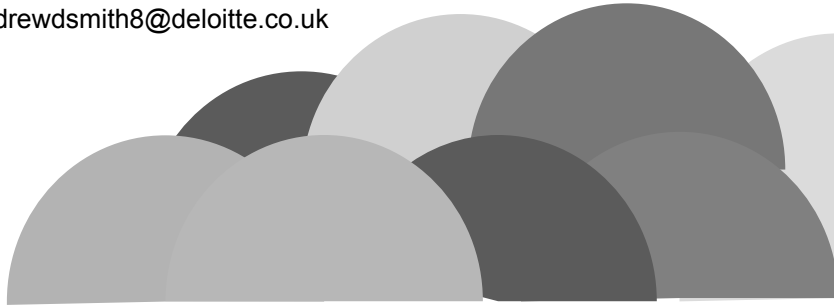


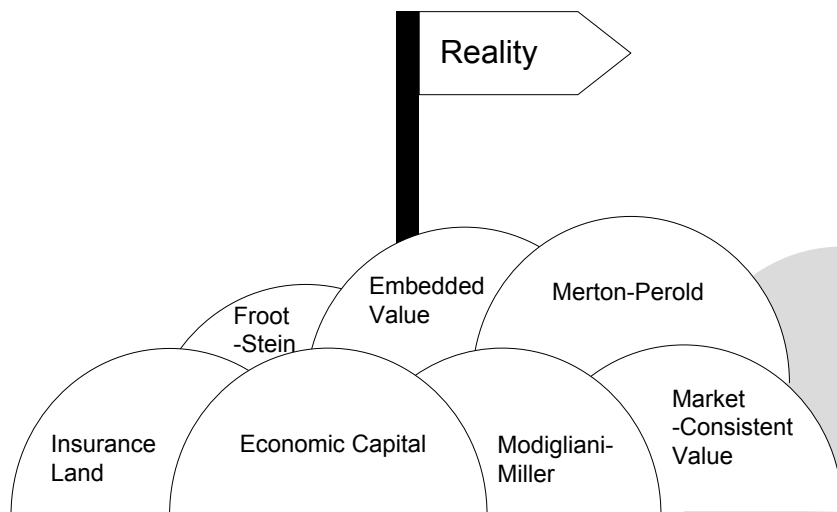
Deloitte.

# What Can Markets Tell about Rare Events?

Keynote Address  
4<sup>th</sup> Enterprise Risk Management Symposium  
Chicago, 25 April 2006  
Andrew Smith  
andrewsmith8@deloitte.co.uk



## From Insurance Land to Reality



## What I'm Going to Talk About

1. 冰淇淋顶料

2. Markets and Statistics for Capital Modelling

3. What this means for Pricing and Performance

## Ice Cream Topping Menu

冰淇淋顶料  
巧克力酱  
蒜味美乃滋酱  
辣椒酱  
酱油  
培根片  
塔巴斯克辣酱油  
绿豆芽  
炸洋葱  
莎莎酱  
坚果碎  
果冻糖豆  
炸海苔

## Possible Responses

冰淇淋顶料  
巧克力酱  
蒜味美乃滋酱  
辣椒酱  
酱油  
培根片  
塔巴斯克辣酱油  
绿豆芽  
炸洋葱  
莎莎酱  
坚果碎  
果冻糖豆  
炸海苔

Just give me vanilla

Random selection

I'll have what  
she's having

## Get what you Expected?

冰淇淋顶料  
巧克力酱  
蒜味美乃滋酱  
辣椒酱  
酱油  
培根片  
塔巴斯克辣酱油  
绿豆芽  
炸洋葱  
莎莎酱  
坚果碎  
果冻糖豆  
炸海苔

Ice Cream Toppings  
Chocolate sauce  
Garlic mayonnaise  
Chilli sauce  
Soy sauce  
Bacon pieces  
Tabasco sauce  
Bean sprouts  
Fried onions  
Salsa sauce  
Chopped nuts  
Jelly beans  
Fried seaweed

# Capital Menu

## Capital Calculation

Economic  
Stochastic  
Enterprise-wide  
Dynamic  
Top-down  
Integrated  
GRC - enabled  
Risk-based  
Coherent  
Bottom-up  
Market-consistent  
Value-based

Some capital models are so complicated, that it is difficult to understand what you have bought. The buzzwords are no more comprehensible than a restaurant menu in Chinese ...

