House Prices, Credit Growth, and Excess Volatility:

Implications for Monetary and Macroprudential Policy

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- Standard macro-modeling approach: House price booms driven by preference shocks. Financial crises caused by "capital quality" shocks. All agents are fully-rational.
- This Paper: DSGE model of housing with excess volatility. Subset of agents employ moving-average forecast rules. Policy experiments:
  - Interest-rate response to house price growth or credit growth.
  - Tightening of lending standards (lower LTV).
  - Weight on wage income in borrowing constraint. (best).

Related literature (partial list)

- Interest rate response to asset prices or credit in RE models
  - Dupor (2005)
  - Gilchrist and Saito (2008)
  - Christiano, Ilut, Motto and Rostagno (2010)
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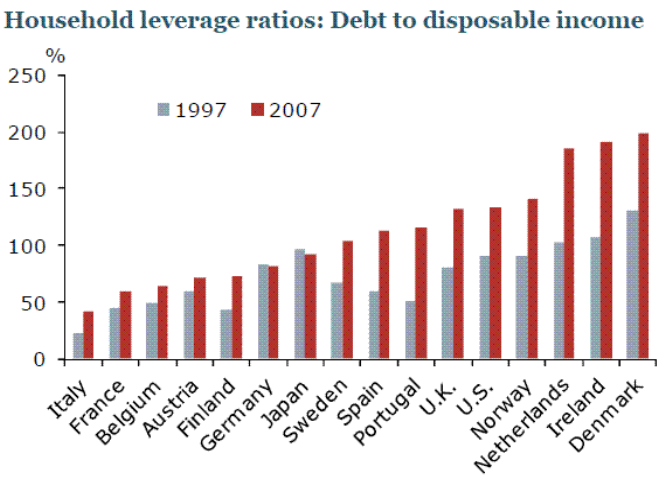
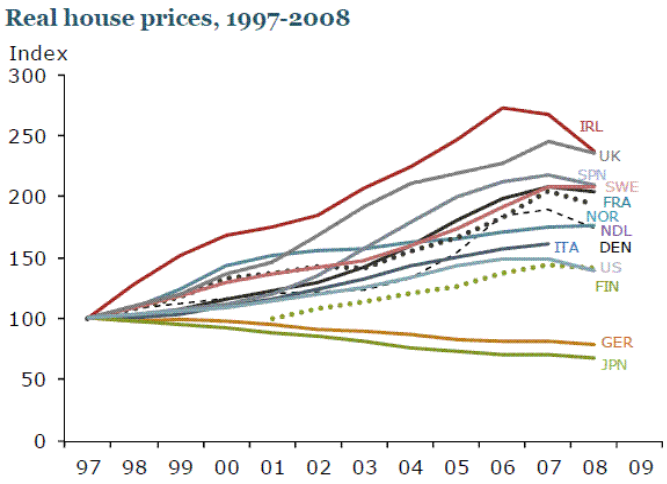
- Countercylical tax on debt in RE Model
  - Bianchi and Mendoza (2010).

Household leverage, house prices, and consumption

From Glick and Lansing (2010), FRBSF Economic Letter 2010-01.





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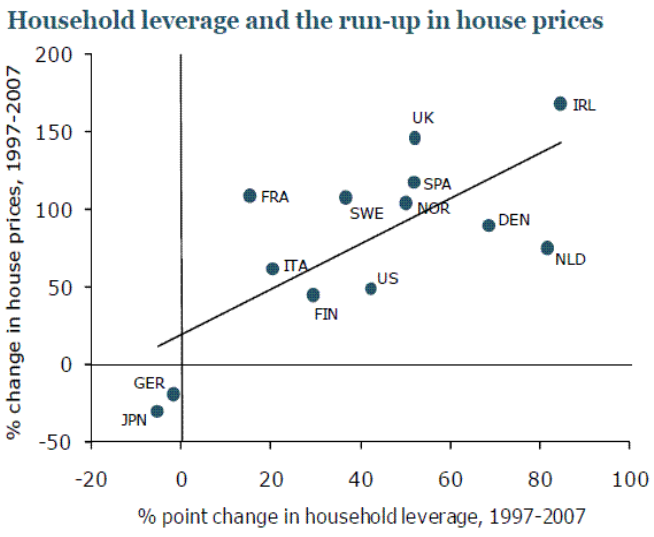
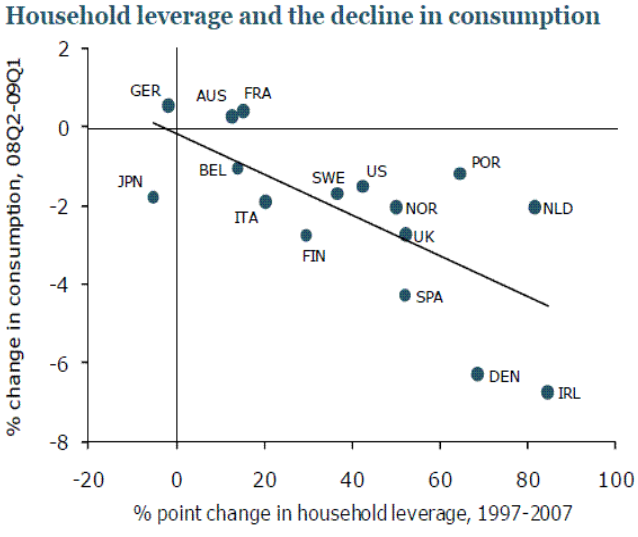
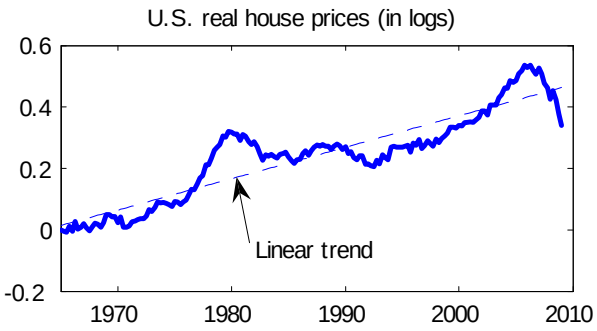
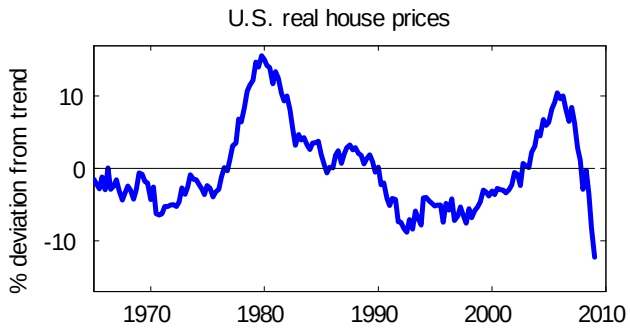


