

Liquidity Shocks and Asset Price Boom/Bust Cycles

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(usual disclaimer applies)

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Results (1)

- Liquidity shocks during booms provide information on post-boom real growth (after controlling for interest rate based measures of the monetary policy stance, the length and size of booms, housing prices and accounting for endogeneity issues): *Cross-section bust analysis*
- Liquidity shocks contain information on housing price developments especially during asset price boom periods (beyond the usual determinants like income and interest rates and after accounting for endogeneity issues): *Panel boom analysis*

Results (2)

- Methodology to derive measure of liquidity shocks implies referring to concepts of
 - a) accumulating imbalances and
 - b) variation in velocity
- We find results are robust for M3 but not for (private or total) domestic credit

[=> Info content of net external assets important? If yes, measures of global liquidity, which net out NEA, might not be optimal for the analysis of asset price cycles]

Outline of Presentation

1. The literature on liquidity and asset prices.
2. Identification of 42 (aggregate) asset price booms for 18 OECD countries in 1970-2004.
3. VAR based measures of liquidity shocks for money and credit growth.
4. Cross-section bust analysis: role of liquidity shocks (during boom phase) to explain post-boom recessions; use also quantile and robust regressions and IV methods.
5. Panel boom analysis: role of liquidity shocks to explain housing prices in boom phases; compare with overall sample (also to explain CPI inflation). LSDV and GMM.
6. Conclusions

Liquidity and Asset Prices...in General

1. Monetarism (Meltzer, JEconP 1995, Congdon, 2005)
Portfolio real balance effect of other financial intermediaries as reaction to temporary excess liquidity.
2. Agency problems: Bank lending and balance-sheet channels reinforce link between credit/money and asset prices (recently liquidity version of bank lending channel, Diamand and Rajan, AER, 2006).
3. Signalling role in DSGE models, (Christiano, Motto, Rostagno, JMCB, 2003).
4. Leverage targeting behaviour by banks (Adrian and Shin, 2006).

Liquidity and Asset Price...Booms

Liquidity even triggering asset price booms?

1. Austrian over-investment fostered by low interest rates (various BIS publications).
2. Risk-shifting, expectations about future credit (Allen and Gale, EJ, 2000).
3. Behavioural characteristics:
 - Disaster myopia in times of loose credit conditions (Guttentag/Herring, JoF, 1984; Herring/Wachter, 2003)
 - Illiquidity seeking, tail-risk seeking, herding (Rajan, 2006).
4. Learning and risk averse agents (Marcet, Adam, Nicolini, ECB, WP 862, February 2008).

Liquidity and Asset Prices...Empirical Work (1)

- 4 dimensions seemingly important:
 - a) Definition of liquidity (constant vs **variable velocity**; current vs **imbalance measure**)
 - b) General versus specific time periods (single vs **specific or variable regimes**)
 - c) Estimation methods (linear vs **non-linear**; country vs **panel**)
 - d) Type of asset prices (equity vs **housing**)

The more **yellow**, the more likely to find info content of monetary liquidity for asset prices.

Liquidity and Asset Prices... Empirical Work (2)

- For example: two very recent papers:
 - a) “Ensuring Financial Stability: Financial Structures and the Impact of Monetary Policy on Asset Prices, Gerlach and Assenmacher-Wesche, March 2008
 - b) “House Prices, Money, Credit and the Macroeconomy”, Goodhart and Hofmann, ECB WP, No. 888, April 2008

Both use panel VARs including asset prices finding strong effects of money shocks on real residential property prices with different interpretations for leaning against the wind policy: a) uncertainty and size do not recommend it; b) stronger effect of mon pol on housing prices during booms could make it an attractive option.