# Possible Responses

## Capital Calculation

Economic  
Stochastic  
Enterprise-wide  
Dynamic  
Top-down  
Integrated  
GRC - enabled  
Risk-based  
Coherent  
Bottom-up  
Market-consistent  
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Just give me vanilla

Random selection

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## Capital Criteria

I hold enough equity capital so that my ruin probability is 0.03%

I hold enough equity capital to maintain a AA credit rating

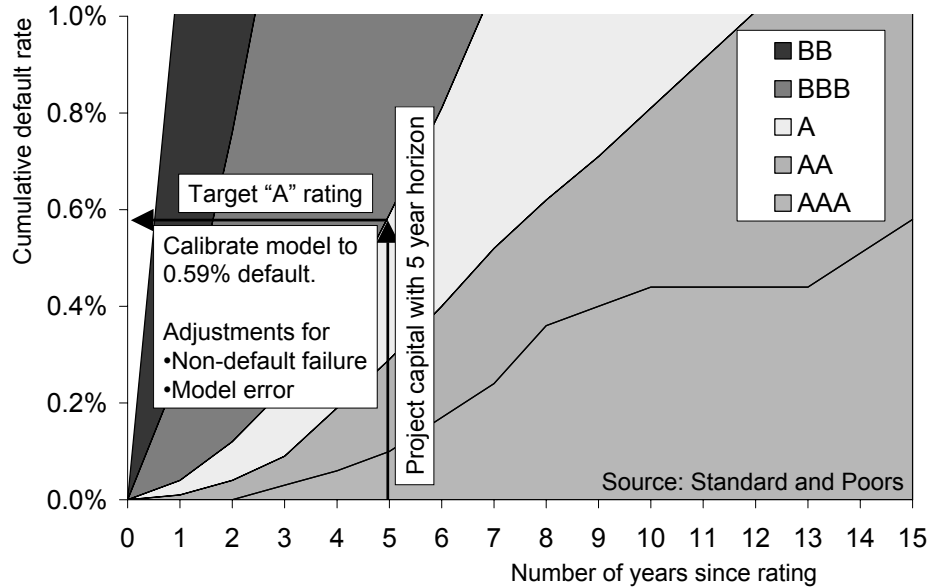
I hold at least twice the regulatory minimum capital requirement

I hold capital that maximises my firm's share price

These are "risk based capital" definitions.

Prefer a value-maximising definition, which makes a link between capital and shareholder value.

## P-Approach to RBC



## Finance: P and Q Approaches

	P – Approach (aka Insurance Land)	Q – Approach (aka Reality)
Objective	Maximise expected return Subject to risk appetite	Maximise market value Allowing for risk costs
Calibration	Statistical behaviour of historic time series	Current market prices
Pricing	Discounting expected cash flow values	Replicating portfolios Risk premiums irrelevant
Validation	Long data time series	Hedge effectiveness

# A Q-Approach to Firm Value

## Calibration Inputs:

Firm market capitalisation	€105
Balance sheet equity	€70
Dividend yield	4.00%
Risk free rate	4.10%
Credit Spread	1.10%
Debt yield	5.20%

## Possible Simplified Model:

Return on Equity	7.20%
Growth	1.20%
Risk free discount	4.10%
Company "mortality"	1.10%
Combined discount	5.20%