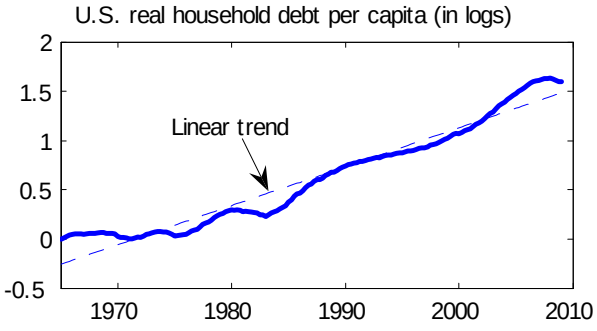


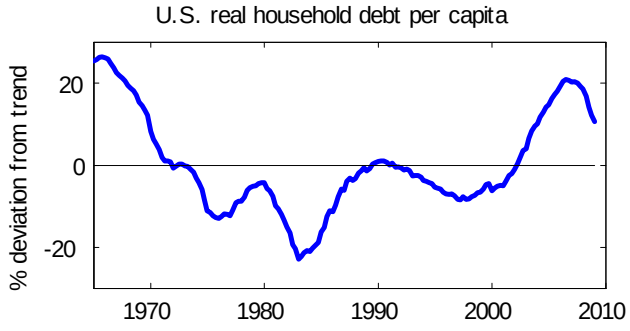
U.S. Housing Boom of the mid-2000s

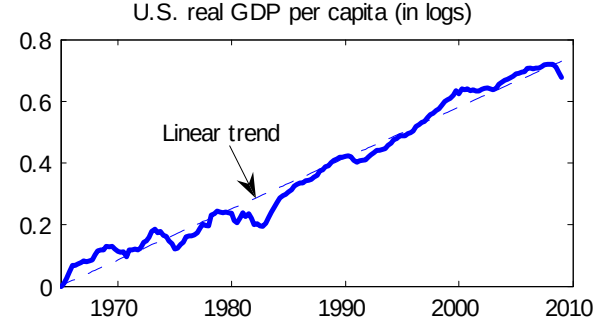
New buyers with access to easy credit helped fuel an excessive run-up in house prices.

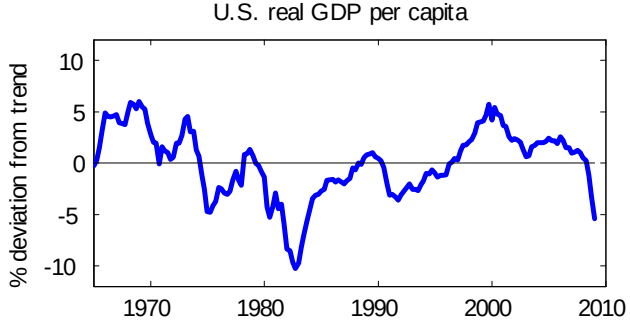






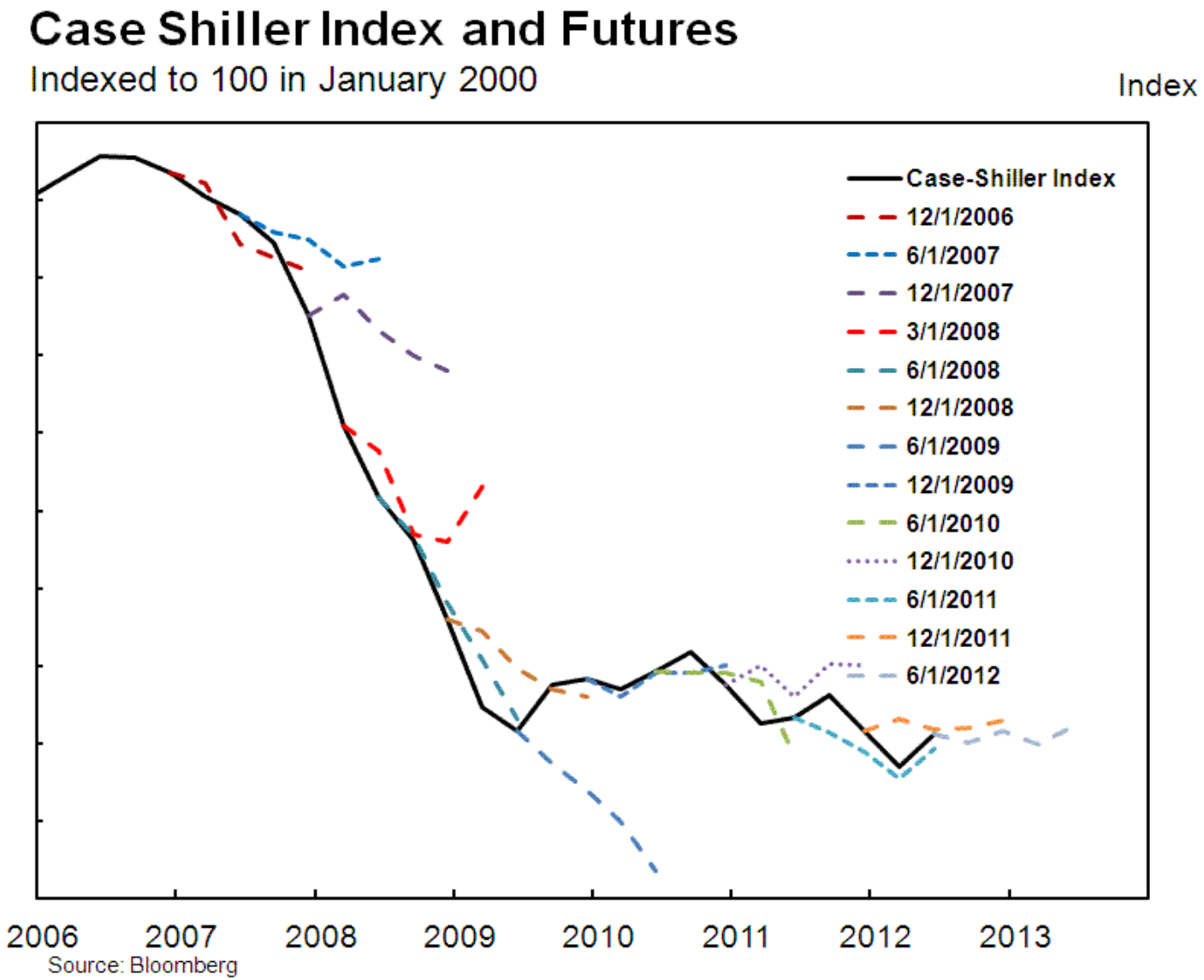






Housing Market Expectations

Futures tend to overpredict prices when prices are falling (moving average forecast rule).



