

GLOBAL FINANCIAL STABILITY AND LONG TERM RISKS

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Eotvos Lorand, December 2009

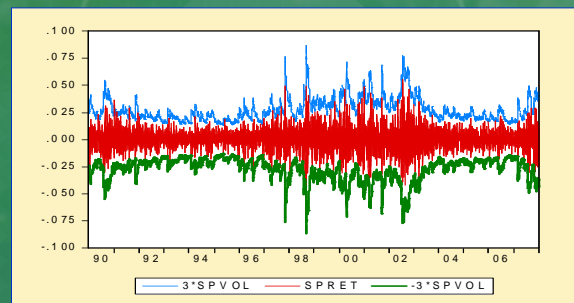
WHAT IS FINANCIAL MARKET VOLATILITY?

- Unpredictable movements in asset prices.
- Although we cannot predict future asset prices we can predict their magnitude.
- Thus we can predict risk
- How can we do this and does it work in turbulent times?

ARCH MODEL

- The ARCH model predicts the variance of returns on the next day.
- Autoregressive Conditional Heteroskedasticity
- It relies on two features of returns
 - Volatility Clustering
 - Mean Reversion of Volatility
- Econometric Methods fit this model to data including many varieties, GARCH, TGARCH,...

Plus and Minus three Sigma



SURPRISING SUCCESS

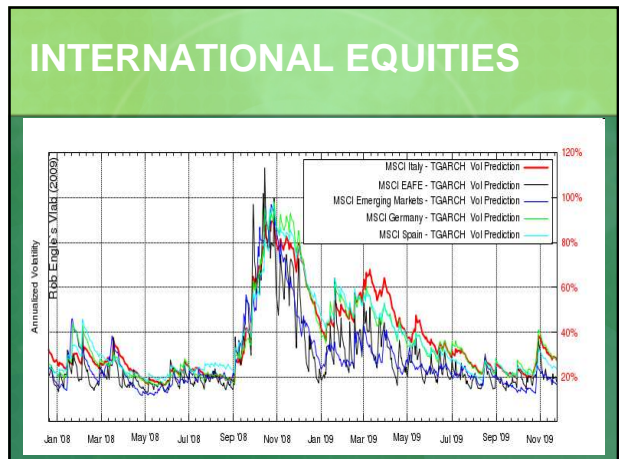
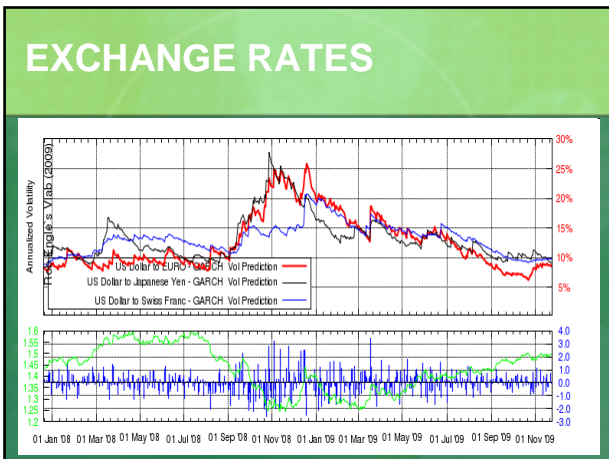
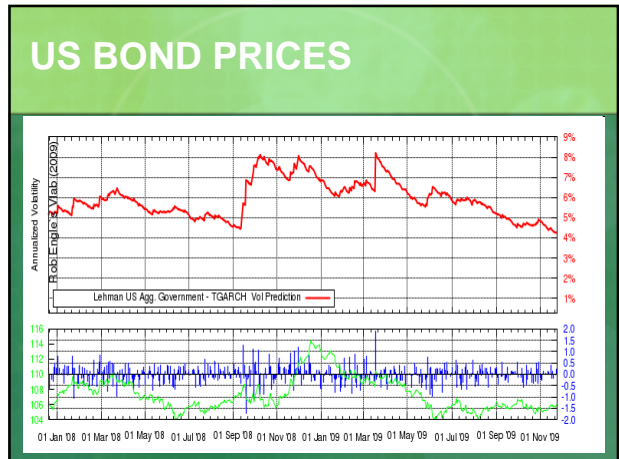
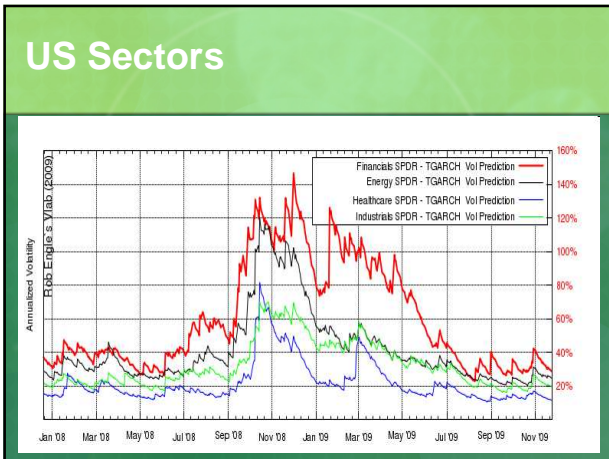
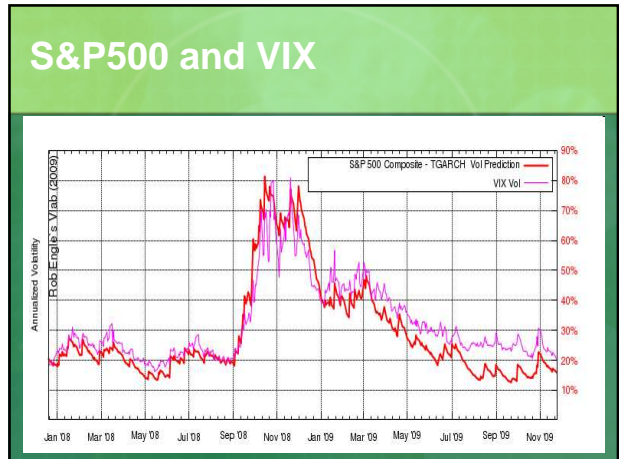
- Although the original application of ARCH was macroeconomic, the big success was for financial data.
- Why does it work?
- What makes volatility high?

