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Liquidity, Credit and Corporate Finance

And the fundamental things apply,

As time goes by.

FactSet Symposium

June 2009

Con Keating

Liquidity

- Is loosely used in practice and inchoate in result
- In asset pricing theory liquidity is perfect
- We often talk of the liquidity of an asset when we mean tradability
- Liquidity is **money**
- Outside, public money is the gold standard – though fiat in nature
- Currency in circulation or deposits at the central bank
- Inside, private commercial bank money is created through the credit process
- There is a question of the substitutability of inside private money for outside public money
- The **liquidity** of an asset is its "***moneyness***", the degree to which it can substitute for outside, public money

Credit and Markets

- A quotation from the May 2009 BIS "*Findings on the interaction of market and credit risk*"
- "Securitisation transforms credit risk into market risk by pooling loans and issuing tradable claims against the pool."
- **This is wrong – it is muddleheaded nonsense**
- Credit is an expectation of specific liquidity – usually the source, amount and timing are known
- Credit risk is the extent to which this expectation deviates from the nominal amount
- It is a first moment and first moments are additive
- There is no benefit to diversification per se
- Market prices are also expectations of liquidity – but less well defined

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Markets

- The source of liquidity is market participants (who are uncommitted)
- **Markets do not create liquidity**
- **They distribute it**
- The amount is the price
- And the timing immediate
- If a bank buys a security from a market, it is supplying liquidity and creating credit
- Securitisation – the credit risk of the pool of mortgages is the same before and after securitisation
- The risk transform is of funding risk to the bank for market risk for the investor owner

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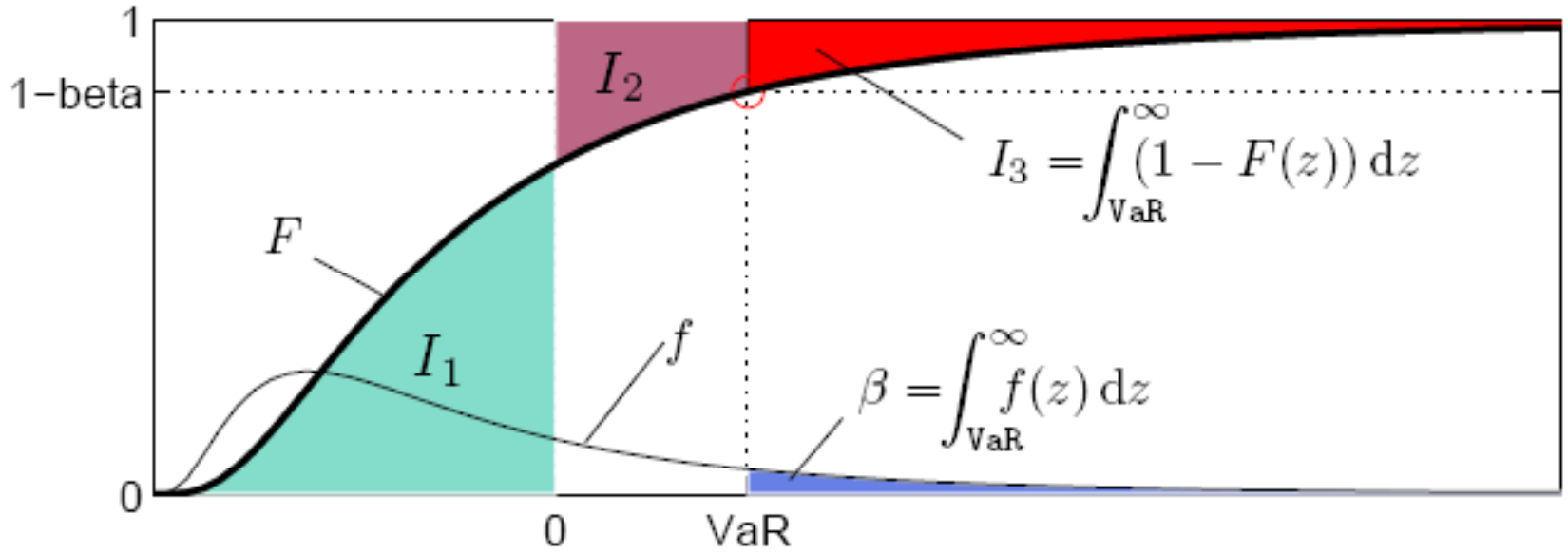
VaR and Shortfall
The conventional

Beware of mixing expectations – credit risk [E(X)] but most risk measures are second moment based [SQRT ($E(X)^2$)]



$$\text{ES} = \text{VaR} + \frac{1}{\beta} \text{I}_3$$

$$\text{VaR}_{1-\beta} = \text{F}^{-1}(1-\beta)$$

But beware the discrete, and do remember that a sample arises from within the true distribution

Value at What?

- There is no time dimension to VaR
- So this is not a dynamical measure
- As such as a risk measure it is incomplete
- This is actually an exercise in comparative statics
- As are most of the Greeks in option pricing
- Or duration and convexity in bond evaluation
- Keynes / Hicks model equilibria are the results of dynamical systems which have ceased movement
- The actual gain or loss forecast is simply the mean of the distribution
- Climatology rather than Meteorology

Comparative Statics vs Dynamics

- Comparative statics shows us how the equilibrium, wrt to a particular set of circumstances, when a particular parameter changes
- However the displaced equilibrium will not be that to which the disturbed system converges
- Rather, the very process of convergence, of adjustment to the displacement, will itself further change the equilibrium
- Whether or not the ultimate equilibrium will be close to the one predicted by the comparative statics or even whether the ultimate effects of the displacements will be in the predicted direction is not a question that lends itself to a general answer
- The answer depends on the effects of the parameter shift on the adjustment path of the system – on the comparative dynamics rather than on comparative statics