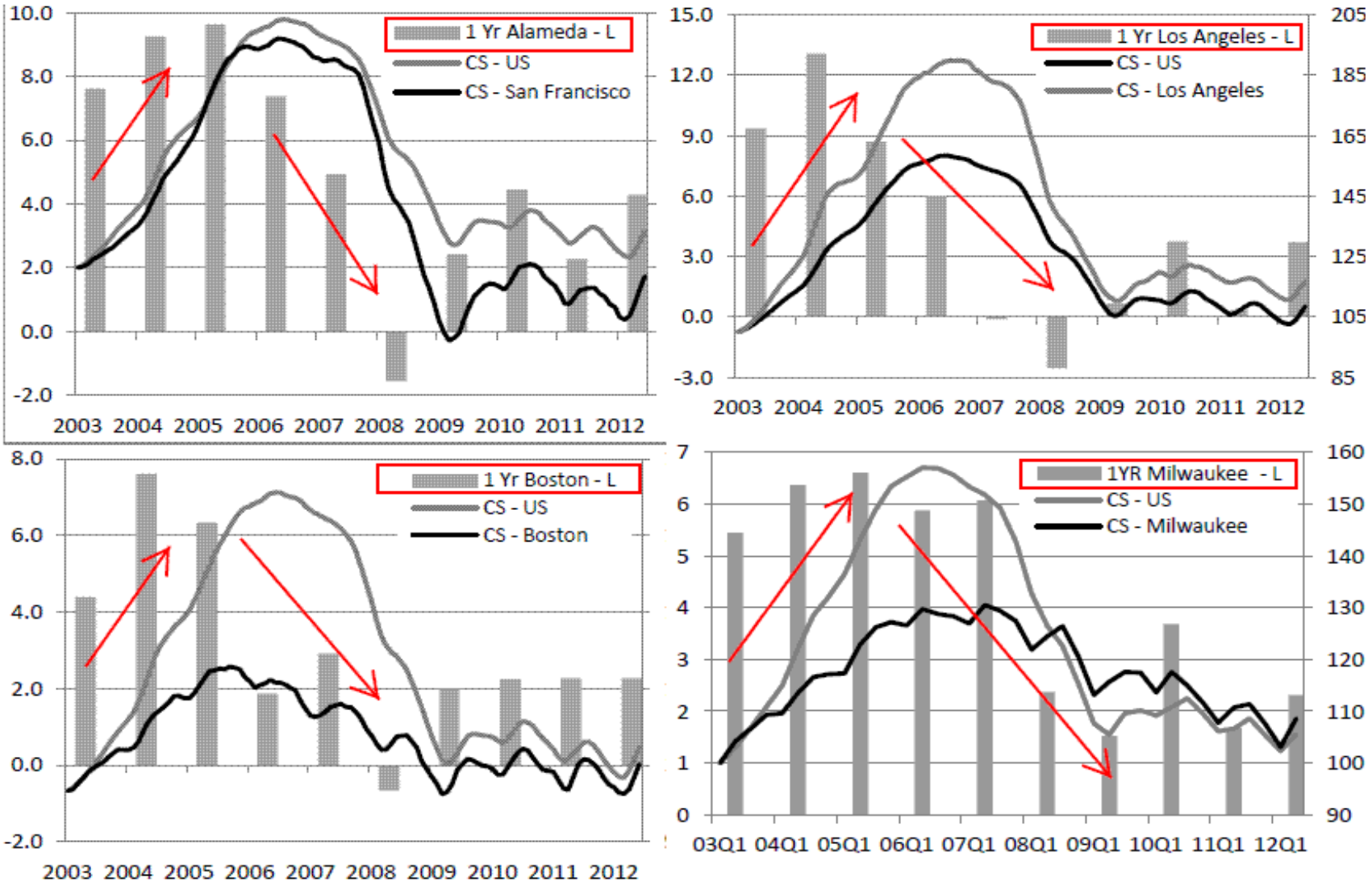
Survey Expectations about U.S. House Prices

Survey expectations track past house price changes.

- Case and Shiller (2003): Surveys in 2002-3. 90% of survey respondents expect house prices to increase over the next several years. Over the next 10 years, respondents expect annual price appreciation in the range of 12 to 16% per year.
- Piazzesi and Schneider (2009): "Starting in 2004, more and more households became optimistic after having watched house prices increase for several years."
- Shiller (2007): Surveys in 2006-7. Places with high recent house price growth exhibited high expectations of future price appreciation, while places with slowing price growth exhibited downward shifts in expected appreciation.
- Case, Shiller and Thompson (2012): Survey in 2008. Respondents in prior boom areas now mostly expect declines in future house prices.

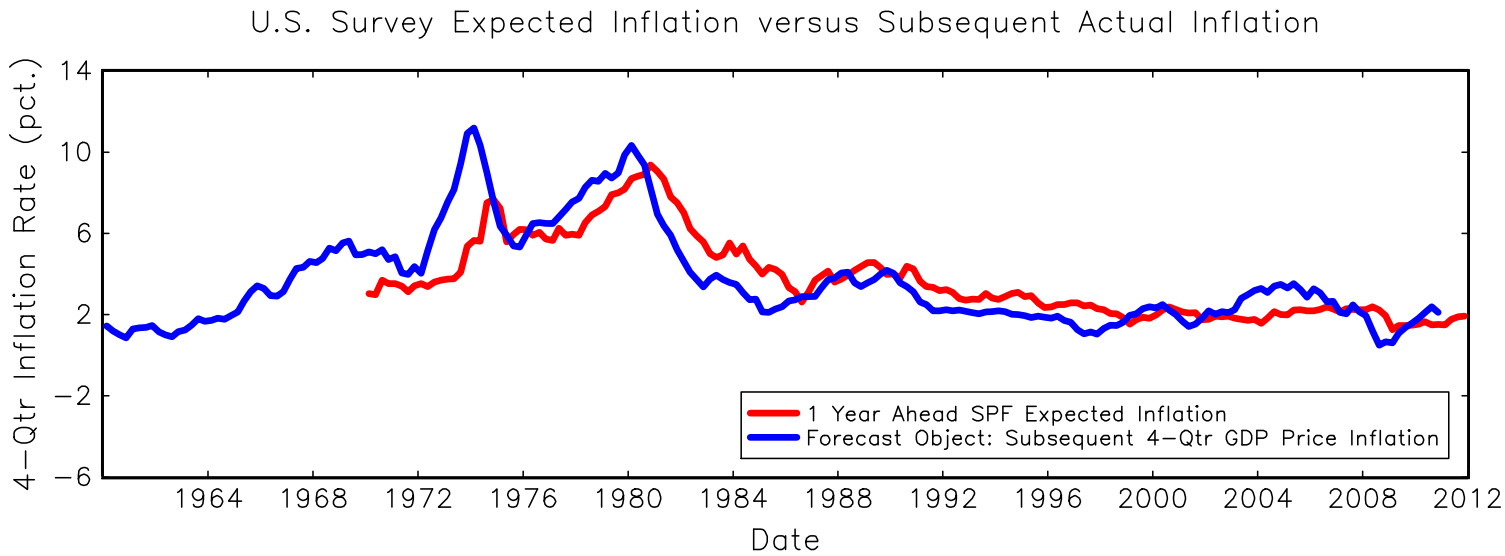
House Prices and Their Expectations in Four Cities

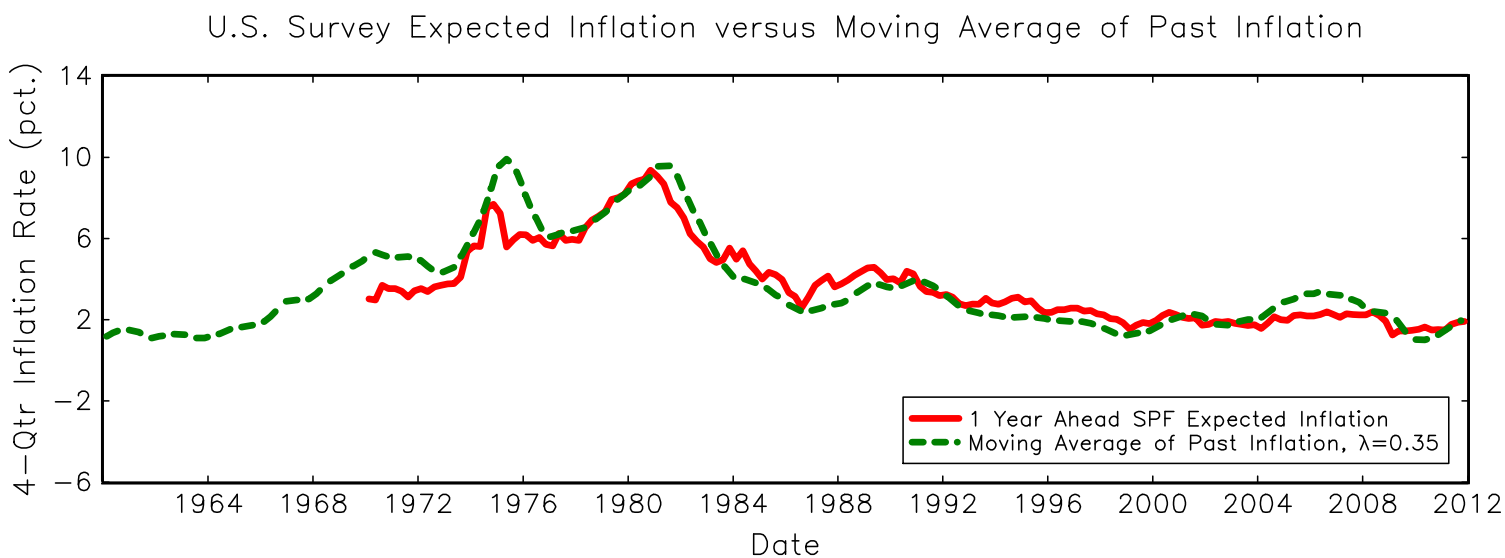
From Case, Shiller, and Thompson (2012), NBER Working Paper 18400.