Risk-Neutral Geometric Projection: Dividend Discount Model

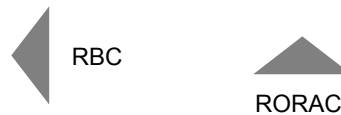
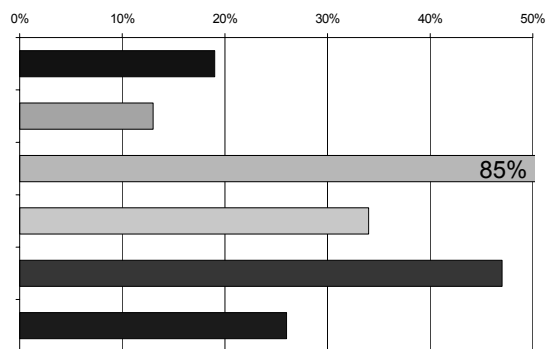
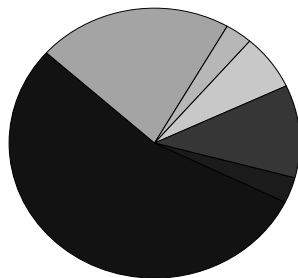
$$\text{Market Cap} = \frac{\text{Return on Capital} - \text{Growth}}{\text{Discount Rate} - \text{Growth}} \times \text{Equity}$$

$$\text{Franchise} = \frac{\text{Return on Capital} - \text{Discount Rate}}{\text{Discount Rate} - \text{Growth}} \times \text{Equity}$$

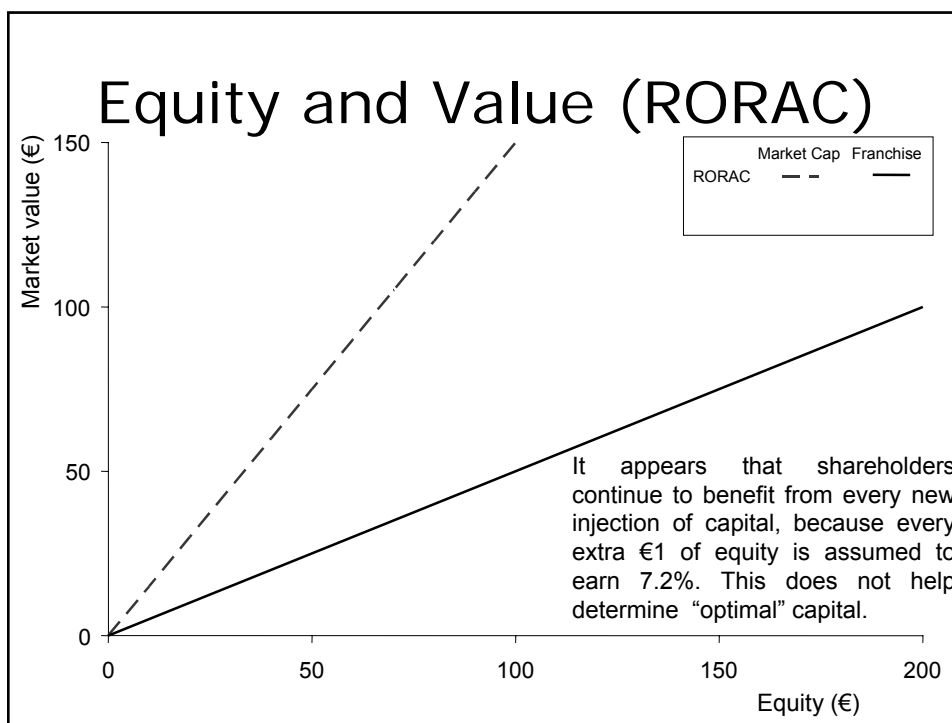
$$= \text{Market Cap} - \text{Equity}$$

# RORAC to Allocate Capital

- Network Banking
- Merchant Banking
- Investment Services
- Fortis AG
- Fortis ASR
- Insurance International