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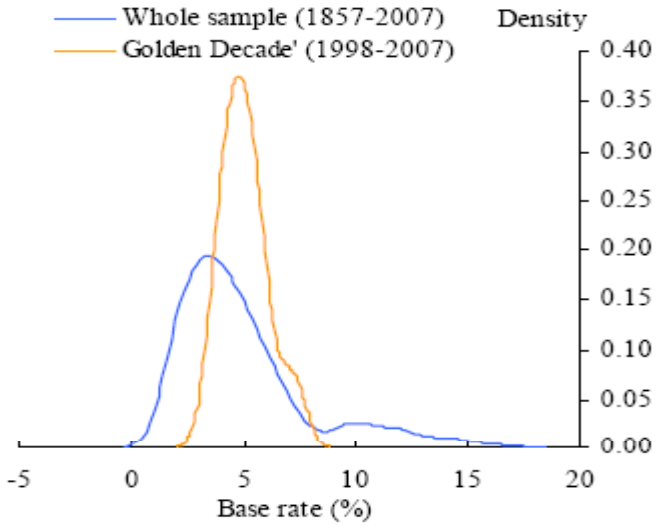
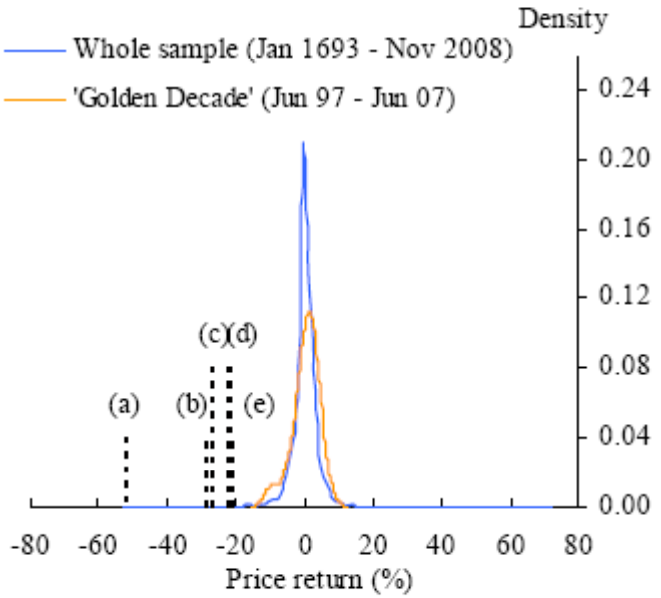
- Representativeness

UK Base rate



FTSE All-Share Index



Sources: Global Financial Data and Bank calculations.
(a) September 1720 (South Sea Bubble)
(b) October 1720 (South Sea Bubble)
(c) October 1987 (Black Monday - portfolio insurance)
(d) July 1940 (WWII - merchant ships attacked)
(e) March 1974 (Price/wage controls, unions, etc.)

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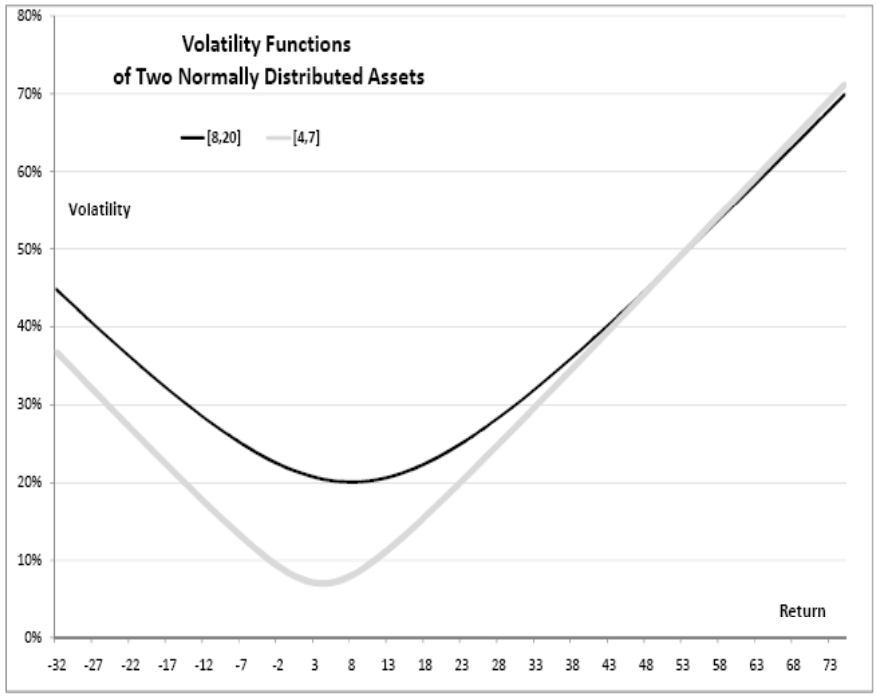
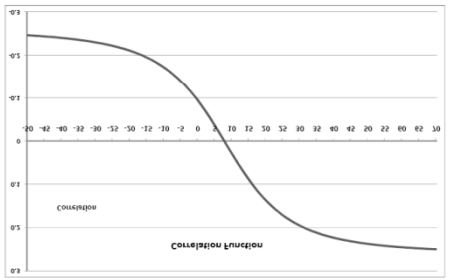
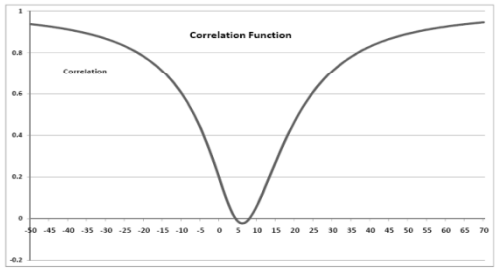
Forecasts and Stresses