2. Asset Price Boom Identification and Classification

- An asset price boom is a period in which the aggregate real asset price index is more than 10 percent above its recursively estimated, slow moving trend (quarterly BIS data).
 - aggregate (weighted equity and private and commercial real estate);
 - asset price “gap” (accumulation of imbalances);
 - recursive estimation (HP filter, $\lambda=100000$);

Go to [example](#)

Identified asset price boom episodes

Aggregate asset price booms in selected industrial countries (1970-2004)

High cost			Low cost	
1988Q3-1990Q1 (7)		Australia	1979Q4-1981Q4 (9)	2003Q2- (7)**
1988Q1-1990Q1 (9)		Belgium	1988Q2-1990Q3 (10)	1998Q1-1999Q3 (7)
1988Q2-1990Q1 (8)		Canada		
1989Q3-1990Q3 (5)	1999Q3-2000Q3 (5)	Switzerland	1999Q1-2001Q1 (9)	
1983Q4-1986Q4 (13)		Germany		
1986Q2-1991Q2 (21)		Denmark	1997Q1-2001Q3 (19)	
1980Q1-1989Q3 (39)	1997Q1-2000Q3 (15)	Spain	1998Q1-2001Q2 (14)	
1988Q4-1990Q3 (8)		Finland		
1972Q3-1973Q4 (6)	1985Q4-1990Q1 (18)	France	1999Q1-2001Q2 (10)	
1987Q1-1990Q3 (13)		United Kingdom	1999Q1-2000Q4 (8)	
		Ireland	1977Q4-1979Q3 (8)	1995Q4-2001Q3 (24)
		Italy	1980Q4-1981Q3 (4)	1989Q2-1991Q3 (10)
1973Q1-1973Q4 (4)	1986Q2-1990Q1 (16)	Japan		1999Q1-2001Q2 (10)
1988Q3-1990Q3 (9)	1993Q4-2000Q4 (29)	Netherlands	1976Q3-1978Q2 (8)	
		Norway	1973Q2-1974Q2 (5)	1981Q2-1987Q3 (26)
1983Q3-1984Q2 (4)	1986Q2-1987Q3 (6)	New Zealand	1994Q3-1996Q4 (10)	1996Q4-2001Q2 (19)
1986Q3-1990Q2 (16)		Sweden	1996Q2-2000Q3 (18)	
		United States	1986Q1-1987Q3 (7)	1996Q1-2000Q4 (20)

<i>Number of high-cost booms</i>	20
<i>Total number of quarters</i>	253
<i>Average number of quarters</i>	12.7
<i>Median number of quarters</i>	9

<i>Number of low-cost booms</i>	22
<i>Total number of quarters</i>	262
<i>Average number of quarters</i>	11.9
<i>Median number of quarters</i>	10

*Figures in parentheses refer to the number of quarters of the particular boom.

**For Australia 2004Q4 was identified as a boom quarter.

3. VAR based measures of liquidity shocks

- Attempt to solve endogeneity problem.
- $Y_t = A(L) Y_{t-1} + u_t$ where u_t linear combinations of independently distributed (structural) shocks to Y_t .
- Identify structural shocks by constraints on contemporaneous effects of these shocks.
- We do not claim to identify monetary policy shocks! VARs simply used to define shock component in the sense of “unusual” given the economic environment.
- VAR Cholesky ordering:
 - *CPI, GDP, is, property prices, equity prices, M3 or domestic credit, real effective exchange rate, exogenous: commodity prices in USD.*
- All variables in growth rates (and first difference of ‘is’).
- Lag length Hannan-Quin: 1 or 2 quarters.

4. Cross-section Bust Analysis

Explaining post-boom real GDP growth (average of 8 quarters)

41 boom episodes = n sections; variables defined with respect to (beginning, average, peak, end of) boom

small sample problem: quantile regressions, robust regressions, excluding suspicious boom episodes.

$$y_r (\text{post-boom})_n = \beta_0 + \beta_1 y_r (\text{boom})_n + \beta_2 \text{boom length}_n + \beta_3 rrp_n^i + \beta_4 \Delta \text{Taylor gap}_n^j + \beta_6 \text{cumulated liquidity}_n^l$$

Cumulated liquidity is sum of quarterly shocks starting two years before the boom until peak quarter of boom

Δ Taylor gap either peak to start quarter of boom (“boom”) or last quarter of 2nd post boom year to peak quarter of boom (“post”).