Source: FORTIS 2004 report

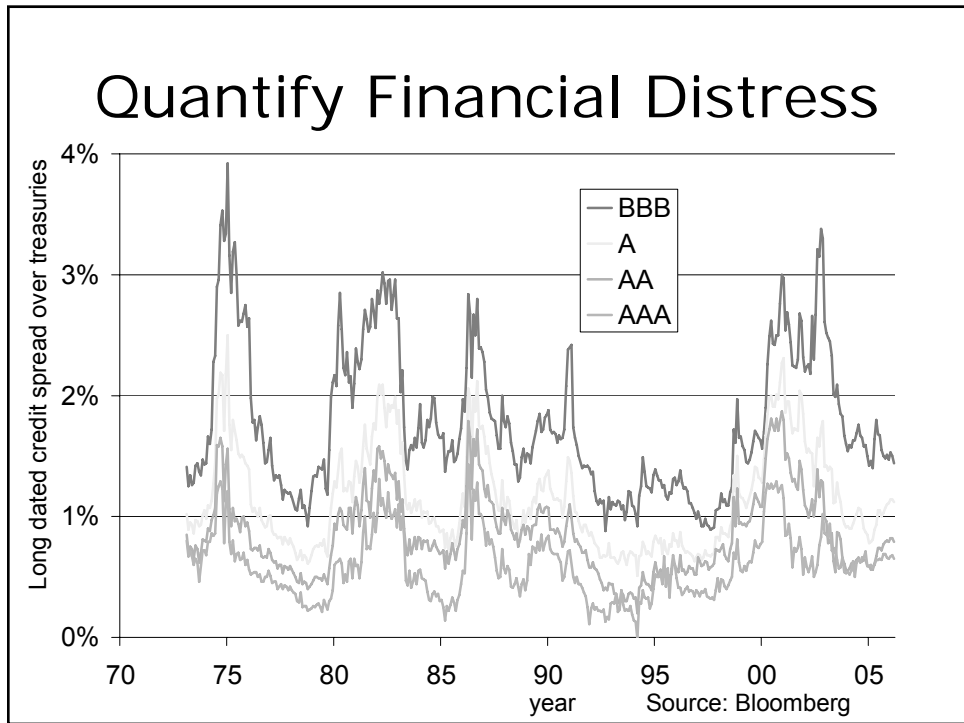
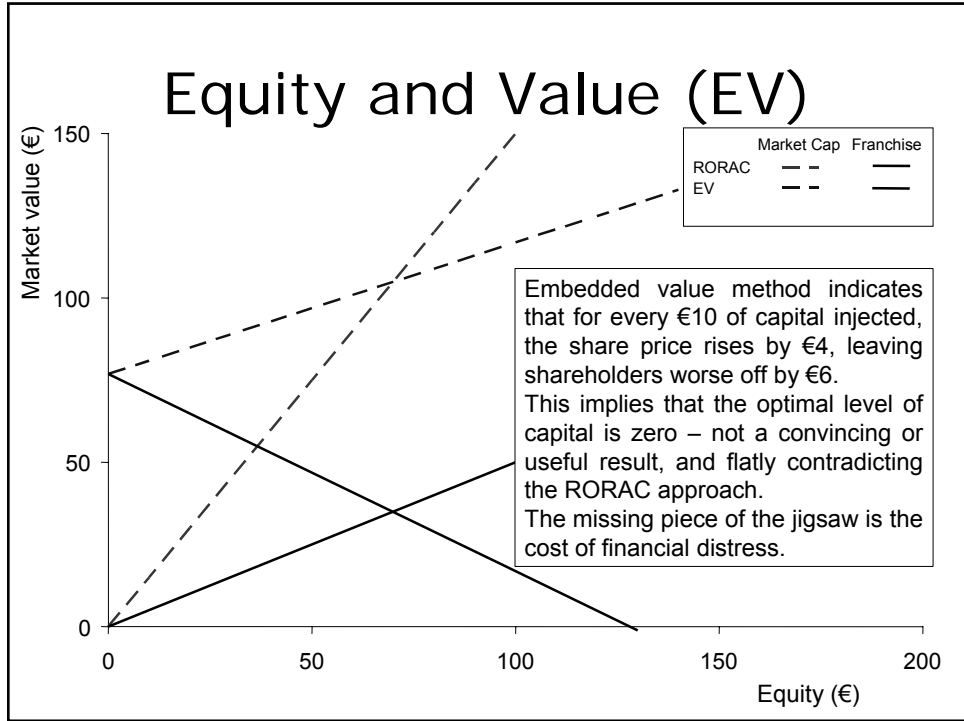


## Embedded Value Approach

The embedded value assumes additional capital is invested in the markets, and therefore, in a risk neutral model, earns the risk free rate. This may be subject to frictional costs: double taxation, agency costs and total loss in the event of company failure.

