Liquidity, Inflation and Asset Prices in a Time-Varying Framework for the Euro Area

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Motivation

• One “pillar” of ECB policy strategy: money aggregates as an indicator of risks to price stability
  – Has been subject to intense criticism
    • Gerlach (2004) and Hofmann (2006): distortions of relationship between money growth and inflation over time
  – ECB: “no mechanical reaction but a comprehensive assessment of the liquidity situation based on information about the balance sheet context as well as the composition of M3 growth”
    • Gerlach (2007) and Fischer, Lenza, Pill and Reichlin (2008): there is a reaction, but also depends on information from the economic analysis
  – Link between excess liquidity and future inflation is probably not constant over time and depends on other factors as well
Motivation

• Monetary analysis could provide early information on emerging financial imbalances (asset price bubbles)
  – Christiano, Motto and Rostagno (2006): theoretical support for correlation between strong credit growth and boom-bust episodes in asset prices
  – Detken and Smets (2004): high-cost booms in asset prices often follow rapid growth in money and credit stocks
  – Also episodes in history where excess money growth is not followed by financial imbalances
  – Growing literature which shows that the impact depends on the underlying state of the economy
    • Asset price boom-busts, financial liberalization, business cycle, …
  – Information of liquidity for asset prices is probably also not constant over time and state dependent
This paper

- Investigates the link between money, economic activity, asset prices and inflation in a time-varying and state dependent framework for the Euro area
  - SVAR to estimate the impact of liquidity shock
    - Benchmark
    - Distinction between the source of increased liquidity (M1, M3-M1 and credit)
  - Time-varying effects of liquidity shocks on the economy
    - A simple sample split (mid-eighties)
    - BVAR with time-varying parameters and stochastic volatility
  - Liquidity shocks and the state of the economy
    - Does the impact depend on the state of the economy (asset price boom-busts, business cycle, credit cycle, monetary policy, …)?
Impact of liquidity shocks

• Benchmark SVAR for the period 1971Q1-2005Q4
  – Real GDP growth, HICP inflation, interest rate, real asset prices growth and money growth (M3)
    • Aggregate asset prices, property prices and equity prices
  – Recursive identification: exogenous shocks to liquidity which are not related to endogenous developments due to business or asset price cycles (“excess liquidity” like money overhang)
Impact of liquidity shocks

• 1% long-run rise in M3
  - Temporary positive effect on real GDP
  - Impact on prices is less than proportional: there is a permanent rise of real money holdings
Impact of liquidity shocks

- 1% long-run rise in M3
  - Significant positive impact on real asset, property and equity prices
Impact of liquidity shocks

- Distinction between shocks to M1, M3-M1 and credit
  - Rise in M1 has a proportional impact on prices and a considerable effect on output (spending indicator)
  - M3-M1 has a much lower effect on output and prices: there is a permanent rise in real money holdings (change in portfolio preferences)
Impact of liquidity shocks

- Distinction between shocks to M1, M3-M1 and credit
  - Impact of shock in counterpart credit is similar as M3, except a stronger effect on output
  - No noticeable differences for impact on real asset prices
Time varying effects of liquidity shocks

- A simple sample split
  - Pre and post 1985

- Bayesian VAR with time-varying parameters and stochastic volatility
  - In the spirit of Cogley and Sargent (2002, 2005), Primiceri (2005), Benati and Mumtaz (2007)
  - Allows for smooth transitions over time and captures possible nonlinearities
  - Volatility of liquidity shocks is allowed to change over time (heteroscedasticity of the shocks)
  - Note: 1971-1978 is used as a training sample to calibrate the priors
Time varying effects of liquidity shocks

• Impact on output is significantly smaller for post 1985 period, but rises again during certain periods.
Time varying effects of liquidity shocks

- (near) proportional impact on prices before early 1980s while more permanent effect on real money holdings afterwards
- But: impact on inflation is also varying over time with noticeable increased impact in more recent period
Time varying effects of liquidity shocks

- Time-variation for asset prices not very clear
Liquidity and the state of the economy

• Growing literature arguing that the impact depends on the underlying state of the economy which can also affect the time-varying results
  – We consider 5 regimes simultaneously

• Single equation approach for output growth, inflation, nominal and real asset price growth

\[
\Delta y_t = \alpha C_t + \sum_{i=1}^{n} \lambda_i \Delta y_{t-i} + \sum_{i=1}^{n} \beta_i \varepsilon_{t-i}^{liq} + u_t
\]

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\Delta y_t = \alpha C_t + \sum_{i=1}^{n} \lambda_i \Delta y_{t-i} + \sum_{i=1}^{n} \beta_i \varepsilon_{t-i}^{liq} + \sum_{j=1}^{k} \sum_{i=1}^{n} \gamma_{j,i,\text{state}_{t-i}} \varepsilon_{t-i}^{liq} + u_t
\]

\[
\Delta y_t = \alpha C_t + \sum_{i=1}^{n} \lambda_i \Delta y_{t-i} + \sum_{i=1}^{n} \beta_i \varepsilon_{t-i}^{liq} + \sum_{j=1}^{k} \sum_{i=1}^{n} \gamma_{j,i,\text{state}_{t-i}} \varepsilon_{t-i}^{liq} + u_t
\]
Liquidity and the state of the economy