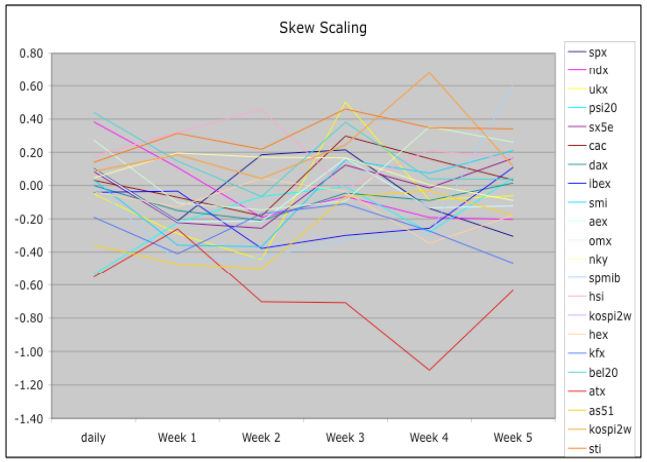
Forecasts are ensembles

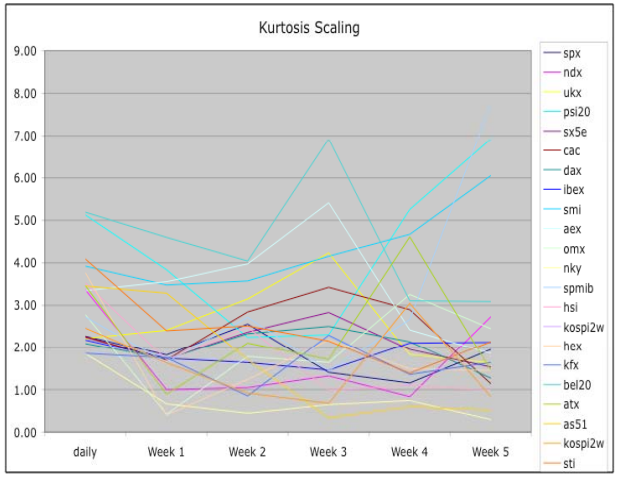






And higher moments nonsense



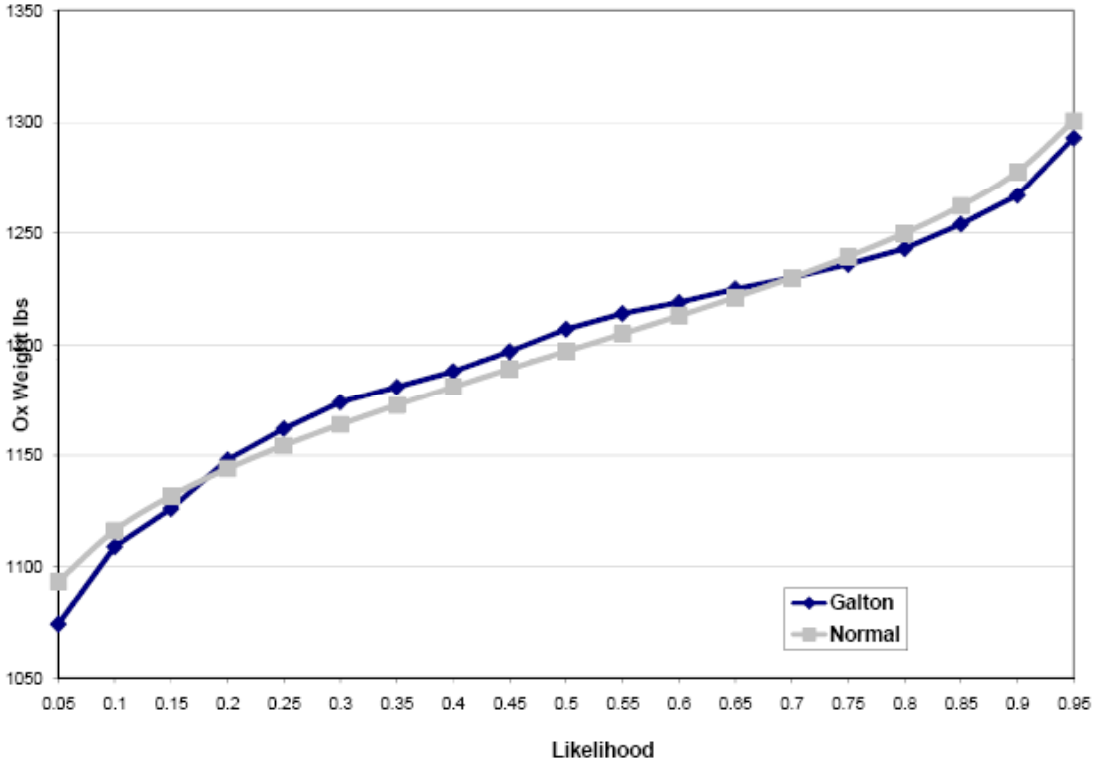


Galton

Laws of large numbers

The average will always be better than most individual

False



Some individual forecast will always outperform the average

Not Necessarily – think of 3,3,3,8,8 (av. 5) and an outcome of 6

Whenever most forecasts perform substantially worse than average, then some will always perform substantially better

False

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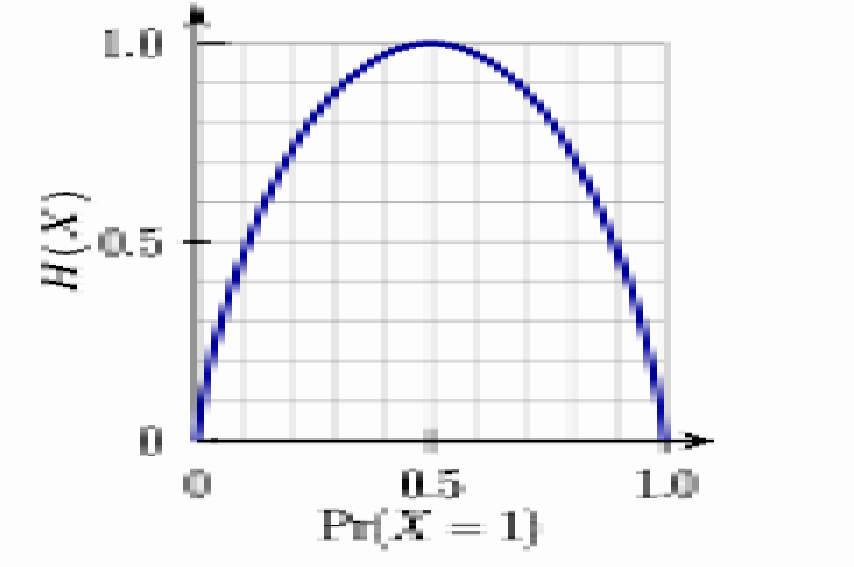
Information

Entropy $H = \sum_{i=1}^{n} p_i \ log_2 \left(\frac{1}{p_i}\right)$ has a direction in time

informative wrt information packing within a distribution

Extends to within group
and among group decompositions



Successful prediction involves new instances of familiar phenomena and the occurrence of new phenomena – This is item novelty versus type novelty

Not just quantitatively more wrt old ground, but qualitatively new in broaching new ground – not just predictions but **surprising** predictions

