WHAT'S NEW IN V-LAB

Robert Engle
Director: Volatility Institute at NYU Stern
April 25, 2014
Volatility Conference on “Liquidity”
Almost twice as many assets

Updating on a rolling basis closer to the market close for global assets.

A New Liquidity Page
The Volatility Laboratory (V-Lab) provides real time measurement, modeling and forecasting of financial volatility, correlations and risk for a wide spectrum of assets. V-Lab blends together both classic models as well as some of the latest advances proposed in the financial econometrics literature. The aim of the website is to provide real time evidence on market dynamics for researchers, regulators, and practitioners.

The V-Lab is currently running 28862 analyses on 6052 datasets producing a total of 63637 series each day!

An Introduction to Financial Volatility: Professor Rob Engle’s video lectures on the Financial Times

V-Lab Related Documents
- Dynamic Conditional Beta
- AEA Paper - Capital Shortfall: A New Approach to Ranking and Regulating Systemic Risks
- Prof. Rob Engle Discusses Risk with Tom Keene and Ken Pruitt of Bloomberg Surveillance
What’s new in Volatility?

Date Range: from 04/23/2012 to 04/23/2014

MICEX Index - GJR-GARCH Vol Prediction

MICEX Index Return, MICEX Index Price
CURRENCY VOLS

Date Range: from 04/23/2012 to 04/23/2014

Window: 3m, 6m, 1y, 2y, 5y, all

V-Lab (2014)
How much would it cost to bail out the global financial system if we have another financial crisis?
WHERE IS THE RISK?

Global Systemic Risk by Country
SRISK (USD billion)

Japan: 500
China: 500
United States: 400
France: 340
United Kingdom: 300
Germany: 250
Italy: 200
Switzerland: 150
Canada: 100
Netherlands: 90
India: 80
Spain: 70
Belgium: 60
Brazil: 50
Sweden: 40
Russian Federation: 30
Denmark: 20
Korea, Rep.: 10
Israel: 5
Greece: 2

5/1/2014 VOLATILITY INSTITUTE
US AND EUROPE

Risk Analysis Overview - United States Financials Total SRISK (US$ billion)

Risk Analysis Overview - Europe Financials Total SRISK (US$ billion)
VOLATILITY
CORRELATION
SYSTEMIC RISK
LONG RUN VALUE AT RISK
LIQUIDITY
The Liquidity Team

- Rob Capellini - V-LAB Director WOW!!
- Robert Ferstenberg – Consultant Extraordinary
- Emil Siriwardane – PhD. in process – Great Expectations
- Yakov Amihud – All World Liquidity Team
- Joel Hasbrouck – All World Liquidity Team
- Viral Acharya and Matt Richardson – the Systemic Squad
WHERE IS THE LIQUIDITY?
Today I will show you our progress in adding a liquidity page to V-LAB.

Initially this will be confined to US and some foreign equities.

Eventually it will include other asset classes and reasonable foreign coverage.
Monitor levels of illiquidity in equities and other assets for evidence that financial markets are freezing.

Examine fluctuations in liquidity estimates for individual assets and the market.

Estimate expected execution costs including price impact over time and assets using publicly available data.
- Amihud’s ILLIQ

\[
ILLIQ = \frac{|\text{return}|}{\text{dollar volume}}
\]

- Bid Ask relative spread

\[
\frac{\text{Ask} - \text{Bid}}{(\text{Ask} + \text{Bid})/2}
\]

- Price Impact for buy (- for Sell)

\[
\text{Expected Shortfall} = \frac{P^\text{Execution} - P^\text{Arrival}}{P^\text{Arrival}}
\]
For economic decision making, we need forecasts of liquidity.
- We might be scheduling trades or
- we might be forming portfolios with certain liquidity properties.
- We might be liquidating positions or
- backtesting a trading strategy.
- We might be setting clearing margins

We might want to know the distribution of liquidity measures, not just the expected value.
How can we forecast something we cannot measure?

How can we forecast something that cannot be anticipated? When liquidity disappears, it surprises all agents.

These arguments can also be made about volatility and there are some close connections.
Forecasting non-negative processes – can you be sure you won’t predict a negative value when it should be impossible?

MEM – Multiplicative Error Model, Engle 2002

\[ y_t = \mu_t \nu_t, \quad E(\nu_t) = 1, \quad \nu \sim [0, \infty), \quad \mu_t(\theta) \geq 0 \forall \theta \in \Theta \]

For example: \( \nu_t \sim X_1^2, \quad \mu_t = \omega + \alpha y_{t-1} + \beta \mu_{t-1} \)

We can see that the square root of \( y \) is a normal garch. Parameter estimation is by MLE and will be the same for the whole family of Gamma distributions. Qmle for other distributions.
Take square root of ILLIQ and estimate it with a GARCH program. The estimate of the conditional variance is the mean of ILLIQ.

Use Spline GARCH to adjust for non-stationary distribution of ILLIQ.

Use signed square root of ILLIQ with asymmetric GARCH models such as GJR to show asymmetry in ILLIQ.

UNITS: basis points of return per million $ of volume.
GOOGLE SINCE IPO

Date Range: from 08/23/2004 to 03/24/2014

V-Lab (2014)

Google Inc - Asymmetric ILLIQ Liq Prediction

Google Inc Return
Google Inc Dollar Volume

Jan '05 Jan '06 Jan '07 Jan '08 Jan '09 Jan '10 Jan '11 Jan '12 Jan '13 Jan '14
Parameters Blackstone

Parameter Estimates

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Today's News Impact Curve

Annualized Liquidity Predictions

1d 1w 1m 6m 1y

360 240 120
Does ILLIQ really measure execution cost? Can we trade a million $ of some asset for ILLIQ bp?

Some evidence from other measures.

What is the Bid Ask spread as a percent cost? This is a minimum for the cost of trading.
Engle Ferstenberg and Russell (2012) JPM

\[ \text{ExpectedShortfall}_i = e^{X_i\beta} + e^{X_i\gamma} \varepsilon_i \]

- In this model the data are trades and the Xs are characteristics such as size, volume, volatility and spread and how the trades are executed.
- The model is estimated on a year of trades from a big broker prior to the financial crisis.
- With this model we can estimate the cost of a 1%ADV or a $1 Million trade.

\[ \text{ExpectedShortfall} = \beta_1 \text{BASpread} + \]
\[ + \beta_2 \text{Volatility} \times \sqrt{\frac{\text{Size}}{\text{AverageDailyVolume}}} \]

This model is also typically estimated using actual trades.

We will approximate it by thinking of a trading day. Often trades go primarily one way during a day so it may be useful to think of it as one large trade.
Taking absolute values to include both buying and selling days, the model becomes

\[ |\text{Return}| = \beta_1 \text{BASpread} + \beta_2 \text{Volatility} \sqrt{\frac{\text{Volume}_t}{\text{AverageDailyVolume}_{t-1}}} \]

The coefficients can be estimated for a time series of days or a panel of days and names.
IBM Results

- SPREAD*10000
- EFRCOST_1M
- EFRCOST_1PERCENTADV
GK ESTIMATES

SPREAD*10000  ILLIQAMEM  GKCOST_1M  GKCOST_1PERCENTADV
Don’t ask....