- Asset price booms and busts
  - Bank behavior changes in asset price booms
    - Herring and Wachter (2003) and Adrian and Shin (2008)
    - Rising bank capital and stronger balance sheets of banks: more willing to hold loans and possibilities for additional lending
    - Value of collateral on outstanding loans rises, reducing the risk on existing portfolio: more additional lending possible
    - Behavioral characteristics of banking sector (e.g. moral hazard)
  - Self-reinforcing process via the financial accelerator (asset prices as collateral), wealth effects, Tobin’s $q$ channel
  - Empirically confirmed by Adalid and Detken (2007) and Goodhart and Hofmann (2007) in cross section dimension
  - Asset price boom regime: when real aggregate asset price index exceeds its trend by more than 10% for at least three quarters
Liquidity and the state of the economy

- Asset price booms and busts: results
  - Stronger impact on output, inflation and real asset prices
    - Not significant for property prices
  - Also stronger effect on output and real asset prices in a bust
    - Including property prices
  - Economically very relevant!
Liquidity and the state of the economy

• Business cycle
  - Financial accelerator weaker in booms: less external financing, high collateral and cash-flow values
    • Bernanke and Gertler (1989)
    • Weaker effect on economic activity and prices
  - Convex short-run aggregate supply curve
    • Weaker effect on economic activity + stronger effect on prices
  - Peersman and Smets (2002): output effects of monetary policy stronger in recessions
  - Economic boom: when real GDP growth is above its trend for at least three quarters
Liquidity and the state of the economy

• Business cycle
  – Weaker impact on output in economic booms
    • Consistent with financial accelerator (−) and convex supply (−)
  – No asymmetry for inflation and equity prices
    • Financial accelerator (−) and convex supply (+) cancelling each other out?
  – Stronger impact on property prices
    • Dominance of convex supply curve (+) in property market?
  – Economically also very important
Liquidity and the state of the economy

- Financial deregulation and liberalization
  - Safest segment of borrowers shifts away from the banking sector towards the capital and stock markets
  - Strengthens the financial accelerator channel: search for new customers leads banks to smaller and riskier borrowers which increases the importance of collateral
  - Credit boom: minimum three quarters in which money/credit to GDP ratio grows faster than its trend
Liquidity and the state of the economy

• Financial deregulation and liberalization
  – Stronger effect on output and all types of asset prices
  • Inflation depends on the specification
  – Economically very important
Liquidity and the state of the economy

• Inflation regimes
  – Borio and Lowe (2002) and Borio (2006): improved central bank credibility and increased globalization could reduce the impact of liquidity shocks on inflation, which could instead be translated into higher asset prices
  – Goodhart and Hofmann (2007): increased responsiveness of asset prices over time
    • Gerlach (2004) and our results: reduced impact on inflation over time
  – Inflation boom: inflation is at least three quarters higher than its trend value
  – Results
    • No robust asymmetry
Liquidity and the state of the economy

• Monetary policy stance & positive versus negative liquidity shocks
  – Restrictive monetary policy stance implies weak balance sheets of firms and a stronger financial accelerator
    • Balke (2000), Atanasova (2003) and Calza and Sousa (2005): stronger output and inflation effects at times of tight policy
  – Similar reasoning to expect stronger effects of negative liquidity shocks relative to positive liquidity shocks (because liquidity constraints more binding)
    • Convex short-run aggregate supply curve also predicts stronger output effects but a weaker impact on prices
    • Cover (1992): stronger effects of negative money supply shocks
    • Oliner and Rudebush (1995): financial accelerator is stronger after restrictive monetary policy shocks
  – Restrictive monetary policy: when actual interest rate is higher than interest rate obtained from Taylor rule
Liquidity and the state of the economy

- Monetary policy stance & positive versus negative liquidity shocks
  - Restrictive monetary policy stance
    - Somewhat stronger effect on output and asset prices but not robust
    - Weaker impact on inflation but economically relatively small
  - Negative versus positive liquidity shocks
    - Negative shocks have significant stronger effects on output and all types of asset prices
    - Weaker effect on inflation
    - Economically relevant asymmetry
Conclusions

- Economic consequences depend on the source of liquidity shock
  - M1: proportional effect on prices and strong effect reaction
  - M3-M1: much lower impact on output and prices: there is a permanent rise in real money holdings

- Impact is time-varying and depends on state of the economy
  - Stronger effects during asset price booms and busts
  - Weaker impact on output and stronger impact on property prices in economic booms
  - Stronger effect on output and asset prices in credit booms
  - Negative shocks to liquidity have significant stronger effects on output and asset prices while impact on inflation is weaker