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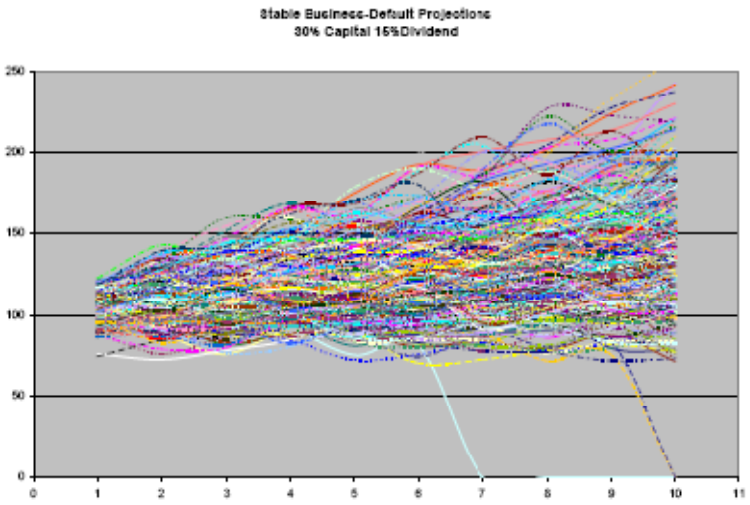
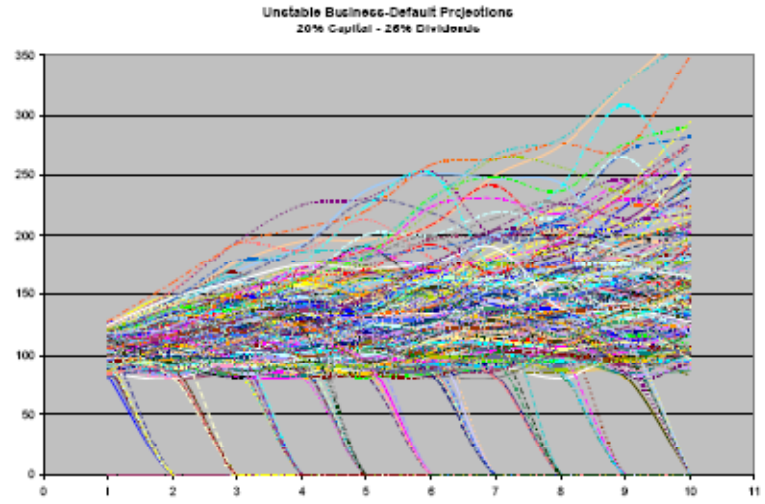
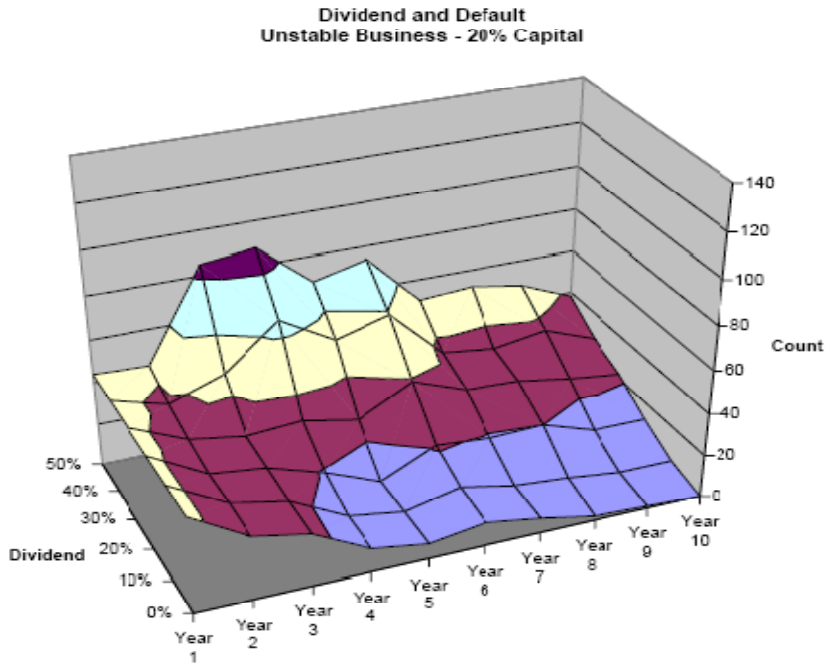
Default

30% Dividend	Cumulative Default Probability	Annual Default Likelihood
Year 1	1.0%	1.00%
Year 2	2.6%	1.62%
Year 3	4.3%	1.75%
Year 4	7.2%	3.03%
Year 5	9.0%	1.94%
Year 6	10.6%	1.76%
Year 7	11.8%	1.34%
Year 8	13.5%	1.93%
Year 9	15.1%	1.85%
Year 10	16.3%	1.41%







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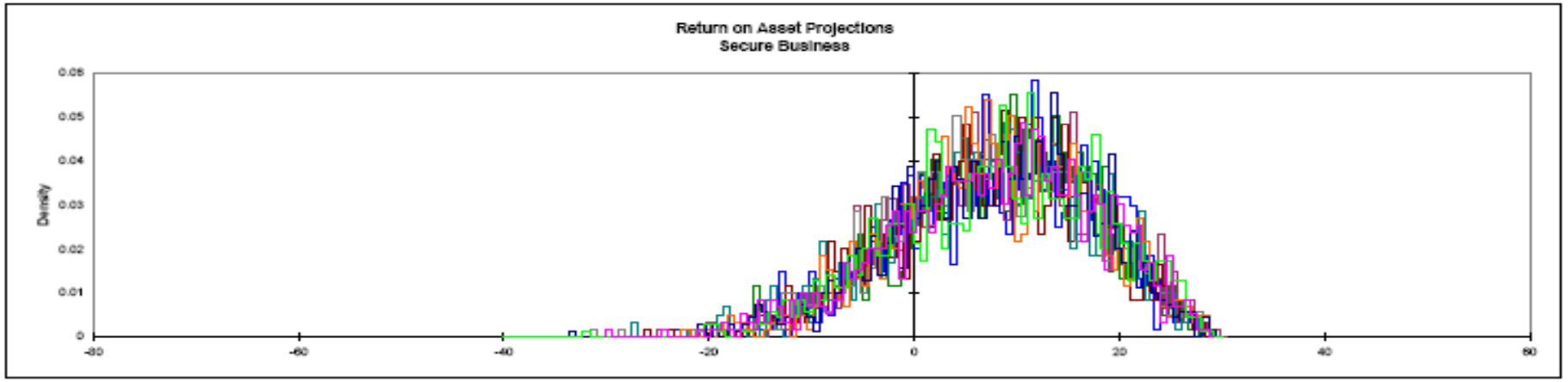
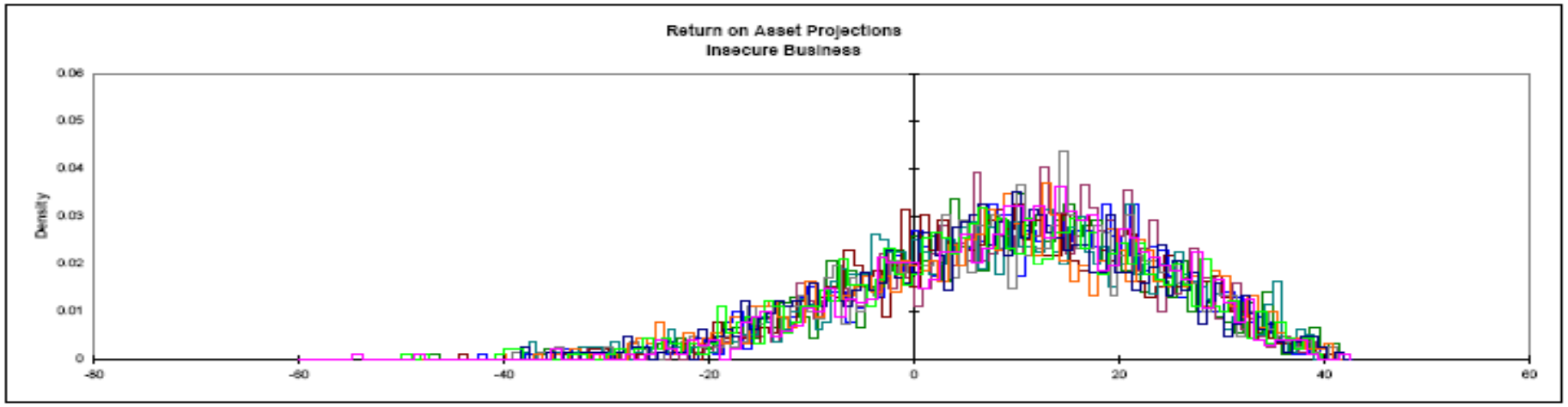
Monte Carlo

Increasing the sample size increases the quality of fit to the assumed distribution

Everything done in PDF and CDF – what about Quantile Functions?