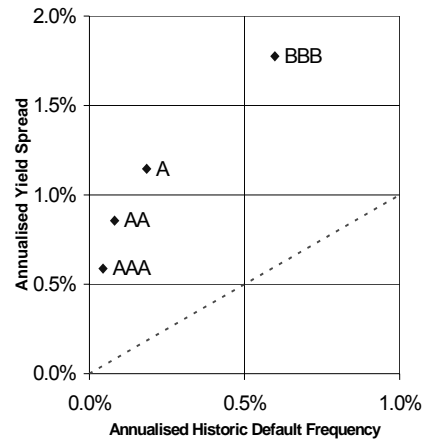
Insurers expect to create wealth primarily by insurance underwriting. The return on capital is diluted when equity increases, and leveraged when equity reduces. This is reflected in the "locking in" effect where €10 of extra equity is worth only €4 to shareholders.

Net Assets	20	50	70	100	150
ROE	18.20%	8.96%	7.20%	5.88%	4.85%
Growth	1.20%	1.20%	1.20%	1.20%	1.20%
Discount	5.20%	5.20%	5.20%	5.20%	5.20%
Franchise Value	65	47	35	17	-13
Market Capitalisation	85	97	105	117	137



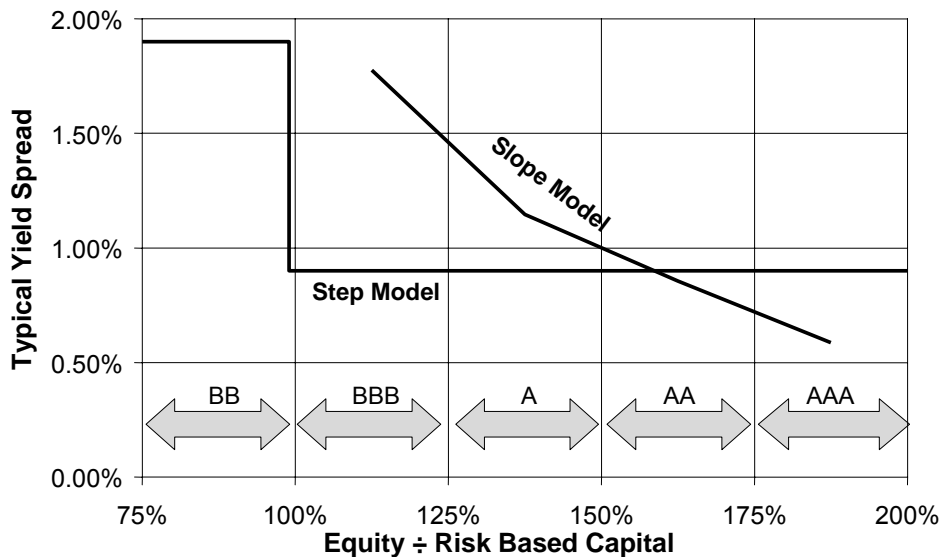
# Statistics and Market Prices

- Statistical risk is based on probabilities of failure or of financial distress, which are subject to enormous statistical uncertainty.
- Observed yield spreads represent the market's price to insure against rare events. The implied prices are often many times larger than the statistical probability, but can be observed with greater precision.
- Today's "economic capital" models are often based on percentile definitions of required assets
- But to make the link to value, we must convert the statistics into prices.



Source: Bloomberg, Standard and Poors.

