

LSAPs and the term structure

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Why have LSAPs raised Treasury bond prices?

Theories

- 1 Supply effects on risk premia
Purchases lower the amount of risk borne by marginal investors in Treasuries
- 2 Supply effect on preferred characteristics of securities
Safety premium; preferred habitat
- 3 Signaling
Purchases convey info about path of future short-term nominal rates

Why have LSAPs raised Treasury bond prices?

My perspective

- 1 Supply effects on risk premia
Weak theory and evidence
- 2 Supply effect on preferred characteristics of securities
Definitely true, but cannot explain all price reactions
- 3 Signaling
Implausible at long horizons

Why have LSAPs raised Treasury bond prices?

A conjecture

- Purchases change investors' perceptions of the Fed's reaction function

Change can affect both risk premia, forecasts of distant forward rates

Supply effects on risk premia

Two stories

1 Capital constraints channel

- Marginal investor has much of his risk in the form of exposure to Treasury price volatility
- Segmented markets – investors in stock funds do not also invest in Treasury securities

2 Aggregate duration channel

- Marginal investor bears interest rate risk through all fixed-income instruments in his portfolio
- Large reduction in the quantity of duration risk lowers the compensation investors require to hold it

The capital constraints channel

- Implication of theory – aggregate portfolio of Treasury bonds is the SDF for Treasury securities

Empirically, portfolio volatility is dominated by longer-maturity bonds

- Corollaries

- Time series

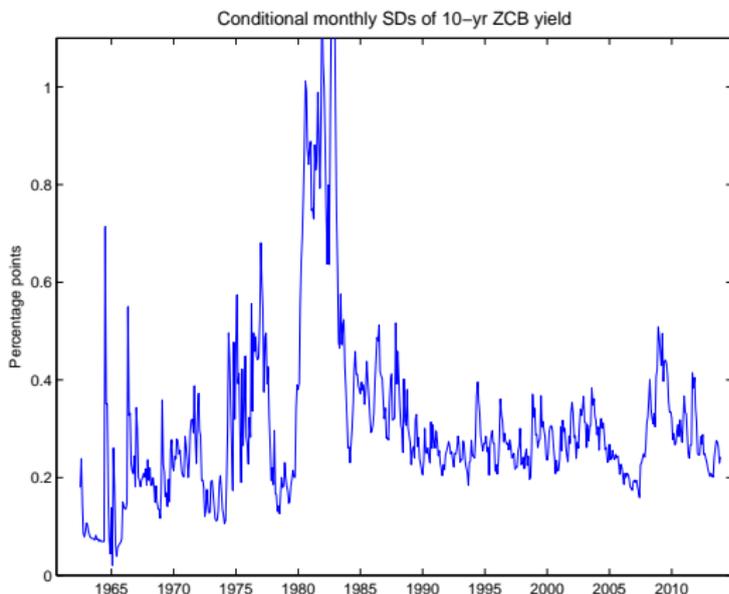
Time variation in cond SD of longer-maturity Treasury bonds should produce time variation in cond expectation of excess bond returns

Gabaix, Krishnamurthy, and Vigneron (2007) (MBS pre-payment risk)

- Cross section

Long-maturity bonds should have highest Sharpe ratio among Treasury securities

Time series evidence—volatility and excess returns



- Monthly realized SDs from squared daily yield changes, projected on 12 lags
- Regress monthly excess T-bond returns on realized SD, using lagged realized SD as instruments
- Full sample, portfolio of bonds with maturities between 5 and 10 years
GMM t-stat: 0.45
- 1988–2007 sample, same portfolio
GMM t-stat: -1.02
- (But economic significance of coef + 2 s.e. is high)

Cross sectional evidence—Sharpe ratios

- Unconditional Sharpe ratios of Treasury securities decline with maturity

Duffee (2010), range from 0.23 to 0.12

Pattern noted in Fama and French (1993), Campbell and Viceira (2001), Asness, Moskowitz and Pedersen (2013)

- Interp in Duffee is slope factor is a hedge—irrelevant logic for capital constraints model

The capital constraints channel

- What limits capital from flowing in/out?