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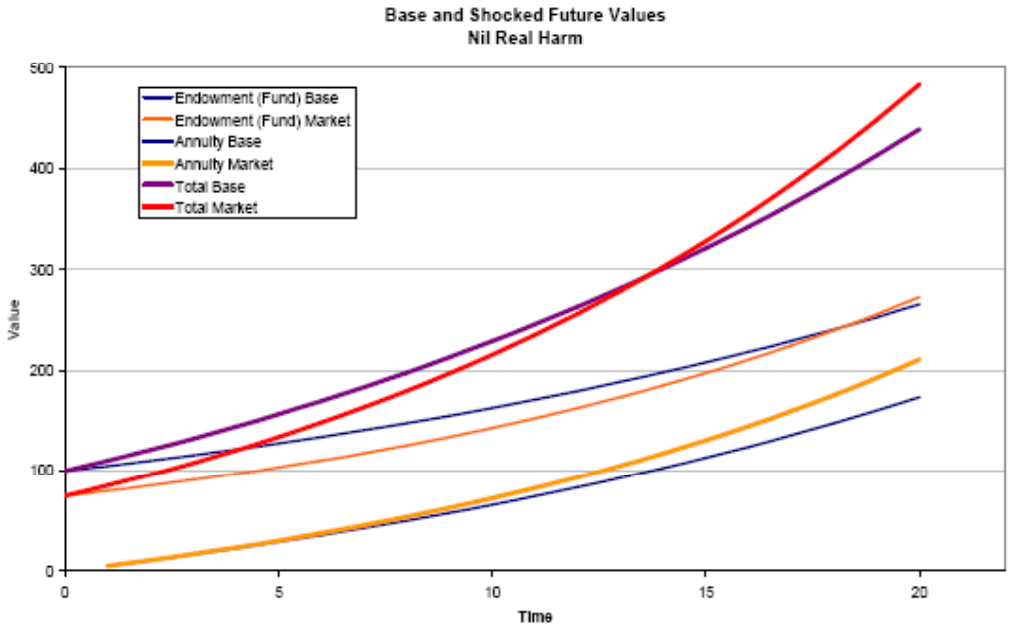
Future Cash Flows

Fund consists of principal endowment and dividend cash-flows



Shock the market price by 25% but leave dividend income unchanged

In 13 years the fund is better off

In less than 20 years the endowment is greater

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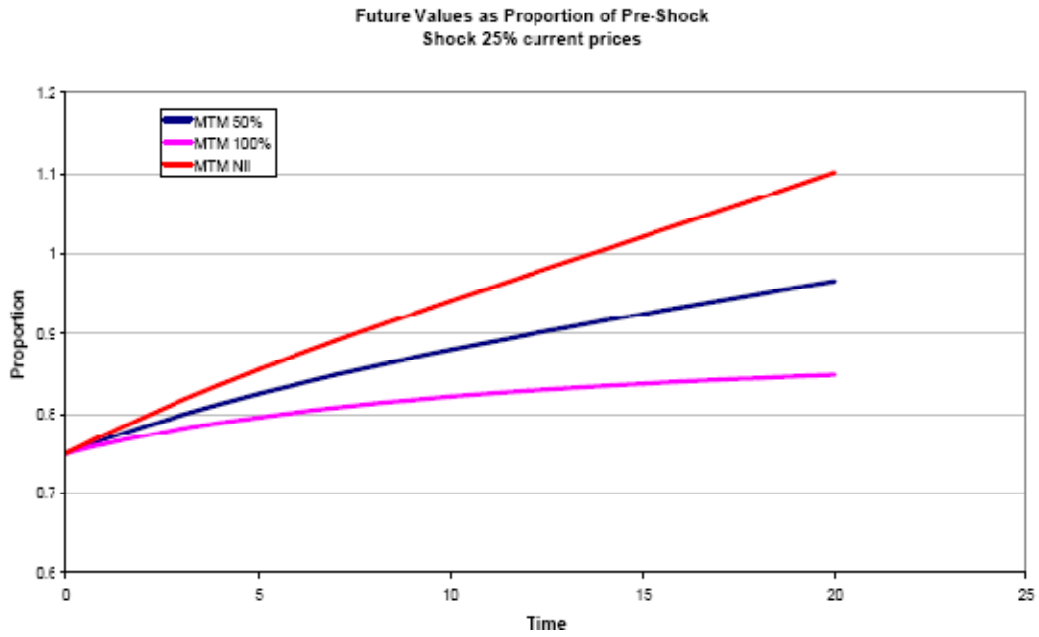
Cash-Flow Reinvestment

Earlier result varies with the level of harm to cash flows



With dividend flow unchanged, the endowment capital value rapidly surpasses the prior value

Only in the case of all market decline being reflected in income loss does the difference never get recaptured

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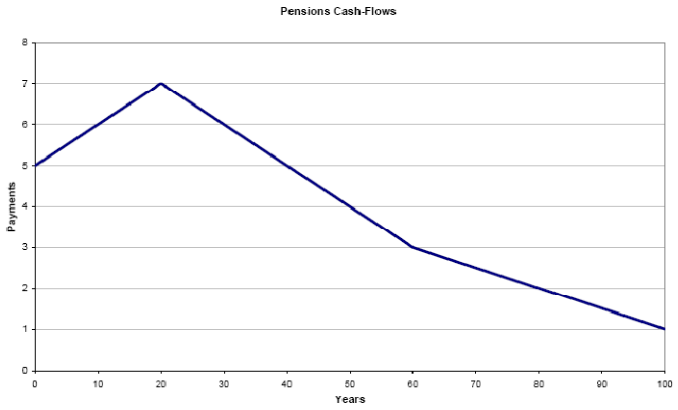
Survival Times



Cash-flow Life (Years)				
	Interest rate			
	Three	Five	Seven	Ten
50% Funded	18	13	10	7
60% Funded	22	17	13	10
70% Funded	29	21	17	13
80% Funded	36	27	22	17
90% Funded	49	38	30	23
100% Funded	NM	NM	NM	NM

The interesting feature of this stylised model is that the lower interest rates are, the longer one has to rectify deficits.

It also suggests that scheme specific funding should be interest rate dependent.

Finally it demonstrates the inadequacy of the view of risk management as concerned only with the immediate.

