

Discussion of  
“Do stylized facts of equity-based volatility indices  
apply to fixed-income volatility indices?  
Evidence from the US Treasury market“  
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# In a nutshell

- ▶ Calculate Treasury-VIX ( $TBVIX$ ) from options
- ▶ 30 day horizon
- ▶ Bonds with 5/10/30 year maturities
- ▶ Data for 1993-2012
- ▶ **Question:** Is  $TBVIX$  behavior similar to the  $VIX$ ? When? Why?

## Contribution:

- ▶ **Method:** Correction for american options (Barone-Adesi/Whaley)
- ▶ **Empirics:** (1)  $TBVIX$  – other volatility indices, (2)  $TBVIX$  – rates

## Interesting + relevant problem:

- ▶ Bonds are most important asset class
- ▶ Variance of a finite-horizon asset (think payoff of a ZCB)
- ▶ Obvious assumption that interest rates are stochastic

# Results

- ▶ *TBVIX* has positive skewness
- ▶ Different maturities are correlated, but not highly (0.49 for 5/30yr)
- ▶ *TBVIX* co-moves with rates, no asymmetric effect

## Instantaneous correlations to other vola indices low

	$\Delta \ln$ TBVIX(10y)	$\Delta \ln$ TBVIX(30y)	$\Delta \ln$ EVZ	$\Delta \ln$ GVZ	$\Delta \ln$ OVX	$\Delta \ln$ VIX
$\Delta \ln$ TBVIX(10y)	1	0.27**	0.12**	0.13**	0.10**	0.13**
$\Delta \ln$ TBVIX(30y)		1	0.10**	0.11**	0.10**	0.11**
$\Delta \ln$ EVZ			1	0.34**	0.16**	0.36**
$\Delta \ln$ GVZ				1	0.27**	0.41**
$\Delta \ln$ OVX					1	0.48**
$\Delta \ln$ VIX						1

GVZ = gold vol, OVZ = oil vol, EVZ = USD/EUR vol

# Results (2)

## Event study

- ▶ *TBVIX* drops after scheduled announcements

## Granger Causality

- ▶  $TBVIX_{10} \rightarrow VIX$
- ▶  $TBVIX_{30} \rightarrow TBVIX_{10}$
- ▶  $TBVIX_{10} \rightarrow TBVIX_{30}$
- ▶  $VIX \rightarrow TBVIX_{10}$
- ▶  $VIX \rightarrow TBVIX_{30}$

# Comments (1)

## Which instrument to measure bond volatility?

- ▶ CBOE Government Bond Volatility Index *TYVIX*
- ▶ CBOE Interest Rate Swap Rate Index *SRVX*

## Correcting for early exercise premium

“The VXTYN formula strictly holds for European-style options and CBOT Treasury options have American-style exercise. The effect of ignoring the early exercise premium on volatility is **likely to be small** because the Treasury options used to calculate the index are out-of-the- money and short-dated.” (Guide to the CBOE TYVIX)

- ▶ How large is the correction? Does it change the economics?

# Comments (2)

## Literature ... missing papers

- ▶ A. Mele , Y. Obayashi: The Price of Government Bond Volatility, August 2011, [www.antoniolemele.org/files/Gbond\\_VX.pdf](http://www.antoniolemele.org/files/Gbond_VX.pdf)
  - ▶ Need to tilt basis assets to account for stochastic interest rates
  - ▶ Advocate basis point volatility measure
- ▶ P. Mueller, A. Vedolin, Y.-M. Yen: Bond Variance Risk Premia, Sept 2013, SSRN 1787478
  - ▶ Correction for early exercise:  
binomial tree → implied volatility → european option price
  - ▶ Focus on trading strategies and bond variance risk premium
- ▶ A. Mele, Y. Obayash, C. Shaleni: Dynamics of Interest Rate Swap and Equity Volatilities, April 2013, [www.antoniolemele.org/files/swap\\_equity.pdf](http://www.antoniolemele.org/files/swap_equity.pdf)
  - ▶ Relationship  $SRVX$  – DJ corp. bond index
  - ▶ Rolling correlations and tail relationship  $SRVX$  –  $VIX$
  - ▶ Determinants of vol-of-vol of  $SRVX$  and  $VIX$

# Comments (3)

## Yield regression

$$\ln(TBVIX_t/TBVIX_{t-1}) = \alpha_0 + \alpha_1 \Delta yield_t + \alpha_2 D^+ \Delta yield_t + u_t$$

- ▶ Any change in yield will mechanically increase volatility  
→ need to disentangle this from changes in price of volatility
- ▶ Stationary processes (?): changes in vol and yield sum up to zero

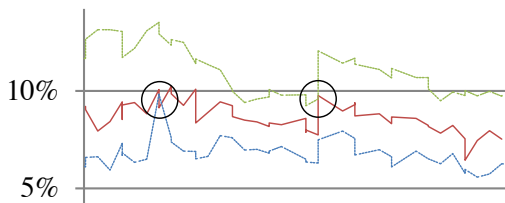
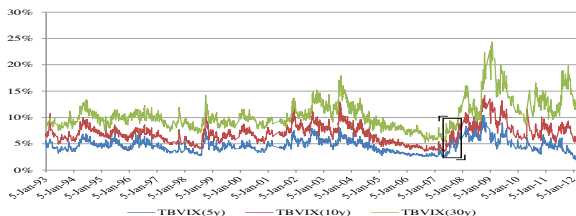
## Event regression

- ▶ What about a symmetric window before/after the announcement?
- ▶ Especially: when does the uncertainty build up?

# What I'd like to see

## (Double) term structure of TBVIX

- ▶ Already there: term structure in bond maturity

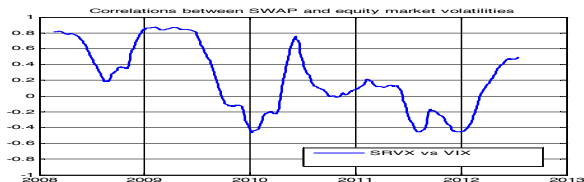


- ▶ Not always increasing in maturity? Artifact? Economics?  
How would we interpret a lower  $\mathbb{Q}$ -Volatility of a longer bond?



# What I'd like to see (2)

## Dynamic relationship between bond variance and other assets



## Tail dependences (“fear indices”)

Dow Jones Invest Grade Corp Bond Index down by:	No of obs.	SRVX average $\Delta$ change (standard error)	VIX average $\Delta$ change (standard error) x 100
< 0	621	0.37bps (0.09)	-0.54bps (0.09)
< -0.5pt	138	1.38bps (0.27)	-1.06bps (0.25)
< -1.0pt	21	1.63bps (0.80)	-1.72bps (1.08)
S&P 500 down by:			
< 0	618	0.16bps (0.10)	1.39bps (0.09)
< -2%	114	0.80bps (0.28)	4.24bps (0.31)
< -5%	14	2.69bps (1.02)	9.11bps (1.26)

# Obvious extensions

- ▶ Do unscheduled announcements/large surprises increase *TBVIX*?
- ▶ The bond variance risk premium and its relationship to (the volatility of) other assets
- ▶ Quantitative easing and bond volatility e.g. by comparing *TBVIX*? for “eligible” and “ineligible” maturities
- ▶ The bond vol-of-vol