# Equity and Yield Spread



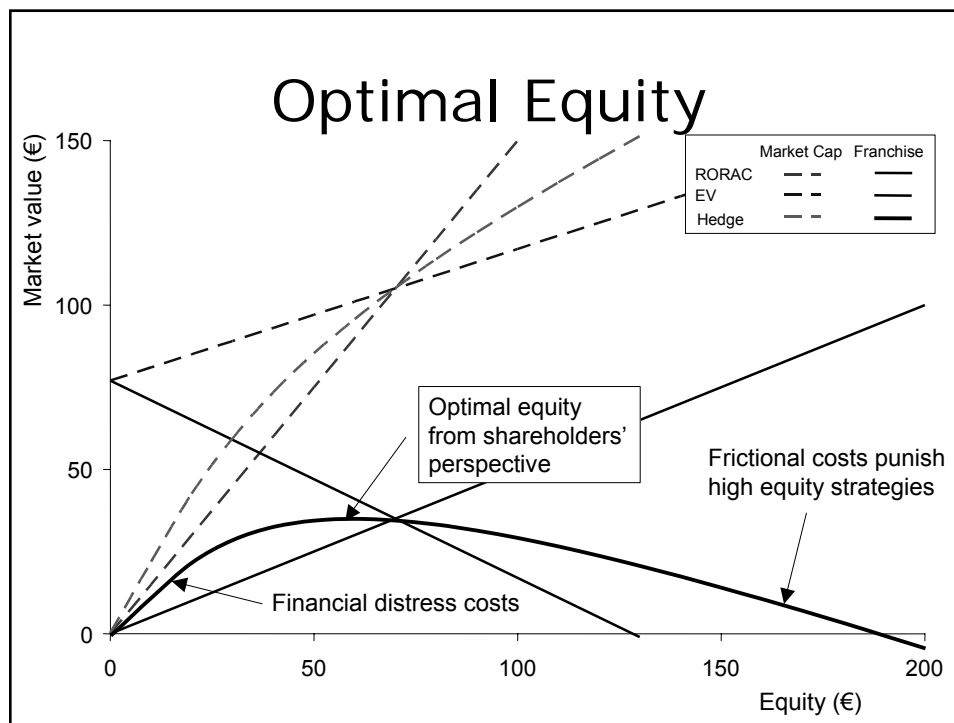
# Allowing for Credit Spreads

Higher equity assets reduces credit spreads, and so reduces the discount rate, even in a risk neutral projection. This partially offsets the locking-in effect and reveals a source of shareholder value in being well capitalised (1-period model gives opposite conclusion because of the limited liability put option).

The optimal equity is reached when an additional €1 of capital increases market capitalisation by €1. This is the point where franchise value is maximised.

Net Assets	20	50	70	100	150
ROE	18.20%	8.96%	7.20%	5.88%	4.85%
Growth	1.20%	1.20%	1.20%	1.20%	1.20%
Discount	9.24%	5.76%	5.20%	4.81%	4.53%
Franchise Value	22.3	35.0	35.0	29.7	14.5
Market Capitalisation	42.3	85.0	105.0	129.7	164.5

The rigorous justification of this calculation comes from a hedging argument; see *The Cost of Capital for Financial Firms*, by C J Exley & A D Smith, forthcoming in BAJ and available now at [www.actuaries.org.uk](http://www.actuaries.org.uk)



1. 冰淇淋顶料

2. Markets and Statistics for Capital Setting

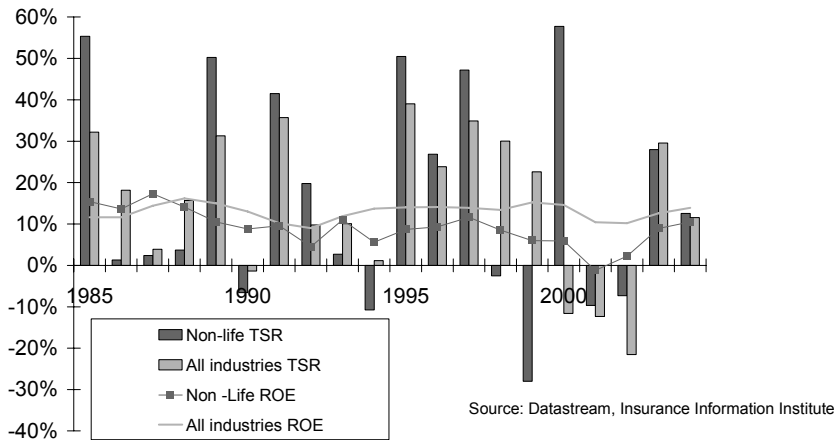
3. What this means for Pricing and Performance