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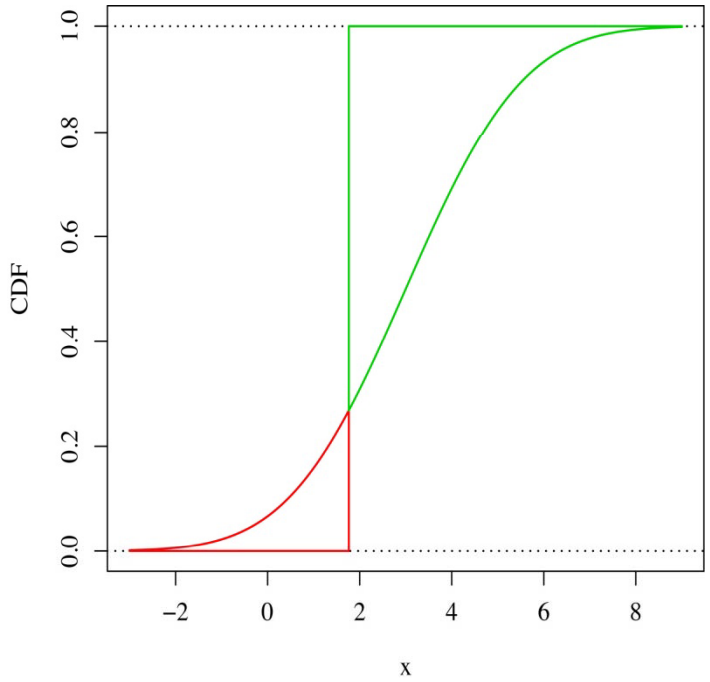
The Omega function

The Omega function of a distribution is an intuitive approach to assess the quality of a bet. It is defined by:

$$\Omega_F(r) = \frac{\int_r^{\infty} (1 - F(x))\,dx}{\int_{-\infty}^{r} F(x)\,dx}$$



It corresponds to the sum of the amounts considered as a win multiplied by their corresponding probabilities divided by the sum of the amounts considered as a loss multiplied by their corresponding probabilities.

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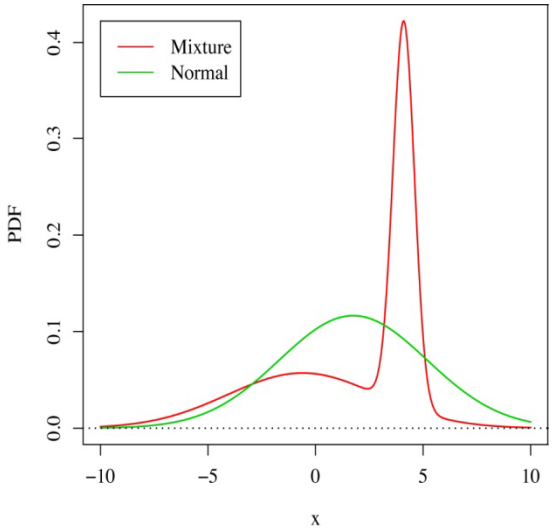
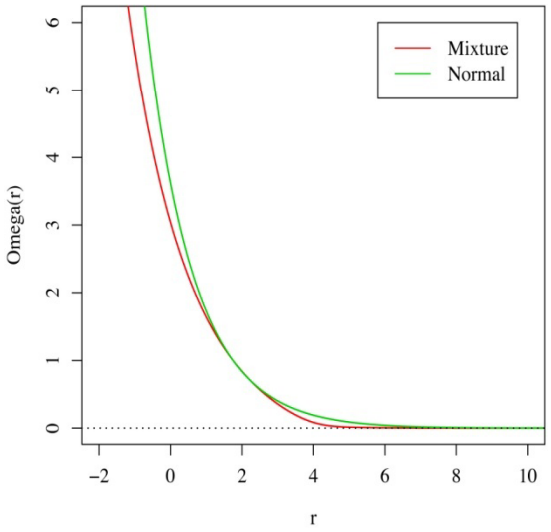
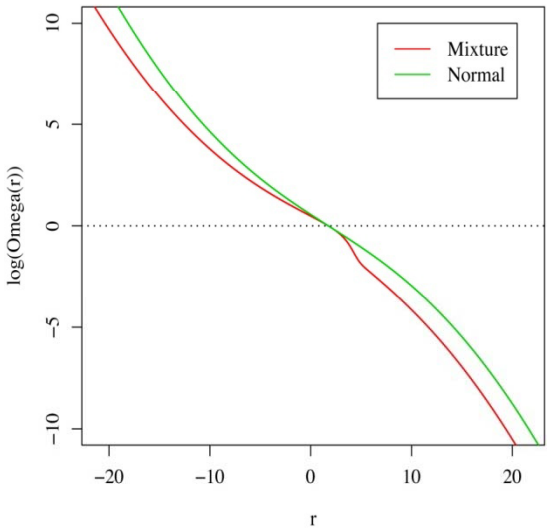
Some characteristics

- At any particular threshold *r*, the larger the Omega value the higher the quality of the bet
- It is positive and monotone decreasing; it goes to infinity on the left and to zero on the right
- It takes value 1 at the mean of the distribution







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Important properties

- The Omega function is mathematically equivalent to the cumulative distribution function (CDF). This means that
  - To each CDF corresponds a unique Omega function
  - All information contained in the CDF in also contained in the Omega function (eg. all moments of the distribution, the tails behaviour, etc)
- Some equivalent formulations:
  - Call-put ratio (2.):

$$\Omega_F(r) = \frac{\mathrm{E}_F\{\max(x-r,0)\}}{\mathrm{E}_F\{\max(r-x,0)\}}$$

  - A derivation of the put-call parity (3.):

$$\Omega_F(r) = 1 + \frac{\mu_F - r}{\mathrm{LPM}_{1,F}(r)}$$

  - Partial moments formulation:

$$\Omega_F(r) = \frac{\mathrm{UPM}_{1,F}(r)}{\mathrm{LPM}_{1,F}(r)}$$

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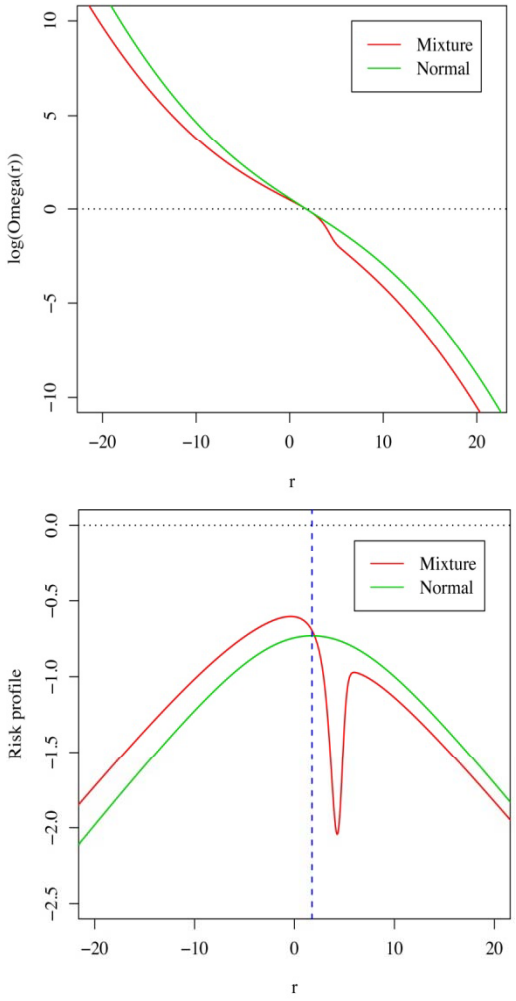
Measuring risk