No knowledge barriers to entry to the business of holding, trading T-bond risk

Low fixed costs of entry

Evidence of local supply effects

Figure 1. LSAP 1 Announcement

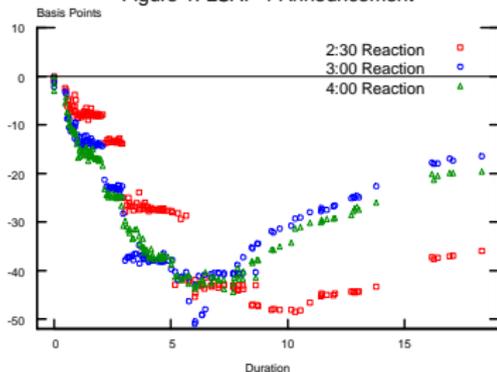
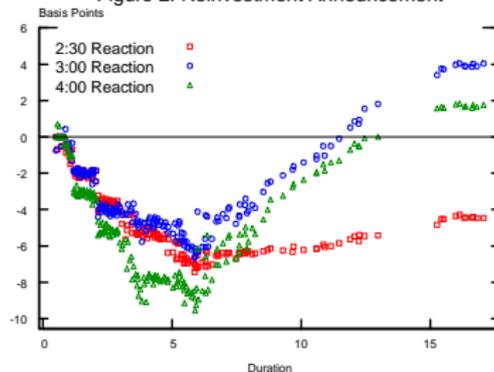


Figure 2. Reinvestment Announcement



- Cahill, D'Amico, Li, and Sears (2014)

- D'Amico and King (2013)

Price spillovers on securities with similar maturities

(Pure) preferred habitat interpretation?

- Some investors prefer fixed-income securities of particular maturities
- Stochastic supply/demand has price effects
- But logic of Vayanos and Vila (2009): local price effects unlikely to be large
 - Arbitrageurs create/absorb supply, hedging optimally
 - Local price effects only if there are local priced risks, but even with capital constraint theory, T-bond risk dominated by level effect

Safety premium/preferred habitat

- Frequently, marginal investor in Treasury securities has preferences for them not linked to risk-return tradeoff

Longstaff (2004), Krishnamurthy and Vissing-Jorgensen (2012)

Anecdotal evidence suggests “safety”

- Safety premium + preferred maturities = local supply effects

Arbitrage breaks down; cannot create supply by issuing default-free securities

- Testing local supply effects

Only indirect spillovers to other fixed income markets

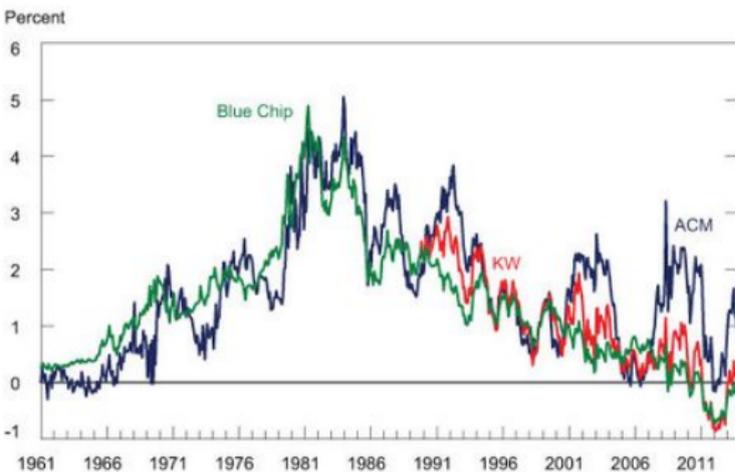
Evidence from other asset markets

Announcement effects

- Krishnamurthy and Vissing-Jorgensen (2011)
Agency and corporate yields, CDS, inflation swaps, TIPs, interest rate volatility
- Wright (2012), Rogers, Scotti, Wright (2014)
Corporate yields, sovereign yields, FX, stock returns
- Key issue: signaling future short rates or news about risk premia?