Survey-Based Inflation Expectations

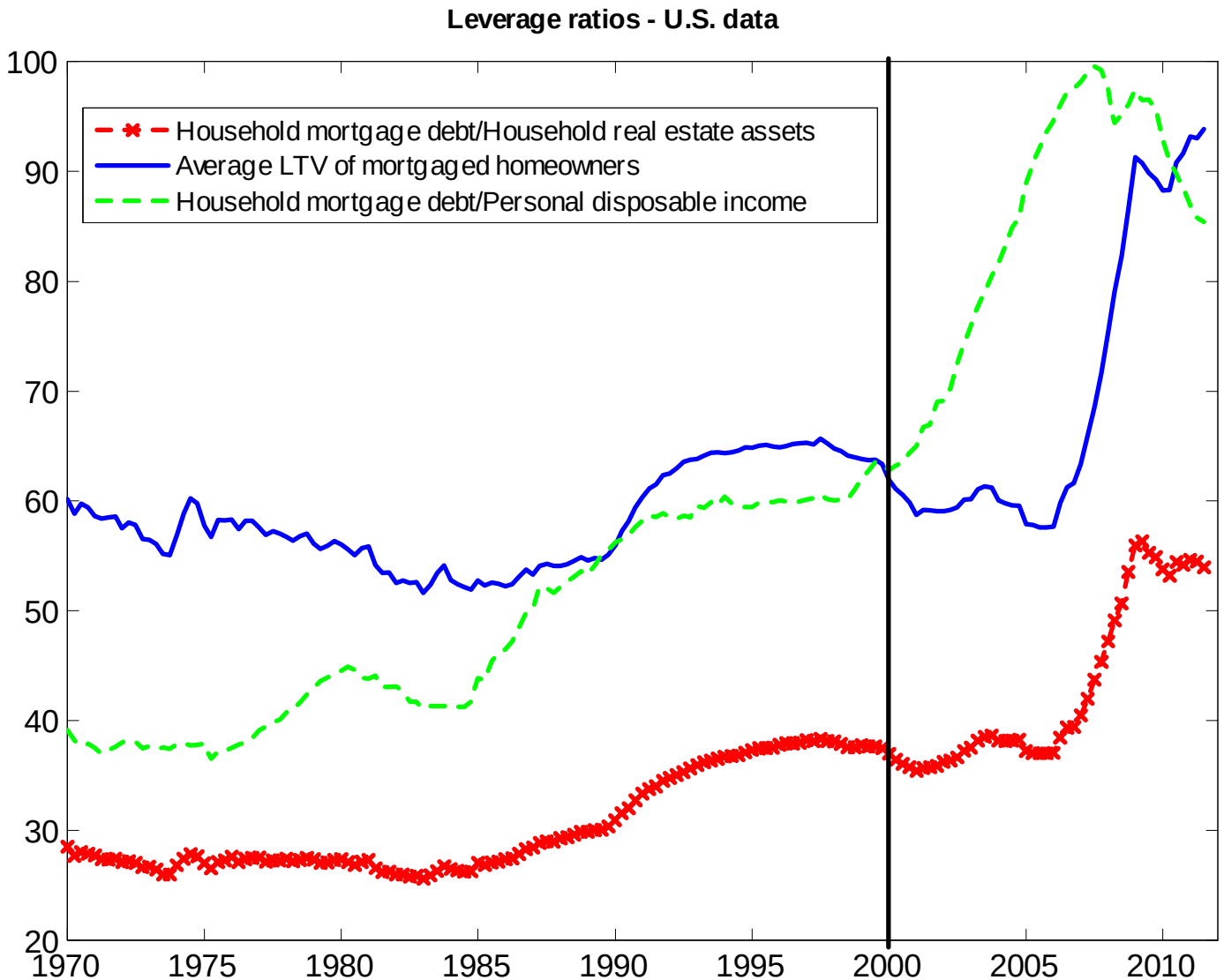
Survey forecasts exhibit 1-sided forecast errors, resemble moving-average of past inflation.





Loan-to-Value (LTV) versus Debt-to-Income (DTI) Ratios

DTI provided a much earlier warning signal of rising household leverage.



"Understanding Household Debt Obligations"

Remarks at Credit Union National Association Governmental Affairs Conference (2004)

"Overall, the household sector seems to be in good shape, and much of the apparent increase in the household sector's debt ratios over the past decade reflects factors that do not suggest increasing household financial stress."

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Fed Chairman Alan Greenspan, February 23, 2004.

Households: Patient-lenders and Impatient-borrowers

Basic setup is similar to Iacoviello (2005, AER).

$$\max \widehat{E}_{1,t} \sum_{t=0}^{\infty} \beta_1^t \left\{ \log\left(c_{1,t} - bc_{1,t-1}\right) + \nu_{1,h} \log\left(h_{1,t}\right) - \nu_{1,L} \frac{L_{1,t}^{1+\varphi_L}}{1+\varphi_L} \right\},$$

$$c_{1,t} + I_t + q_t\left(h_{1,t} - h_{1,t-1}\right) + \frac{b_{1,t-1} R_{t-1}}{\pi_t} = b_{1,t} + w_t L_{1,t} + r_t^k k_{t-1} + \phi_t.$$

$$k_t = (1-\delta) k_{t-1} + \left[1 - \frac{\psi}{2}\left(\frac{I_t}{I_{t-1}} - 1\right)^2\right] I_t,$$

$$\max \widehat{E}_{2,t} \sum_{t=0}^{\infty} \beta_2^t \left\{ \log\left(c_{2,t} - bc_{2,t-1}\right) + \nu_{2,h} \log\left(h_{2,t}\right) - \nu_{2,L} \frac{L_{2,t}^{1+\varphi_L}}{1+\varphi_L} \right\},$$

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$$b_{2,t} \leq \frac{\gamma}{R_t} \left[\widehat{E}_{1,t}\, q_{t+1} \pi_{t+1}\right] h_{2,t},$$

$\beta_2 < \beta_1$ (Incentive to borrow)

Household Expectations

Subset employ moving-average forecast rules. Remainder employ rational forecast rules.

$$\underbrace{F_t X_{t+1}}_{\text{Current forecast}} = \underbrace{F_{t-1} X_t}_{\text{Previous forecast}} + \lambda \underbrace{(X_t - F_{t-1} X_t)}_{\text{Previous forecast error}}, \qquad 0 < \lambda \leq 1,$$

$$= \lambda \left[X_t + (1-\lambda) X_{t-1} + (1-\lambda)^2 X_{t-2} + ... \right],$$

where λ = weight on recent data in moving average.

X_{t+1} = object to be forecasted.

$= U_{c_{1,t+1}} \left[q^k_{t+1}(1-\delta) + r^k_{t+1} \right]$ (example).