Omega functions also provide a natural measure of risk: the slope of log(Omega).

- It corresponds to the relative rate of change of the quality of the bet.
- At the left of the mean, the lower the better.
  A fast increase towards the left offers downside protection.
- At the right of the mean, the higher the better.
  A slow decrease towards the right offers upside potential.

There are many places in finance where we can exploit the duality of the first derivative and the second moment.



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Omega Optimisation

Five assets – of which two are almost identical

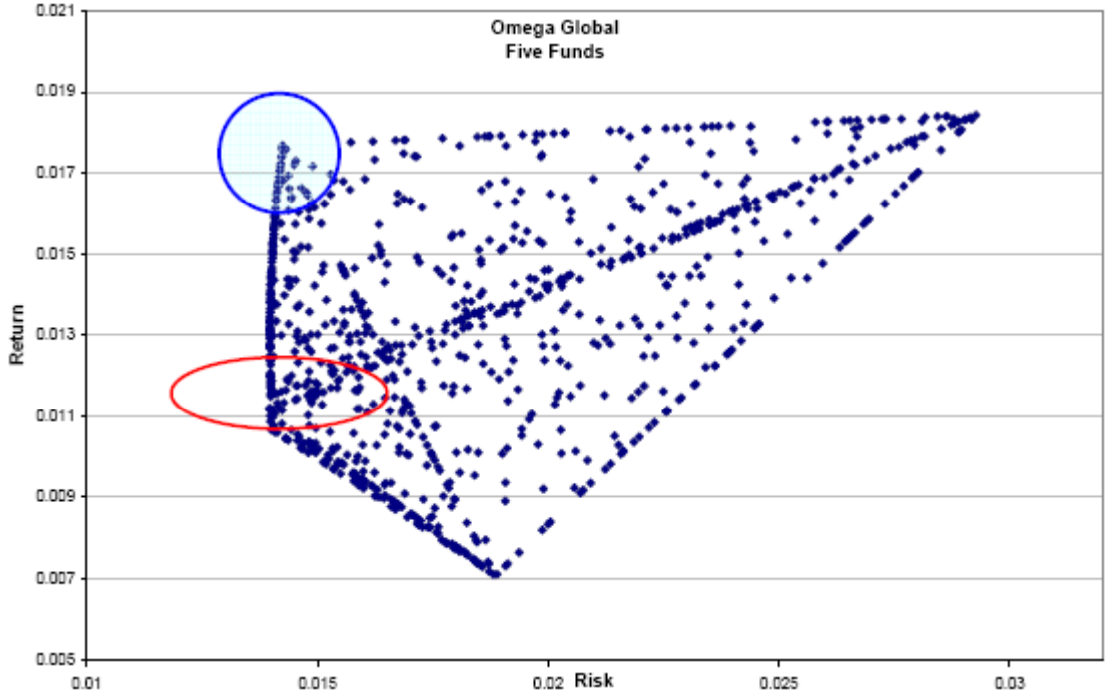

Diagram 4: Average Risk / Return space

Return – Risk (Omega Global)