Explaining Post-Boom Recession (also controlling for housing prices)

Table P2: Regressions explaining the average real GDP post-boom growth
 Dependent variable: GDP growth av. post-boom

Equation	a2.5	a4.5	a6.5	a2.9	a4.9	a6.9	a2.14	a4.14	a6.14	a2.18	a4.18	a6.18	a2.23	a2.27
Estimation method	OLS	Rreg	Q(20)	OLS	Rreg	Q(20)	OLS	Rreg	Q(20)	OLS	Rreg	Q(20)	TSL5	TSL5
GDP growth av. boom	0.53*** (0.001)	0.53*** (0.001)	0.40** (0.039)	0.51*** (0.001)	0.50*** (0.003)	0.27 (0.298)	0.51*** (0.003)	0.53*** (0.001)	0.63*** (0.001)	0.49*** (0.004)	0.5 (0.002)	0.58** (0.026)	0.55*** (0.000)	0.54*** (0.000)
Boom length	-0.24** (0.031)	-0.23* (0.060)	-0.22 (0.166)	-0.32** (0.046)	-0.25** (0.043)	-0.33 (0.220)	-0.06 (0.692)	-0.01 (0.931)	0.10 (0.525)	-0.07 (0.641)	-0.03 (0.871)	0.07 (0.719)	-0.28*** (0.004)	-0.34*** (0.004)
Housing growth Post1													0.09* (0.070)	0.11** (0.031)
Housing growth cum							-0.03* (0.067)	-0.04* (0.084)	-0.05** (0.012)	-0.04** (0.027)	-0.04** (0.041)	-0.05* (0.032)		
Money shock cum. F	-0.10** (0.020)	-0.10** (0.046)	-0.12** (0.017)				-0.08** (0.027)	-0.08 (0.139)	-0.10** (0.043)				-0.07** (0.045)	
Priv. Credit shock cum. F				0.00 (0.896)	0.00 (0.986)	-0.07 (0.405)				0.00 (0.939)	0.00 (0.920)	-0.06 (0.416)		-0.01 (0.823)
Adjusted R-sq.	0.39	0.34	-	0.30	0.22	-	0.42	0.37	-	0.37	0.31	-	0.53	0.50
Pseudo R-sq	-	-	0.30	-	-	0.18	-	-	0.38	-	-	0.29	-	-
N. of instruments	-	-	-	-	-	-	-	-	-	-	-	-	5	5

Stars (**, *, *) denote the significance of the t-test at the 1%, 5% and 10% level, respectively. Stars (**, *, *) denote the significance of the t-test at the 1%, 5% and 10% level, respectively. Stars (**, *, *) denote the significance of the t-test at the 1%, 5% and 10% level, respectively.

- Only money contributes significantly; private credit not.
- Coefficients robust (across methods and specifications) and reveal economic significance.
- Housing price growth robust and important (slightly collinear with money)
- Money based liquidity shocks survive adding boom housing price growth and post-boom housing price decline.

Go to Annex [Tables](#)

Explaining Post-Boom Recession (controlling for Taylor Gaps)

Table P3: OLS and TSLS Regressions explaining the average real GDP post-boom growth