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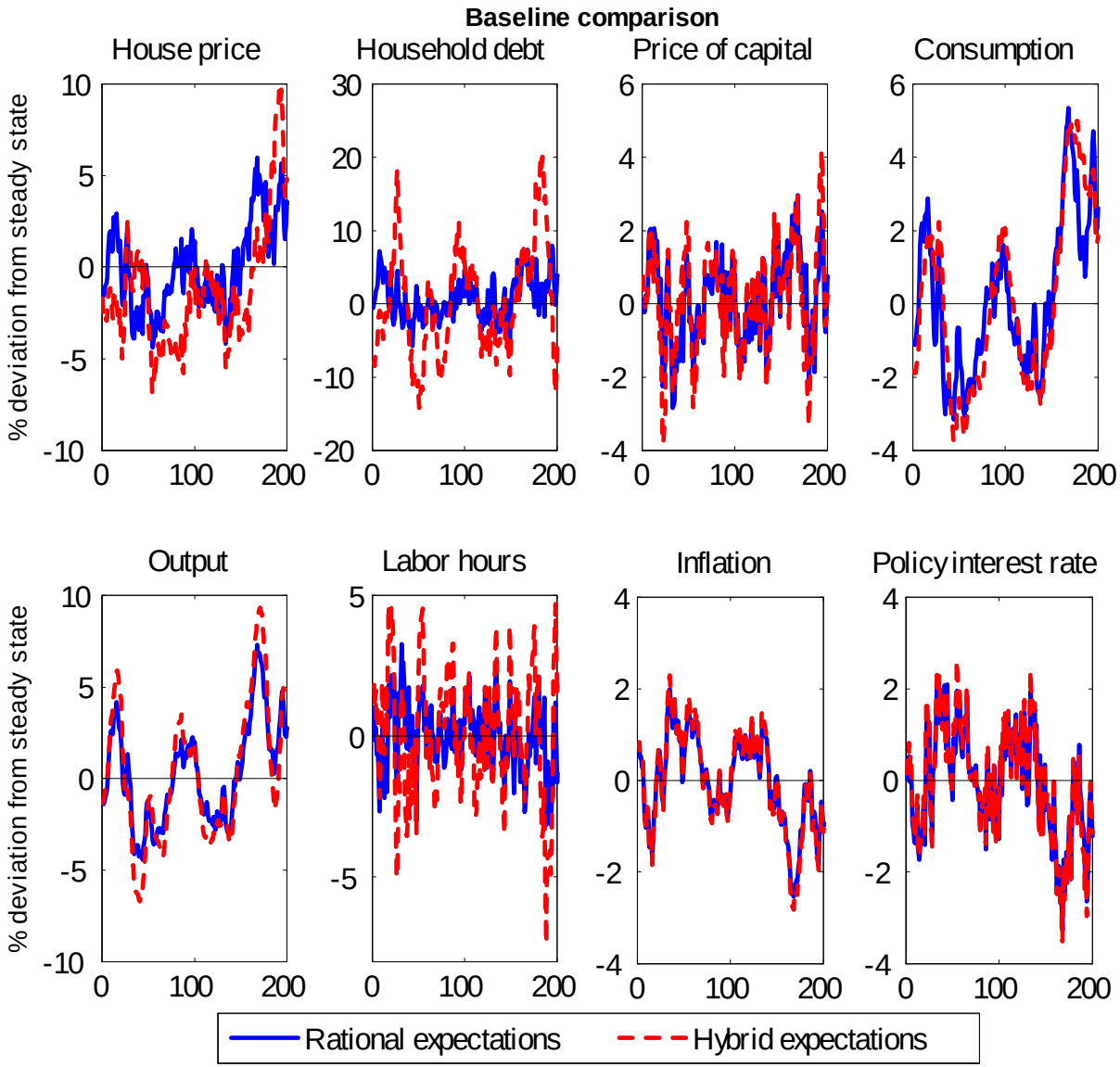
$$\widehat{E}_t X_{t+1} = \omega F_t X_{t+1} + (1-\omega) E_t X_{t+1}, \quad 0 \leq \omega \leq 1$$

where ω = fraction who employ moving-average forecast rule.

$\omega = 0.3, \quad \lambda = 0.35$ (hybrid expectations w/ no-trade).

Hybrid Expectations Model Exhibits Excess Volatility

Moving-average forecast rule embeds a unit root which magnifies volatility.



Monetary Policy and Macroprudential Policy

What policy actions are effective in dampening excess volatility in credit, output, etc.?

Interest-rate response to house price growth or credit growth:

$$R_t = (1+r)\left(\frac{\pi_t}{1}\right)^{1.5}\left(\frac{y_t}{y}\right)^{0.125}\left(\frac{q_t}{q_{t-4}}\right)^{\alpha_q}\left(\frac{b_{2,t}}{b_{2,t-4}}\right)^{\alpha_b}\varsigma_t,$$

$$\alpha_q \text{ or } \alpha_b \in [0,\ 0.4], \qquad \text{(baseline} = 0\text{)}$$

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$$\alpha_q \text{ or } \alpha_b \in [0,\ 0.4], \qquad \text{(baseline} = 0\text{)}$$

Lower LTV or move towards DTI constraint:

$$b_{2,t} \leq \frac{\gamma}{R_t}\left[\widehat{E}_{1,t}\, q_{t+1}\pi_{t+1}\right] h_{2,t}$$

$$\gamma \in [0.2,\ 1.0], \qquad \text{(baseline} = 0.7\text{)}$$

$$b_{2,t} \leq \frac{\widehat{\gamma}}{R_t}\left\{m\, w_t L_{2,t} + (1-m)\left[\widehat{E}_{1,t}\, q_{t+1}\pi_{t+1}\right] h_{2,t}\right\}$$

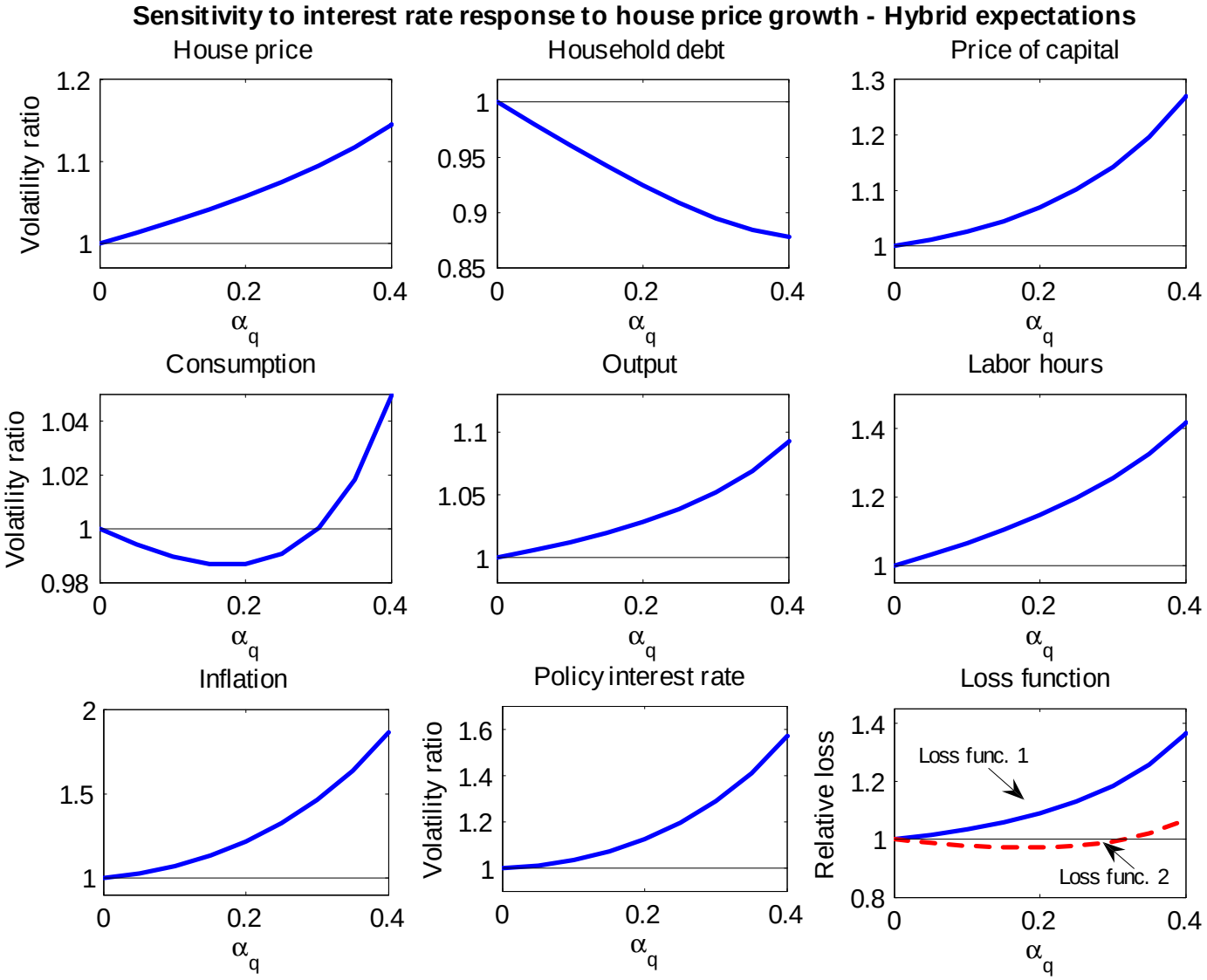
$$m \in [0,\ 1] \qquad \text{(baseline} = 0\text{)}$$