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Secondary Objective

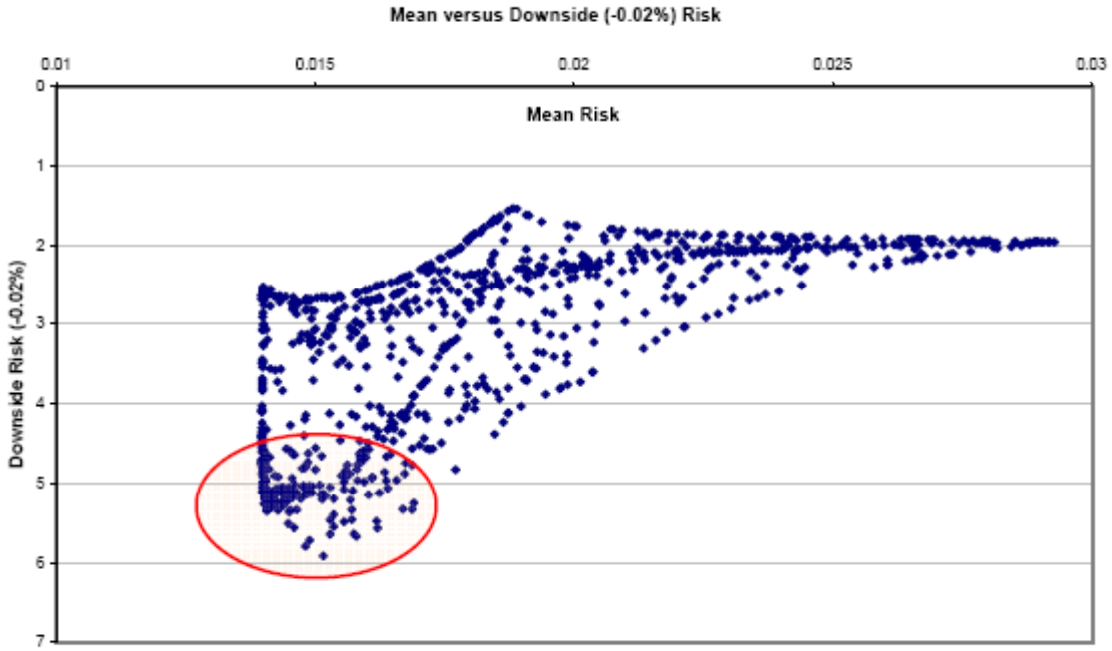

Diagram 5: Omega Mean versus Downside Risk

Mean Risk versus Downside Risk

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Secondary Choice

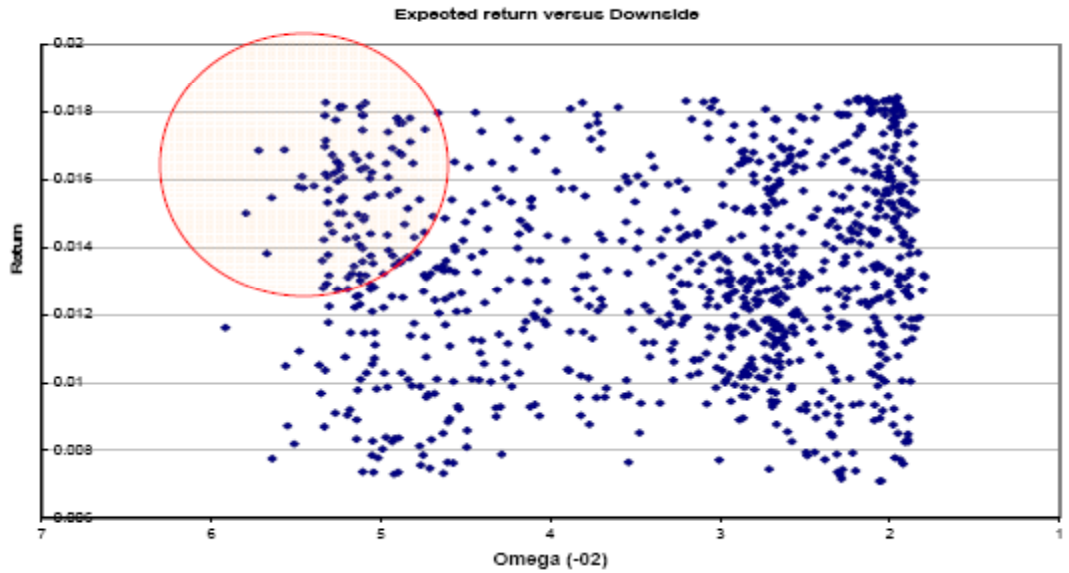

Diagram 6: Downside risk versus Mean Return

Mean return versus downside

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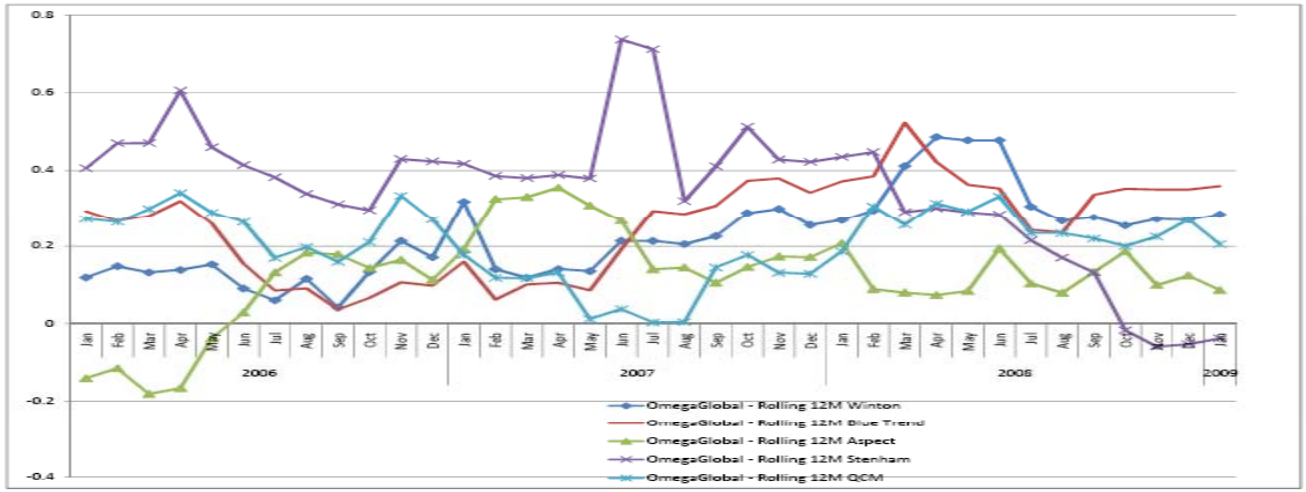
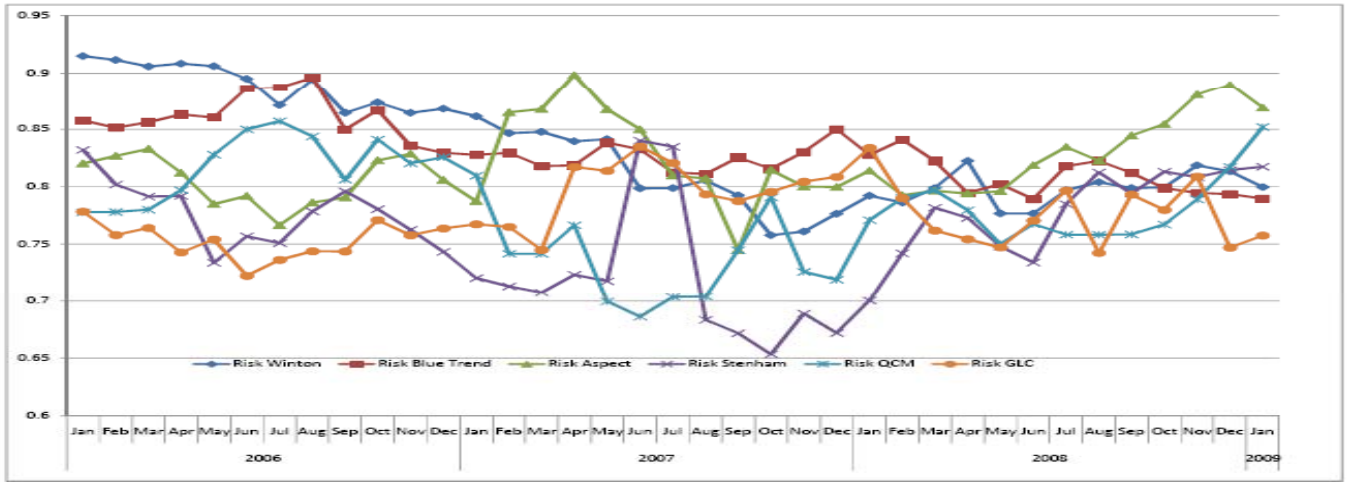
Performance Monitoring



Instability in performance is the rule
But there is enough predictability for profit



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The Future

- Co-ordination Effects
- Learning Effects
- Self-Reinforcing Expectations
- Large Set-up or Fixed Costs

Lead to…

- Multiple equilibria
- Path dependence
- Lock-in
- Possible inefficiency
- The theory of value is not satisfactory without a description of the adjustment processes that are applicable to the economy and of the way individuals adjust to disequilibrium

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An ending quotation

Because things are the way they are, things will not stay the way they are.

Bertolt Brecht (1898 - 1956)

Life can only be understood backwards; but it must be lived forwards.

Soren Kierkegaard (1813 - 1855)

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