Formal methods of inferring signals of future short rates

Ten-Year Term Premium Estimates



Sources: Authors' calculations; Federal Reserve Board; Blue Chip Financial Forecasts.
Notes: Blue chip estimates are based on data from the Blue Chip Financial Forecasts survey.
ACM term premia are obtained from the model described in Adrian, Crump, and Moench (2013). KW estimates are derived from Kim and Wright (2005).

- Decompose yields into expected path of future short rates and term premia
- No-arb model and/or survey forecasts
- Use to study announcements and time series properties

Examples: Gagnon, Raskin, Remache and Sack (2010), Li and Wei (2013)

- Main problem: large uncertainty in the decomposition (figure from Adrian, Crump, Mills, and Moench, NY Fed blog May 2014)

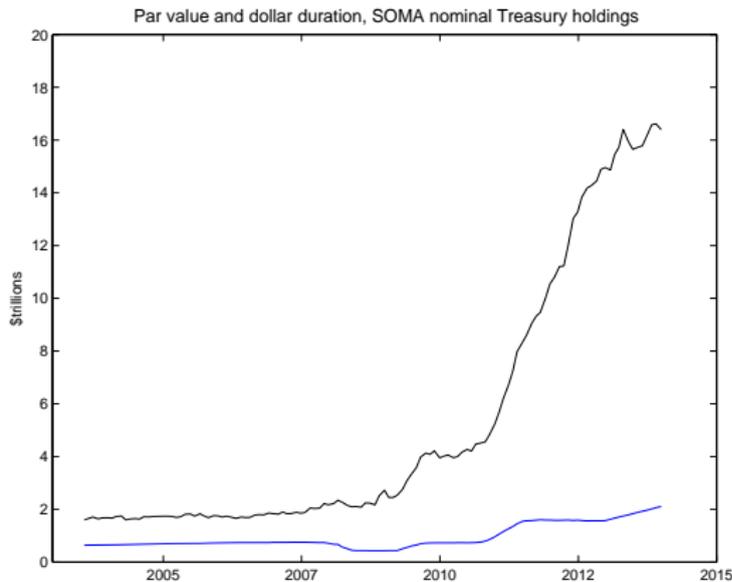
Less formal methods

- Extrapolations from announcement effects on Fed fund futures

Krishnamurthy and Vissing-Jorgensen (2013)
- Intuition of monetary policy about announcement effects on long-horizon short rates

Rogers, Scotti, and Wright (2014)
- Methods rely heavily on priors

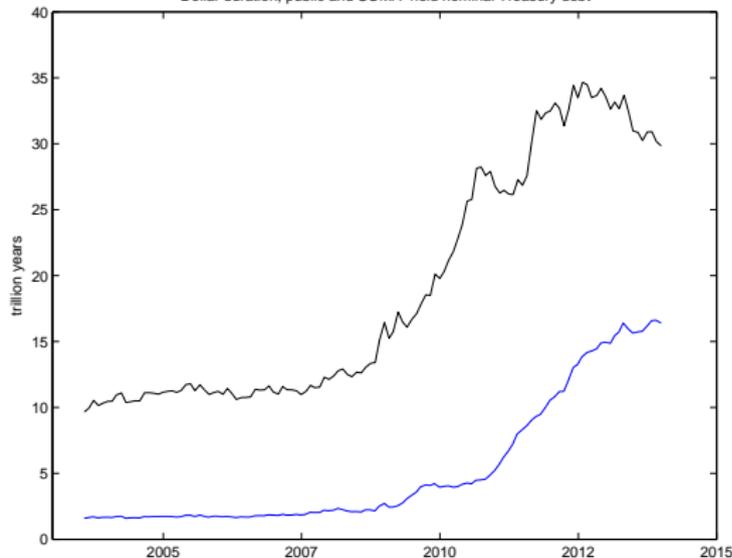
The aggregate duration channel



- Blue line – par value
- Black line – aggregate duration
- Fed removed \$ trillions of duration (if Ricardian equivalence does not hold)
- Estimates in Li and Wei, Cahill et al., approx 7 b.p. decline in term premium per \$1 trillion
- Approx 100 b.p. total for \$14 trillion removed

How large are SOMA holdings?