Dependent variable: GDP growth av. post-boom

Equation	a3.5	a5.5	a7.5	a3.9	a5.9	a7.9	a3.14	a3.18
Estimation method	OLS	Rreg	Q(20)	OLS	Rreg	Q(20)	TSLS	TSLS
GDP growth av. boom	0.62*** (0.000)	0.63*** (0.000)	0.45** (0.048)	0.61*** (0.000)	0.61*** (0.000)	0.62** (0.014)	0.56*** (0.000)	0.53*** (0.000)
Boom length	-0.22** (0.017)	-0.21 (0.073)	-0.25 (0.102)	-0.29** (0.017)	-0.23* (0.032)	-0.44* (0.057)	-0.18* (0.079)	-0.28* (0.065)
Δ Taylor gap boom	0.11*** (0.005)	0.12** (0.027)	0.04 (0.559)	0.12*** (0.007)	0.13** (0.023)	0.13 (0.136)		
Δ Taylor gap post							-0.12* (0.060)	-0.10* (0.082)
Money shock cum. F	-0.09** (0.019)	-0.09* (0.070)	-0.10* (0.064)				-0.12*** (0.008)	
Priv. Credit shock cum. F				-0.01 (0.890)	-0.01 (0.871)	0.03 (0.800)		-0.01 (0.767)
Adjusted R-sq.	0.45	0.43	-	0.38	0.36	-	0.43	0.33
Pseudo R-sq	-	-	0.32	-	-	0.24	-	-
N. of instruments	-	-	-	-	-	-	6	6

Stars (***, **, *) denote the significance of the t-test at the 1%, 5% and 10% level, respectively.

- Only money not credit shocks significant; robust across methods.
- Money shocks survive Δ Taylor gap-boom and Δ Taylor gap-post-boom.
- Liquidity seems to have role beyond New Keynesian paradigm.

5. Panel Boom Analysis

- Explaining real housing price growth during the boom;
16 boom episodes of minimum length of 3 years = sections;
4 quarters before the boom + boom quarters = time dimension.
- Controls: 6q movav of real GDP growth, change in nominal long term interest rate, six lags of endogenous variable
- Variables of main interest: 6q movav of excessive liquidity growth
- Methods: OLS (pooled), Fixed effects (CS, CS+P, CS+RT), SysGMM (annual)
- Also: overall sample regressions for comparison where $n = 18$ countries and time dimension 1972-2004; and same regressions for consumer price inflation as endogenous variable.

$$rrp_{n,t} = \sum_{a=1}^6 \beta_a rrp_{n,t-a} + \gamma x'_{n,t-1} + \eta_n + \lambda_t + v_{n,t}$$

and $n = 1, \dots, 16$; $t = bq_{-4}, bq_{-3}, \dots, bq_{last}$ or $t =$ calendar quarters

Panel Boom Analysis: Econometric Issues

- GMM methods (Arellano/Bond etc.) designed for micro panels with small T , large N => annual data, otherwise inconsistent.
- LSDV consistent for large T , small N , but biased.
- Bias in LSDV soon acceptable in T and depends positively on degree of unbalancedness.
=> 3 year minimum length

Explaining Real Housing Price Growth Boom versus Overall Sample

Table 1: Panel regressions - Boom episodes

Dependent variable: housing price growth				
Equation	1.1	1.2	1.3	1.4
Estimation method	CS+P	CS+P	CS+RT	CS+RT
@ GDP growth (-1)	0.71 (0.133)	0.6 (0.204)	1.24** (0.035)	1.09* (0.061)
Δlong term interest rate (-1)	-0.43* (0.067)	-0.49** (0.034)	-0.25 (0.310)	-0.27 (0.263)
@ Money shock (-1)	1.16*** (0.009)		1.36*** (0.005)	
@ Priv. Credit shock (-1)		0.65 (0.120)		0.52 (0.218)
Adj. R-squared	0.28	0.27	0.2	0.19
N. of observations	386	386	383	383
Av. N. of periods	24.13	24.13	23.94	23.94
N. of cross sections (boom episodes)	16	16	16	16

6 lags of the dependent variable always included.