Why Not Consider "Optimal" Policy Rules?

- Policy rule coefficients are not optimized with respect to any utility function or loss function.
- Thought experiment: A modest shift from exisiting central bank policy (captured by Taylor-type rule) to a policy that responds to a financial variable (house price growth or credit growth) that previously had been ignored.
- If such a policy shift were to be undertaken by a real-world central bank, we would not expect policymakers to radically alter their responses to inflation and output at the same time.

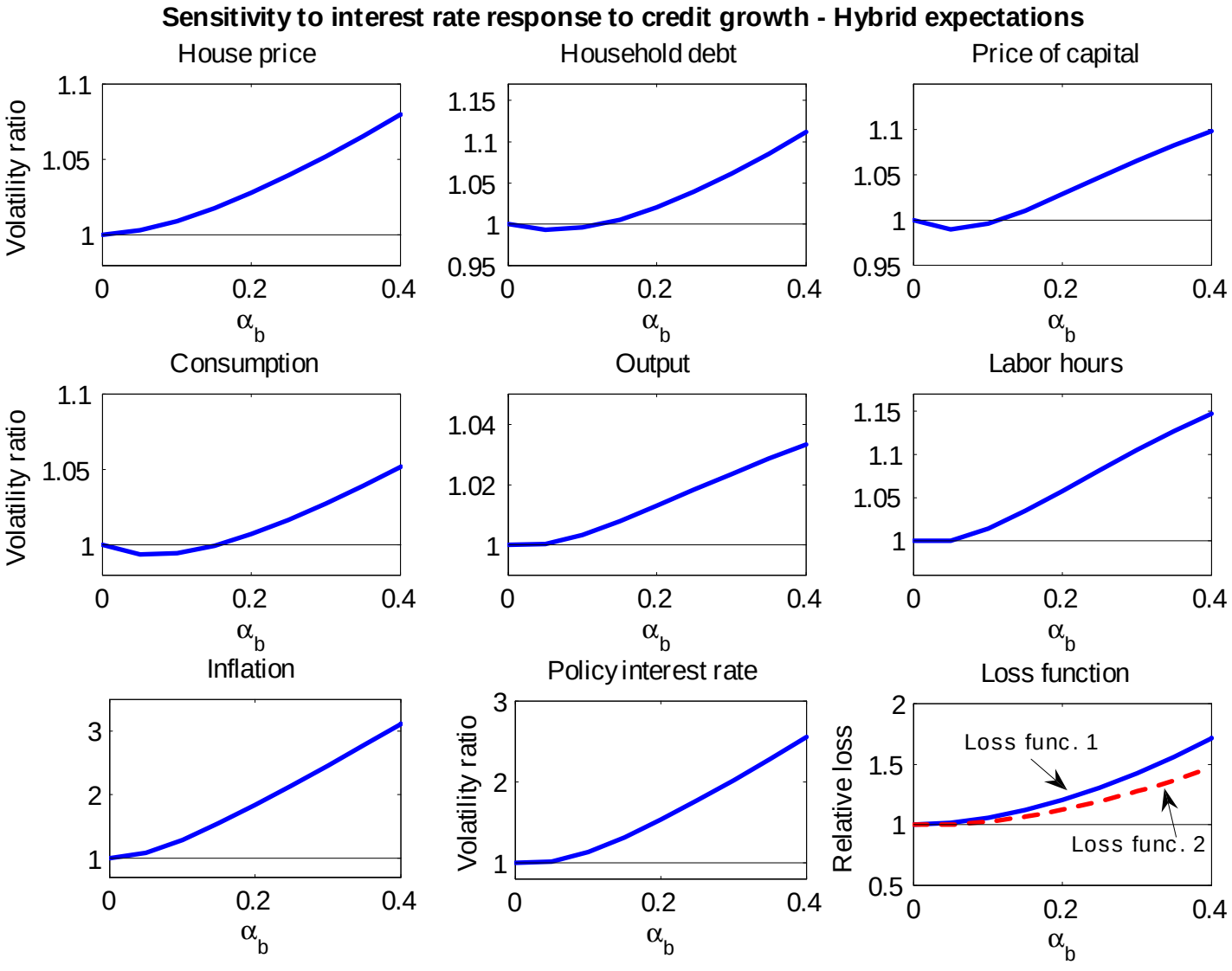
Interest Rate Response to House Price Growth

Reduces volatility of household debt but magnifies volatility of output and nflation.



Interest Rate Response to Credit Growth

Tends to magnify volatility of household debt and other macro variables.



Monetary policy results depend on expectations

Previous results obtained from rational expectations models may not be robust.

