_0$, and drawing $B(L)$ from its posterior distribution conditional on $\Gamma_0$.

**Confidence bands are then constructed from the weighted percentiles of the impulse-response functions.**
II. Nonlinear Approach: Smooth Transition Regression Model

- Inflation and the output gap tend to show an asymmetric adjustment to the business cycle (Hamilton, 1989).

- Central banks can have asymmetric preferences (Nobay and Peel, 2003; Surico, 2007a).
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- A nonlinear monetary rule might be more appropriate.

- **Smooth transition regression (STR) model**: smooth endogenous regime switches.
Standard STR model for a nonlinear monetary rule:

\[ i_t = \psi' z_t + \omega' z_t G(\eta, c, s_t) + \varepsilon_t, \quad t = 1, \ldots, T \]  

(3)

\( z_t \): vector of explanatory variables; \( \psi \) (linear) and \( \omega \) (nonlinear) parameter vectors; \( \eta \) smoothness of regime transition.
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Monotonic transition function (LSTR1):

\[ G(\eta, c, s_t) = \left[ 1 + \exp \left\{ -\eta (s_t - c) \right\} \right]^{-1} \quad (4) \]

Point-target? Different reaction when inflation (transition variable, \( s_t = \pi_t \)) is above or below that target (c)?


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Point-target? Different reaction when inflation (transition variable, \(s_t = \pi_t\)) is above or below that target (c)?

**Non-monotonic transition function (LSTR2):**

\[ G(\eta, c, s_t) = [1 + \exp \{-\eta (s_t - c_1) (s_t - c_2)\}]^{-1} \]  \hspace{1cm} (5)

Target-range? Different reaction when \(\pi_t\) is inside or outside \([c_1, c_2]\)?
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Data

- **Variables** in natural logarithms, measured at constant prices:
  - *Monetary policy instrument*: short-term interest rate.
  - *Macroeconomic variables*: real GDP, GDP deflator, producer price index of raw materials, unemp. rate.
  - *Monetary aggregate*: $M_3$ (EA); $M_2$ (US); $M_4$ (UK).
  - *Monetary policy rule*: aggregate wealth;
    - financial market: financial wealth & stock price index;
    - housing market: housing wealth & housing price index;
    - and real effective exchange rate.


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Wealth Composition and Asset Prices?
Linear Evidence (SVAR model): ECB, Fed, BoE

- Monetary aggregate: ECB & Fed respond to increases in money supply with increases in interest rate, but not the BoE.
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- **Monetary aggregate**: ECB & Fed respond to increases in money supply with increases in interest rate, but not the BoE.

- **Aggregate wealth**: ECB & BoE react to increases in aggregate wealth with higher interest rates, but not the Fed.
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- **Monetary aggregate**: ECB & Fed respond to increases in money supply with increases in interest rate, but not the BoE.
- **Aggregate wealth**: ECB & BoE react to increases in aggregate wealth with higher interest rates, but not the Fed.
- **Wealth composition effects**:
  - ECB & Fed’s monetary policy is tightened when financial wealth rises and relaxed when housing wealth increases.
  - BoE reacts to rises in housing wealth and falls in financial wealth with increases in the interest rate.
  - Our results point out to the difficulty of central banks stabilizing both wealth components.
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- **Commodity prices and exchange rate**: Fed & BoE respond actively ($\uparrow cp$, depreciation $er \Rightarrow \uparrow ir$), but not the ECB.

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- The ECB reacts to inflation only when it is above the target of 2.7%; below that target, it only reacts to output gap.
Nonlinear Evidence (STR model): ECB, Fed, BoE

- Threshold variable: Inflation (point target: LSTR1 models)
- The ECB reacts to inflation only when it is above the target of 2.7%; below that target, it only reacts to output gap.
- *Monetary aggregate*: ECB, Fed & BoE react to money supply, especially when inflation is high.
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- Threshold variable: Inflation (point target: LSTR1 models)
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- Monetary aggregate: ECB, Fed & BoE react to money supply, especially when inflation is high.
- Wealth composition effects:
  - ECB reacts linearly to aggregate wealth; BoE reacts when inflation is low (< 4.1%); but not the Fed.
  - ECB reacts to increases in financial \((\uparrow \text{ir})\) and housing \((\downarrow \text{ir})\) wealth when inflation is low.
  - Fed is concerned with housing wealth \((\uparrow \text{ir})\) when inflation is high \((> 3.1\%)\) and with financial wealth when it is low.
  - BoE reacts to increases in financial wealth \((\uparrow \text{ir})\) when inflation is low \((< 4.1\%)\); accommodative to housing effects.
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- Fed & BoE increase the interest rate when housing (stock) prices increase (decrease).
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Central banks may find it quite difficult to simultaneously stabilize stock and housing prices.

Attempts to control the developments in housing prices may disturb the stock prices effects (and vice-versa).
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- Central banks may find it quite difficult to simultaneously stabilize stock and housing prices.

- Attempts to control the developments in housing prices may disturb the stock prices effects (and vice-versa).

- Our evidence also suggests that central banks seem to be more concerned with wealth than price effects.
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- Presence of nonlinearities in the policy reaction function of the ECB, the Fed and the BoE.
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- Presence of nonlinearities in the policy reaction function of the ECB, the Fed and the BoE.

- Insignificant reaction of the ECB to the stock prices, but a negative reaction to housing prices only when inflation is low.
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- Positive linear reaction ($\uparrow ir$) of the Fed to increases in stock prices, but negative reaction ($\downarrow ir$) to increases in housing prices when inflation is low.

- BoE reacts always negatively to increases in housing prices (accommodation of housing demand $\Rightarrow$ boom in the UK market).
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- While the **ECB** and the **Fed** pay a special attention to the dynamics of **financial wealth**, the **BoE** tends to focus on **housing wealth** developments.
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While the ECB and the Fed pay a special attention to the dynamics of financial wealth, the BoE tends to focus on housing wealth developments.

Difficult for central banks to mitigate simultaneously the adverse dynamics in financial and housing markets.
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While the ECB and the Fed pay a special attention to the dynamics of financial wealth, the BoE tends to focus on housing wealth developments.

Difficult for central banks to mitigate simultaneously the adverse dynamics in financial and housing markets.

Smaller concern about asset "price" effects.
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The Fed is responsive to stock (+) and housing prices (-) and to financial wealth (+) when inflation is low.

The nonlinear model also indicates that the BoE tries to accommodate the developments in the housing market.
This **accommodative behaviour**, linked to the goal of stabilizing the demand for housing and mortgages, can lead to a **disruption in financial markets**.
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A de-synchronization of the business cycle and tensions regarding market (un)segmentation may be important consequences of the difficulties found by the monetary authorities in stabilizing unpleasant developments that hit simultaneously the housing and the financial markets. (Blenman, 1991; Rafiq & Mallick, 2008; Mallick & Mohsin, 2010)
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**Issue for further research.**
THE END

Comments are Welcome

Thank you!