BETTER ANSWER

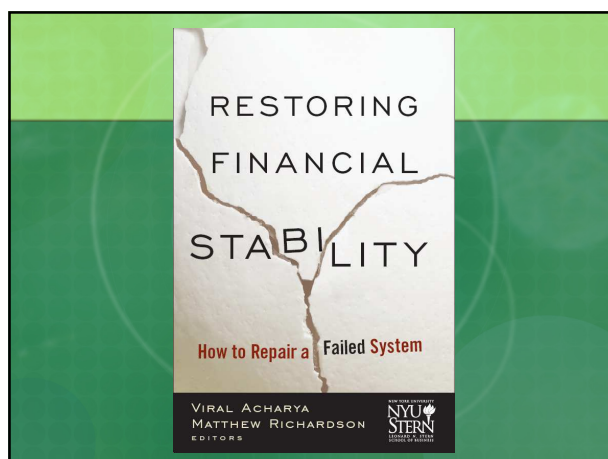
- Economic news on future values and risks moves prices
- Volatility is the natural response of a financial market to new information.
- News arrives in clusters.
- *High volatility means a cluster of important news!*

VOLATILITY

Through November 25, 2009
 VLAB <http://vlab.stern.nyu.edu>



FINANCIAL CRISIS - CAUSES



FUNDAMENTAL CAUSES OF FINANCIAL CRISIS

- ***Risk was underestimated*** by many market participants (traders, money managers, bank ceo's and boards, ratings agencies, regulators, investors and probably risk managers)
- ***Many of these had strong incentives to ignore risks.***

IMPROVING RISK MEASUREMENT

SHOULD WE HAVE KNOWN?

- Would a good econometrician and risk assessor have known that the financial crisis was coming?
- Would the crisis have been in the confidence set?
- Was there information that risk assessment typically misses?
- Would economics have helped?

FORECAST PERFORMANCE IN VLAB

- During the financial crisis, the short run forecasts were just as accurate as during the low volatility period.
- One month ahead forecasts were less accurate during the crisis but were still within the 1% confidence interval of historical and theoretical experience.
- See Brownlees, Engle, Kelly, "A Practical Guide to Forecasting in Calm and Storm"

SHORT RUN VS. LONG RUN RISK

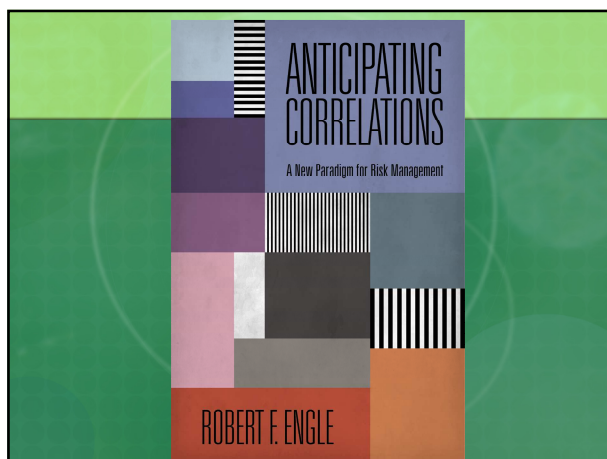
- Widely used risk measures are Value at Risk and Expected Shortfall.
- These measure risk at a one day horizon (or 10 day which is calculated from 1 day)
- However, many positions are held much longer than this and many securities have long horizons.
- *There is a risk that the risk will change!!*