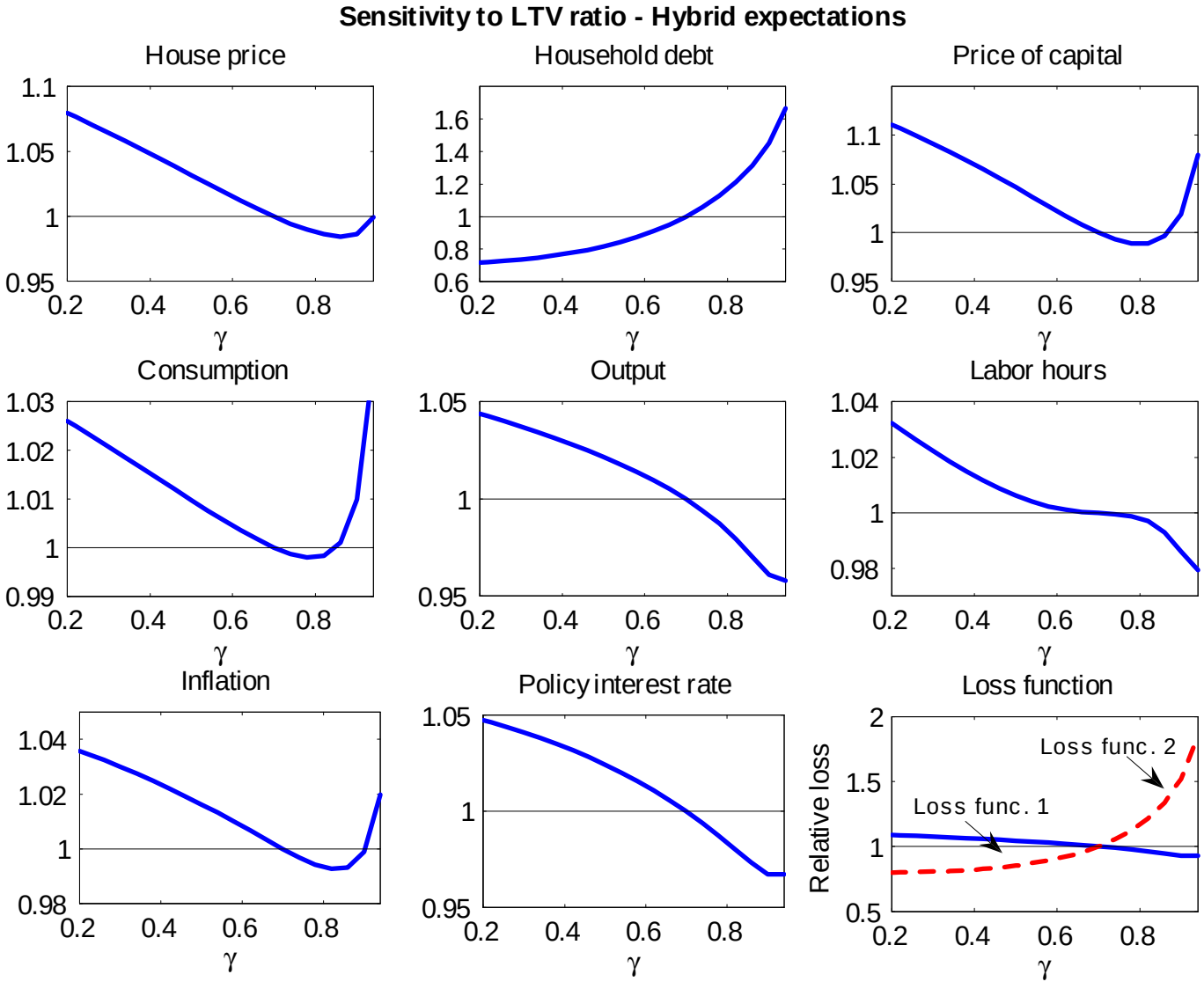
Interest rate response to credit growth ($\alpha_b = 0.2$)

	Standard deviations			
	House price	HH debt	Output	Inflation
Rational Expectations				
Not responding	2.08	3.17	2.31	0.81
Responding	2.14	2.00	2.34	0.84
Volatility Ratio	1.03	0.63	1.01	1.04
Hybrid Expectations				
Not responding	3.62	6.55	3.14	0.90
Responding	3.72	6.68	3.18	1.65
Volatility Ratio	1.03	1.02	1.01	1.83

Standard deviations expressed as percent deviations from steady state.

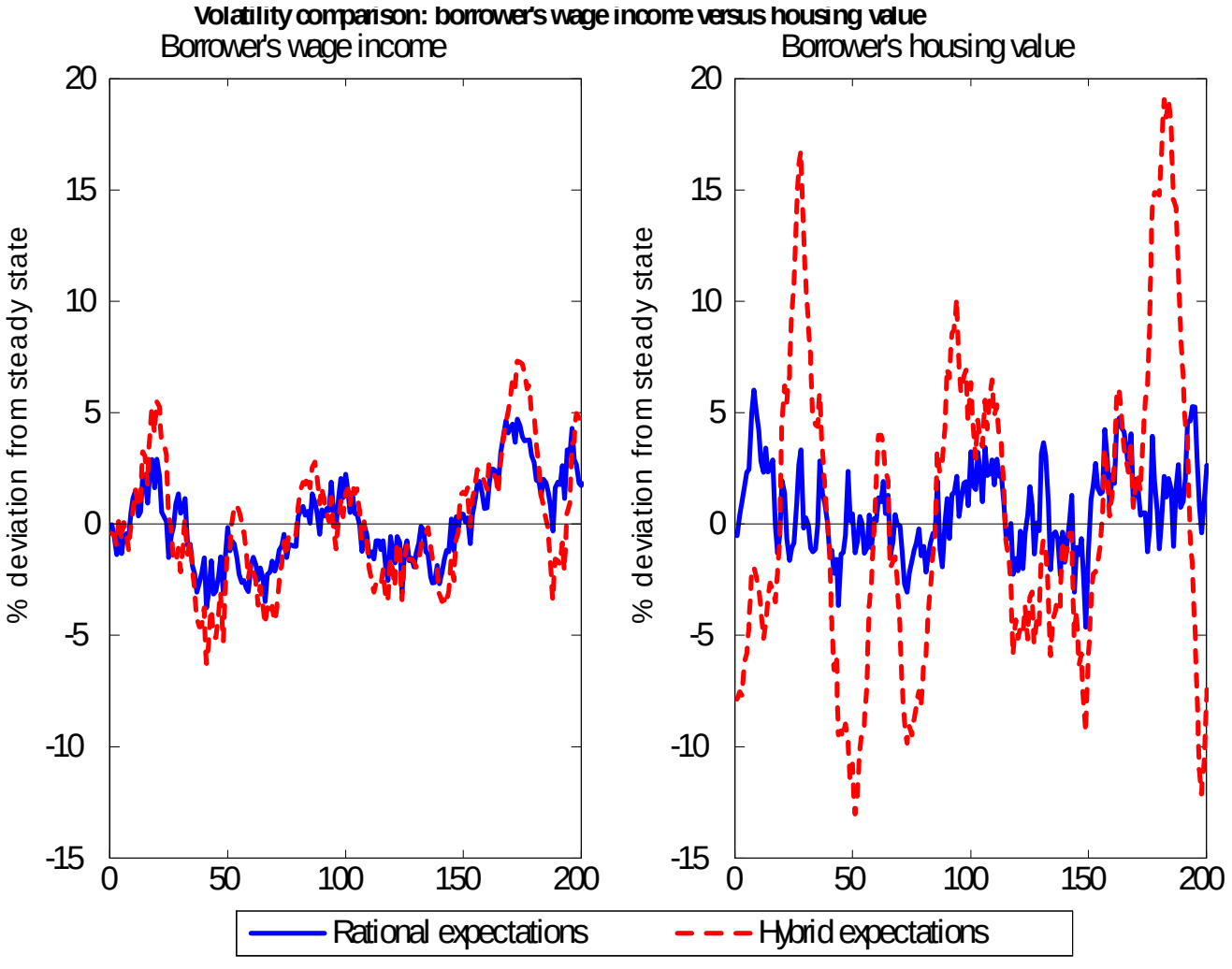
Tighten Lending Standards: Lower LTV

Reduces volatility of household debt but magnifies volatility of other macro variables.