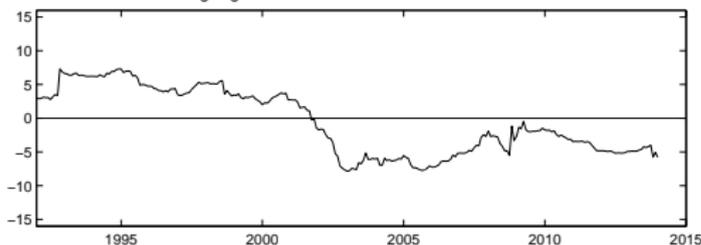
Dollar duration, public and SOMA-held nominal Treasury debt



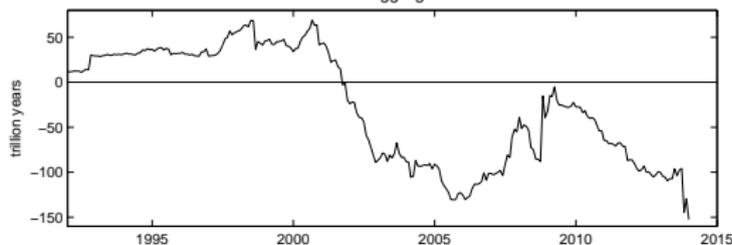
- Blue line – Duration removed by Fed
- Black line – Duration remaining; marketable less SOMA holdings
- Total Treasury duration in hands of public (ex Fed) increased by \$20 trillion
- Previous estimates imply increase in term premium of 140 b.p.
- If true, main action in term premia during LSAP period is not Treasury supply

Sources of duration risk

Rolling regression estimates of stock market duration



Dollar duration of aggregate stock market

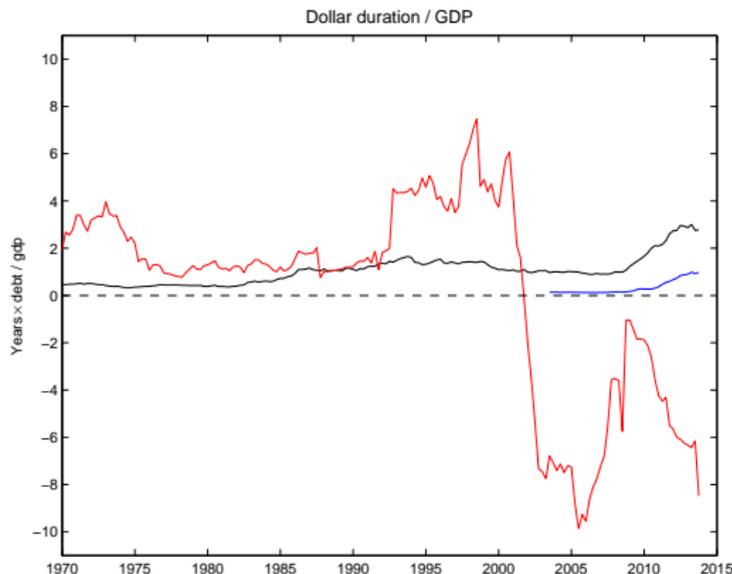


- Well-diversified portfolio holds stocks and bonds
- Stocks and bonds covary; what is duration equivalent of the stock market?

Projection of stock returns on long-term Treasury bond returns

- Top panel, rolling regression estimates of stock excess ret on 10-year bond excess ret, times 10
- Bottom panel, multiply regression estimates by market cap of stock market

Indirect evidence on duration risk effect of LSAPs



- Duration of three portfolios, scaled by GDP
 - SOMA Treasury holdings (blue), marketable Treasury securities (black), aggregate stock market (red)
- If LSAPs have significant effect on duration risk premia, we should see huge swings in risk premia driven by stock market risk

