Explanation of Real US Interest Rates with an Exchange Economy

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Objectives

Build and evaluate a standard cash-in-advance (CIA) model extended with optimal inflation tax avoidance via intra-temporal credit to

1. explain real 3-month US T-bill interest rates beyond fundamentals;
2. explain business cycle filtered and level interest rates;
3. compare methods of shock construciton to be used in the evaluation process; e.g. Jermann & Quadrini (2012).

Model

We are using the model of Benk et al. (2005) to explain the real 3-month T-bill rate:

- Exchange credit is used as a perfect substitute to money, $m_t + q_t + \tau_t \geq c_t$;
- This allows the consumer to avoid the inflation tax;
- Bank produces exchange credit;
- Results in endogenous velocity.

The resulting bond pricing equation equals the fundamentals factored by a wedge term based on expected user cost.

$$1 = \beta E_t \left[\left(\frac{c_t}{c_{t+1}} \right)^{\theta} \left(\frac{x_{t+1}}{x_t} \right)^{\psi(1-\theta)} \left(\frac{1+R_{t+1}}{1+\pi_{t+1}} \right) \times \underbrace{\left(\frac{1+R_t-R_t^d}{1+R_{t+1}-R_{t+1}^d} \right)}_{\text{'wedge'}} \right]$$

Evaluation Method

Jermann & Quadrini (2012) evaluation method is used to evaluate the ability of the model. We do this given three different shock construction methods that include

- Solow method;
- Backing out shocks using the model solution with iterative convergence [Benk et al. (2005)];
- Bayesian estimation.

Benk et al. (2005) is the most efficient shock construction method as Table 2 indicates it.

2nd Moments

HP Filtered	2nd Moments	1975Q1-2020Q4
$R-\pi$	Corr.	0.48
	Rel. Vol.	1.09

Table 1: 2nd Moments of Model Implied Monetary Variables with US Data

Level $R-\pi$	2nd Moments	1975Q1-2020Q4
Solow	Corr.	0.12
	Rel. Vol.	20.37
Benk	Corr.	0.86
	Rel. Vol.	1.04
Bayes	Corr.	0.65
	Rel. Vol.	1.35

Table 2: Correlation and Relative Standard Deviation of Unfiltered Model Implied Level Real Interest Rate with US Data

Visual Results

Figure 1: HP Filtered Ex-post Real Interest Rate (Benk - black) vs US Data (dashed).

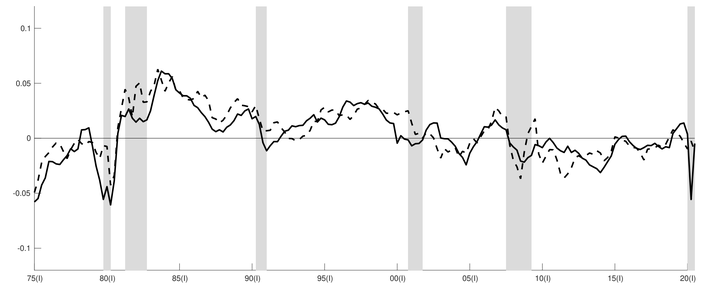

Figure 2: Level of Ex-post Real Bond Interest Rate: Benk Method (black) vs US Data (dashed)

Conclusion

- Anticipating Inflation while using exchange credit as alternative means of exchange creates asset pricing "liquidity" wedge as markets anticipate changes to the expected user cost $R - R^d$ of exchange, as they optimally avoid the inflation tax.
- It offers a rational expectations explanation of real bond rates.
- The standard asset pricing puzzle can be solved by extending monetary real business cycle model with exchange credit and endogenous velocity. Expected changes in user cost drive ex-post bond interest rate even into negative territory.

References

Benk, Sz., & Gillman, M., & Kejak, M., 2005. "Credit Shocks in the Financial Deregulatory Era: Not the Usual Suspects," Review of Economic Dynamics, vol 8(3), 668-2687.

Canzoneri, M., & Cumby, R., & Diba, B. T., 2007. "Euler equations and money market interest rates: A challenge for monetary policy models," Journal of Monetary Economics, vol 54(7), 1863-1881.

Jerman, U., & Quadrini, V., 2012. "Macroeconomic Effects of Financial Shocks," American Economic Review, vol 102(1), 238-271.

Future Research

This paper calculates the asset pricing of the real short-term bond interest rate using the full model solution in a monetary RBC model. This can be extended to compare to the marginal product of capital within the model, as compared to historical experience. Single equation estimation methods can be used as in Canzoneri et al. (2007) also for this asset pricing kernel. Wee also plan to extend this to explain the equity premium and loan premium. We also plan econometric testing of the long run relation along with transition dynamics using VECM.

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