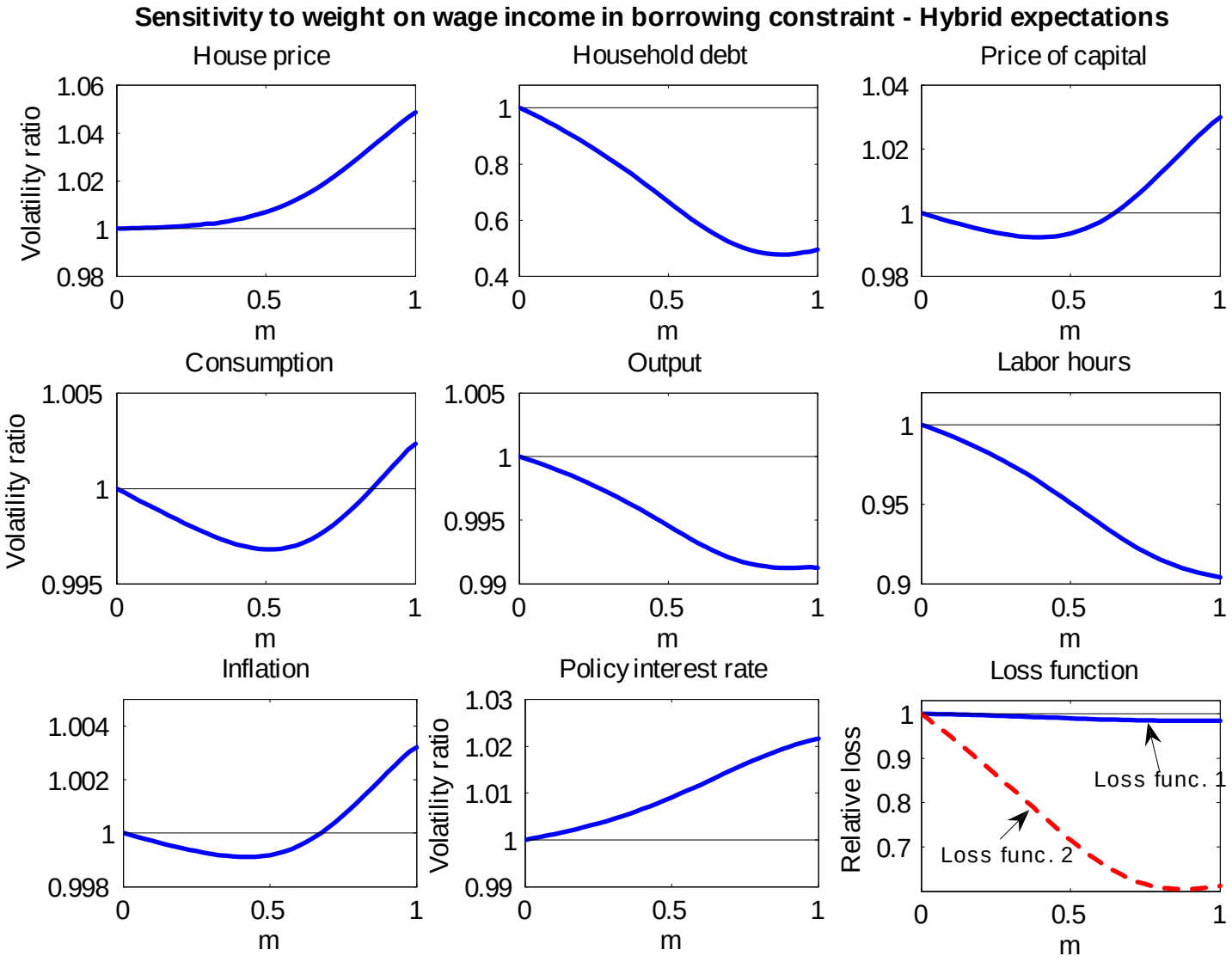
Volatility Comparison: Wage Income versus Housing Value

Wage income is less subject to bubble-induced distortions.



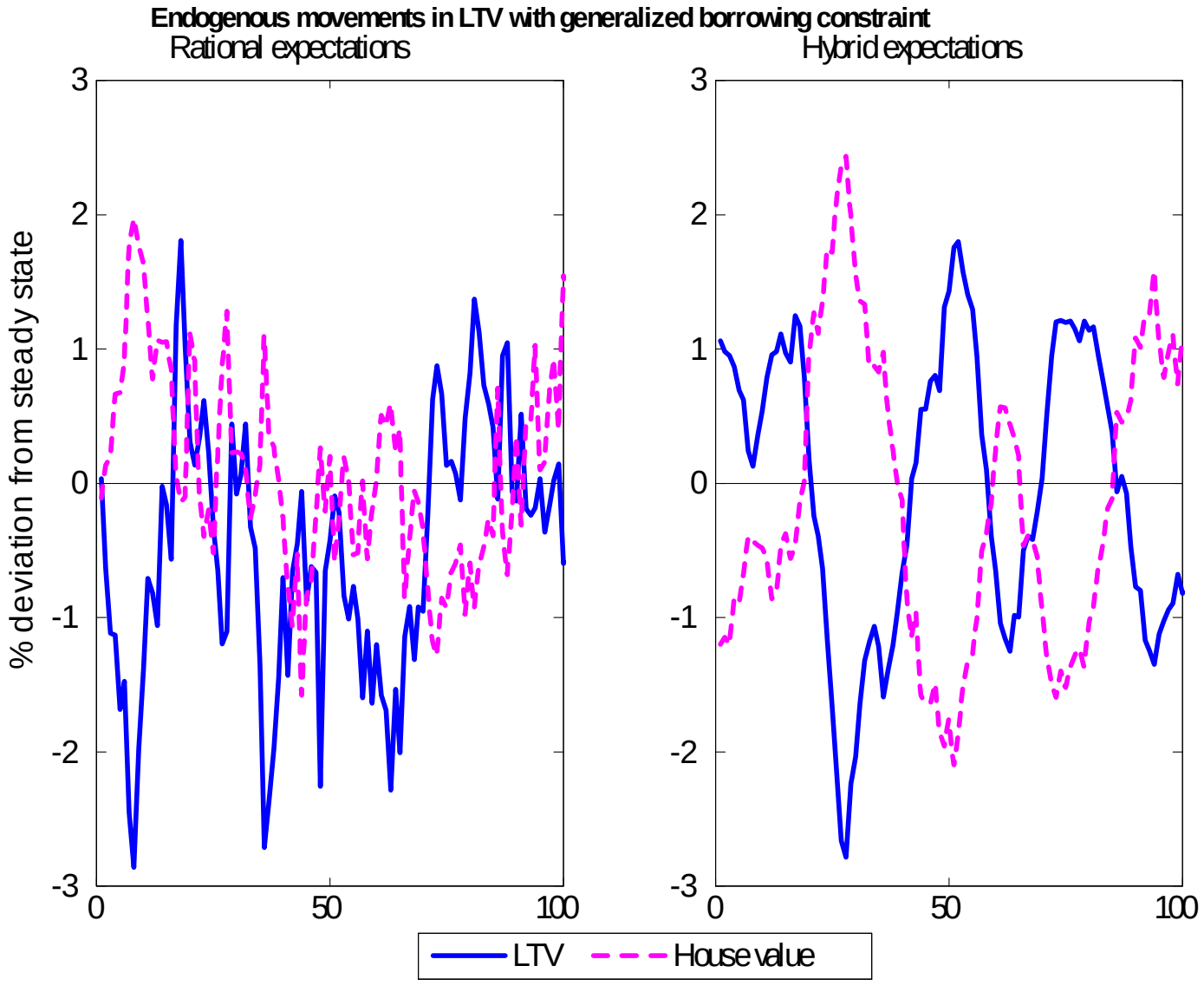
Move Towards Debt-to-Income Constraint (Best)

Reduces volatility of household debt as well other economic variables.



Endogenous LTV acts like an automatic stabilizer

Weight on wage income in borrowing constraint induces countercyclical LTV ratio.



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- Best-performing policy: Require lenders to put substantial weight on wage income in the borrowing constraint. Promotes both economic and financial stability (automatic stabilizer).

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- Best-performing policy: Require lenders to put substantial weight on wage income in the borrowing constraint. Promotes both economic and financial stability (automatic stabilizer).
- Best performing policy calls for lending behavior that is basically the opposite of what U.S. lenders did during housing boom of the mid-2000s. By 2006, 27 percent of all new mortgages were "no-doc" and "low-doc" loans.