An alternative risk premia story

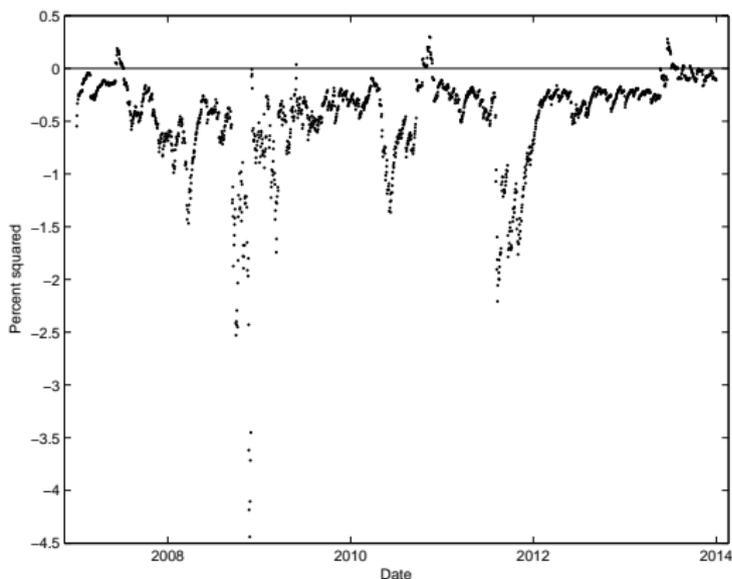
- Risk premia determined by covar of returns with SDF
- Perhaps LSAP announcements are (partially) news about Fed's reaction function

Campbell, Pflueger and Viceira (2014)

- Perfect experiment: test for change in conditional covariance at times of LSAP announcements
- Practical indirect test: does conditional covar between Treasury bond returns and aggregate stock returns change at announcements?

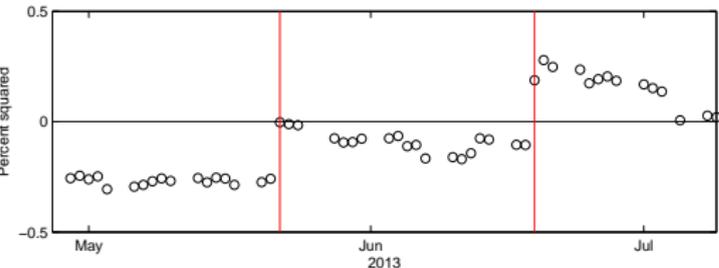
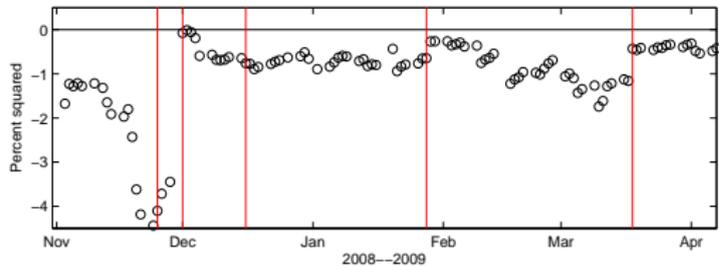
Not a claim that CAPM holds (doesn't, for bonds)

Econometric approach



- Daily conditional covariance between aggregate stock return, ten-year bond return is stochastic unobserved factor
 - Follows AR(1) process with dummies for major LSAP announcement dates
- Realized product of stock, bond return equals unobserved factor plus white noise
- Update econometrician's filtered conditional covariance using this realized product
- Estimate with Kalman filter

Some interesting events



- Dots are end of day- t conditional covariance of day $t+1$ stock market and 10-yr bond returns
- Red lines: LSAP announcements on day t ; in information set used for conditional covariance
 - Top panel: (1) Fed announces purchases of MBS and agency bonds, (2) Bernanke states Treasuries may be purchased, (3)-(5) FOMC meetings
 - Bottom panel: (1) Bernanke speech of “step down” in QE, (2) FOMC meeting that signaled future tapering

Conclusions

- Why have LSAPs raised Treasury prices? No explanation yet that convinces a skeptic
- Recommendation here is to explore news about changes in dynamics