INVESTING IN A LOW RISK ENVIRONMENT

- Many investors took low borrowing rates and low volatilities as opportunities to increase leverage without much risk.
- Structured products such as CDOs were very low risk unless volatility or correlations rose.
- Insurance purchased on these positions made the risks even lower as long as the insurer had adequate capital.
- Credit spreads were low because volatility was low.

WHAT HAPPENED?

- Volatilities and correlations rose and all these low risk positions became high risk and impossible to sell without deep discounts.
- Insurance became worthless as insurers were undercapitalized.
- Options market and many forecasters including myself believed volatility would rise.
- Risk measurement does not have a good way to incorporate this information.



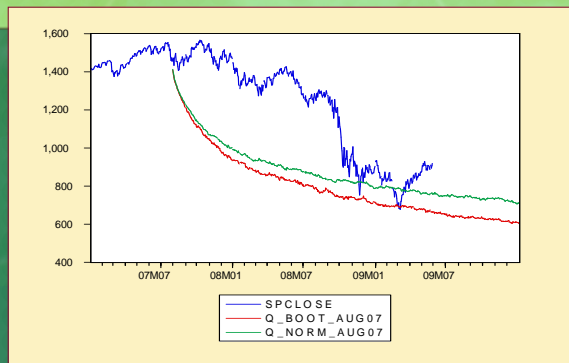
HOW TO MEASURE TERM STRUCTURE OF RISK?

- Calculate VaR and ES for long horizons with return processes that allow changing risk.
- Use economic information to improve these estimates
- Continue to use Scenario and Stress Testing

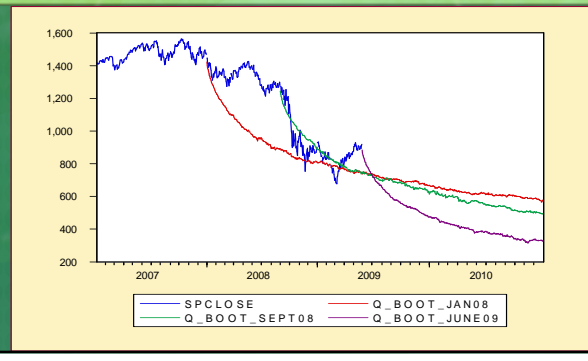
SIMULATED 1% QUANTILES FROM TARCH

- Using S&P500 data through 2007, estimate a model.
- Simulate from the model 10,000 times and calculate the 1% quantile.
- Assume either normal shocks or bootstrap from historical shocks.

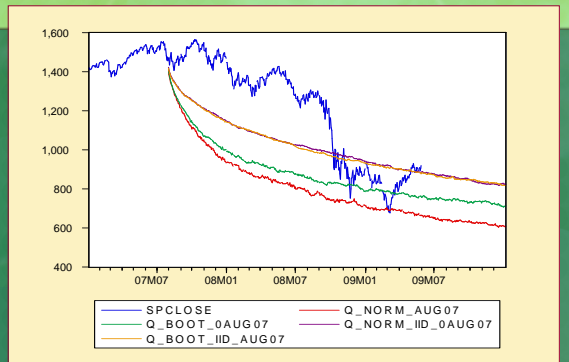
1% Quantiles starting August 2007



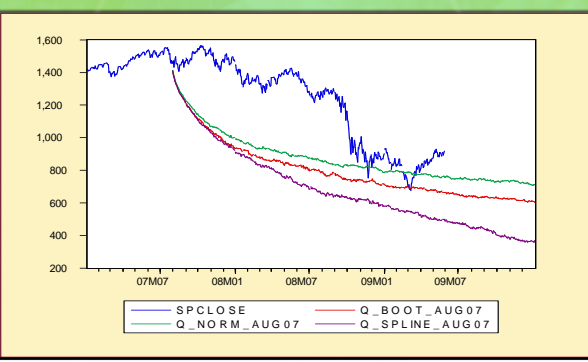
1% Quantiles starting Jan 08, Sept 08 and June 09



1% Quantiles for iid returns



1% Quantile for Spline GARCH with forecast of rising volatility



INVESTOR REACTIONS TO HIGH LONG TERM RISK

- Investors may shorten holding period. Selling on rising risk is “market timing” and faces risk of panic selling.
- Investors may take smaller positions as assets are less desirable. Thus risk premium is higher and asset prices are lower.
- Investors may choose to hedge long term risks. How good are these hedges? Hedge portfolios:
 - Volatility
 - Gold
 - Government bonds
 - High grade corporates

CONSEQUENCES

- LONG RUN RISKS MAKE INVESTING RISKIER AND SHOULD LOWER THE PRICE OF ASSETS TODAY BY INCREASING THE RISK PREMIUM.
- REDUCING LONG RUN RISK SHOULD INCREASE ASSET PRICES TODAY.