Table 2: Panel regressions - Overall

Dependent variable: housing price growth		
Equation	2.1	2.2
Estimation method	CS+P	CS+P
@ GDP growth (-1)	0.91*** (0.000)	0.93*** (0.000)
Δlong term interest rate (-1)	-0.46*** (0.000)	-0.47*** (0.000)
@ Money shock (-1)	0.3* (0.056)	
@ Priv. Credit shock (-1)		0.05 (0.679)
Adj. R-squared	0.34	0.34
N. of observations	2269	2285
Av. N. of periods	126.06	126.94
N. of cross sections (countries)	18	18

8 lags of the dependent variable always included.

- Money based excessive liquidity highly significant and robust; coefficients economically significant; marginal explanatory contribution low, but... (panel, asset price, lagged endogenous).
- Private credit never significant.
- In overall sample liquidity coefficients 4-5 times smaller; fundamentals dominate; no expl. contribution of money anymore.

Explaining Consumer Price Inflation Boom versus Overall Sample

Table 3: Panel regressions - Boom episodes
Dependent variable: consumer price growth

Equation Estimation method	3.1 CS+P	3.2 CS+P	3.3 CS+RT	3.4 CS+RT
@ GDP growth (-1)	0.17* (0.092)	0.17* (0.093)	0.05 (0.617)	0.05 (0.617)
@ Money shock (-1)	0.01 (0.943)		-0.02 (0.866)	
@ Priv. Credit shock (-1)		0.01 (0.950)		0.02 (0.783)
Adj. R-squared	0.61	0.61	0.66	0.66
N. of observations	375	375	372	372
Av. N. of periods	23.44	23.44	23.25	23.25
N. of cross sections (boom episodes)	16	16	16	16

6 lags of the dependent variable always included.

Table 4: Panel regressions - Overall

Equation Estimation method	4.1 CS+P	4.2 CS+P
@ GDP growth (-1)	0.17*** (0.000)	0.19*** (0.000)
@ Money shock (-1)	0.11** (0.034)	
@ Priv. Credit shock (-1)		0.08** (0.028)
Adj. R-squared	0.74	0.74
N. of observations	2259	2275
Av. N. of periods	125.50	126.39
N. of cross sections (countries)	18	18

8 lags of the dependent variable always included.

- Excessive liquidity helps to predict consumer price inflation only for overall sample, not in boom episodes.
- During booms, only own dynamics and @GDP growth (-1) help, although the latter only marginally.

Explaining Real Housing Price Growth (Boom) System GMM

Table 5: Regressions explaining the real housing price growth during boom episodes

Dependent variable: housing price growth (annual frequency)

Equation	5.1	5.2
Estimation method	SysGMM	SysGMM
Housing price growth (-1)	0.43*** (0.000)	0.46*** (0.000)
GDP growth	0.85* (0.080)	1.10** (0.025)
Δlong term interest rate	-0.39 (0.640)	-0.02 (0.983)
Money shock	1.00** (0.028)	
Priv. Credit shock		-0.48 (0.202)
N. of groups	42	42
N. of observations	154	155
Av. N. of periods	3.67	3.69
N. of instruments	69	69
Test of 1st. order serial corr. (p-value)	0.021	0.026
Test of 2st. order serial corr. (p-value)	0.586	0.804
Test of overid. restrictions (p-value)	0.997	0.991

P-values in parentheses, derived from Windmeijer's corrected two-step covariance matrix.

Annual data

Simultaneous variables

42 boom periods

But system GMM results not robust

6. Conclusions

- Pre-boom and boom excessive liquidity (money based) seems responsible for a significant part of the post-boom GDP growth performance...the more...the worse.
- Evidence is consistent with some transmission from excessive liquidity (money based) to residential real estate prices during the boom.
- However, there is additional information content for the boom derailment in excessive liquidity (beyond real estate and interest rates).
- Credit based measures of excessive liquidity do not have the same property as broad money based measures.
- Boom episodes and normal times are very different as to the relative explanatory power of liquidity shocks and other macro variables with respect to consumer and asset price inflation.
- Caveat: Association versus causality issue and econometric identification! Structural models needed (literature progressing). Real-time analysis required to evaluate policy usefulness (ongoing).

End of Presentation

