Liberty Street Economics

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Technical Appendix to "What Can We Learn from Prior Periods of Low Volatility?"

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Regression Setup and Output

The broad list of possible independent variables are narrowed down using a general-to-specific modeling framework per Hendry (1993), which involves removing the least statistically significant variable, one at a time. The five independent variables we end up with are statistically significant at the 10 percent level across at least one or more of the three dependent variables. Tests of joint significance show that the excluded variables are not jointly significant with any of the remaining five independent variables.

We conducted unit-root tests on the dependent variables. Since we reject the null hypothesis of the presence of a unit root, we specify a model for the entire sample period from April 1994 to June 2014. However, due to the persistence of the dependent variables, all regression specifications include a lagged dependent variable. Since some of the independent variables are not stationary, we also conducted unit-root tests of the regression residuals. We also rejected the null hypothesis of the existence of a unit root on the residuals. The regression model is estimated using ordinary least squares (OLS) with robust and autocorrelation consistent standard errors.

The dependent variables represent the one-month implied volatilities of the S&P 500 index, the two-year swap rate, and the ten-year swap rate. We also tested the model with realized volatilities as dependent variables and had similar results.

Table 1 provides a description of all the independent variables considered. Table 2 includes detail on the dependent variables, and Table 3 shows the regression results.

References

Hendry, D. F. 1993. *Econometrics: Alchemy or Science? Essays in Econometric Methodology*. Oxford: Blackwell Publishers.

Li, D. and Li, G. 2014. "Are Household Investors Noise Traders? Evidence from Belief Dispersion and Stock Trading Volume." Board of Governors of the Federal Reserve System *Finance and Economics Discussion Series*: 2014-35.

Table 1: Data Description

Broad Buckets	Potential Variables of Analysis	Data Sources
Economic environment	Six-month unemployment rate change	Bureau of Labor Statistics
	Twelve-month unemployment rate change	Bureau of Labor Statistics
	GDP yearly percentage change	U.S. Department of Commerce
	CPI yearly percentage change	Bureau of Labor Statistics
	NBER recession dummy	www.nber.org
Monetary policy	LSAP (large-scale asset purchase) dummy	Takes value 1 during periods of Fed asset purchases and 0 otherwise.
	Zero-lower bound dummy	Takes value 1 from December 2008 onwards and 0 otherwise.
	Forward-guidance dummy	Takes value 1 from August 2011 onwards and 0 otherwise.
Hedging demand	**Yield of ten-year Treasury note****	**Federal Reserve Economic Data (FRED)**
	MBS origination, net of Fed purchases	www.embs.com
	Treasury supply, net of Fed purchases	Bloomberg L.P.
Dispersion of market expectations regarding: • Asset prices • Economic outlook • Fiscal policy	**Three-month Treasury bill interquartile range****	**Survey of Professional Forecasters**
	Household survey forecast dispersion**	**Li and Li (2014)**
	News-based uncertainty index (references to uncertainty in the press)**	**www.policyuncertainty.com**
	Ten-year Treasury note interquartile range	Survey of Professional Forecasters
	CPI interquartile range	Survey of Professional Forecasters
	GDP interquartile range	Survey of Professional Forecasters
	Tax code expiration data	Survey of Professional Forecasters
Financial stress	**TED spread****	**Bloomberg L.P.**

** Included in regression framework

Table 2: Dependent Variables

Underlying	Data used
S&P 500	VIX: One-month options on S&P 500 index
Two-year swap	1M2Y: One-month expiry, two-year rate swaption
Ten-year swap	1M10Y: One-month expiry, ten-year rate swaption

Table 3: Regression Results

	S&P 500 Index	Two-year Swap Rate	Ten-year Swap Rate
Constant	-2.99	-7.32	4.11
Three-month Treasury bill interquartile	2.02	16.06	8.00
	(*)	(***)	(**)
News uncertainty index	4.34	2.99	5.76
	(***)		(***)
Forecast dispersion (SCA survey)	-0.13	3.37	1.73
		(***)	(**)
TED spread	4.02	15.41	9.06
	(**)	(***)	(***)
Ten-year Treasury level	0.27	4.65	1.00
		(***)	
Lagged dependent variable	0.71	0.66	0.78
	(***)	(***)	(***)
R-squared	0.84	0.89	0.84
Observations	243	243	243

Source: Authors' calculations.

Notes: This table presents monthly observations for the sample period April 1994–June 2014. The estimation method is ordinary least squares with heteroskedasticity and autocorrelation consistent standard errors. The superscripts ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.