HOW TO CORRECT INCENTIVES?

TWO KINDS OF RISK

- INDIVIDUAL RISK
- SYSTEMIC RISK

REGULATION

- Regulate to reduce systemic risk, not all risk
- Tax on biggest, most systemically risky firms – not just financials
- Tax rate is countercyclical – higher when economy is doing well
- Coordinate globally
- Establish legal resolution authority to wind down complex financial institutions in bankruptcy.
- Reduce role of ratings agencies in capital requirements.

IT IS TIME

- It is now time to put new regulatory structures in place.
- It is time to coordinate this process globally.
- As the finance sector recovers, there is a temptation to return to business as usual.
- We cannot foresee the next crisis so we need robust institutions and appropriate incentives.

LONG RUN RISKS

FUTURE FINANCIAL INSTABILITY

- Reducing this risk will improve financial markets now.
- This is the G-20 agenda and finance ministers globally.
- This risk is being hedged by investors with big appetites for US Treasuries, gold, and maybe volatility products
- We also see substantial cash on the sidelines, trying to time the market.

THE RISK OF WAR AND TERRORISM

- Deteriorating Global Economy
- Increasing income differential between rich and poor countries
- Rising fundamentalism
- Rising social unrest
- Competition for resources

- Increase the risk of War and Terrorism

DEPRESSED ASSET PRICES

- Rising Long run risks lower asset prices as investors are more cautious.
- This raises the cost of doing business and raising capital
- This reduces income of entrepreneurs
- And costs jobs

WHAT TO DO?

- **PROMOTE PEACE AND STABILITY**

- **PEACE PERMITS PROSPERITY**

BENEFITS

- Reducing future risk of war/terrorism
- Yields benefits today by
- Improving business and stock market valuations and
- Creating jobs

GLOBAL OVERHEATING

WHAT ARE THE RISKS?

- Scientific evidence seems clear that the climate is changing.
 - CO₂ concentrations are rising rapidly
 - Glaciers and polar ice are melting
 - Warmest years on record are almost all within 10 years.
- But what are the costs? Scientific evidence is not precise.

ECONOMIC COSTS

- THE GLOBAL ECONOMY WILL BE UNABLE TO PRODUCE AS MUCH IN THE FUTURE AS IT WOULD WITHOUT CLIMATE CHANGE
- TAXES WILL BE RAISED TO PAY FOR PUBLIC EFFORTS TO MITIGATE THESE COSTS
- COMPANIES WILL HAVE EXTRA COSTS OF DOING BUSINESS SO PROFITS WILL BE LOWER.

FINANCIAL MARKET EVALUATION OF CLIMATE RISK. *IS CLIMATE RISK PRICED?*

- Can we see evidence of climate risk in financial markets?
- We would expect that stock prices would be depressed by climate risk.
- This should be especially true of businesses that will suffer from climate change.
- We expect high prices for assets that will benefit from climate change as these are the hedge portfolios.

A SOLUTION

High Oil Prices are a Good Thing!

- These encouraged consumers and industry to use less oil
 - Driving in the US was down
 - Hybrid Cars were selling and SUV's were not
 - House prices in the suburbs were declining more than in the central city
 - Ridership on public transportation was up
- Today these effects may be reversed.

A SOLUTION

- Most Economists believe the best solution to global overheating is a comprehensive tax on carbon emissions and other greenhouse gases.
 - Only if it is comprehensive will it encourage alternative energy solutions
 - Only if it is comprehensive will efforts to avoid the tax be socially beneficial.
- In a time of big deficits, such a tax might be politically acceptable.

Cap and Trade

- This is the Obama choice
- Kyoto agreement and probably Copenhagen outcome
- Covers only a subset of emissions
- Raises consumer prices only if certificates are scarce.
- Raises revenue only if certificates are sold, not given away.
- Likely to be expensive and ineffective.

CONCLUSION

- Make sure you take only the risks you intend to take including long term risks.
- Regulators should reduce incentives to take systemic risks.
- Policy makers must know that reducing long term risks gives benefits today.