## Cake and Insurance Ingredients



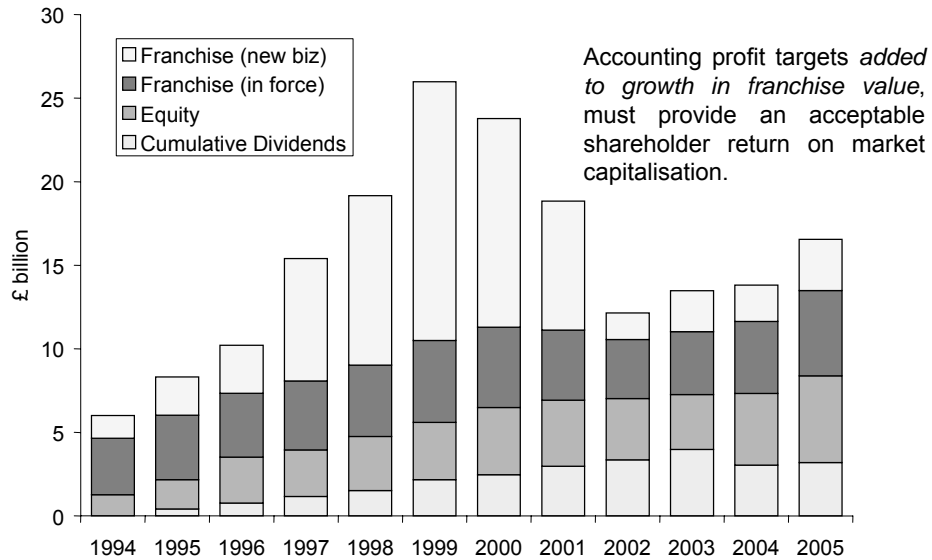
Accurate insurance pricing requires an assessment of the cost of all the ingredients. Valuation techniques for benefits and service (= expenses) are well known. But how can we tell how much franchise or capital is used by a particular product? What are the competitive consequences of being efficient with franchise or capital?

## Value of high ROE?



Non-life ROE was below All Industries every year 1990 through 2004  
 Yet, on a total shareholder return (TSR) basis, non-life *outperformed* All Industries over this period.

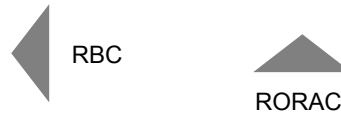
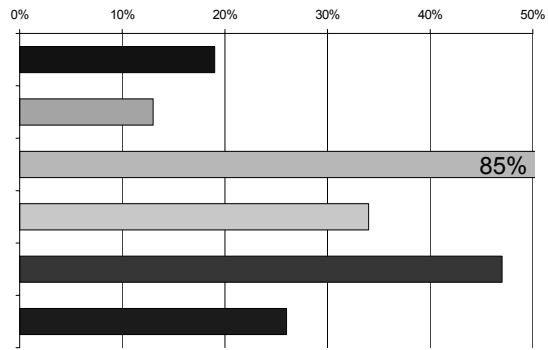
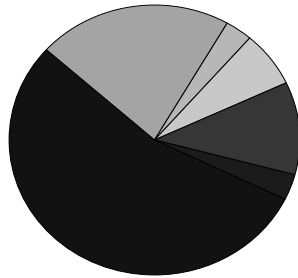
## Where Returns Come From



Source: Datastream, Prudential (UK) Annual Reports

# How to Make 85% RORAC

- Network Banking
- Merchant Banking
- Investment Services
- Fortis AG
- Fortis ASR
- Insurance International



Source: FORTIS 2004 report

# Risk Premium and Annuities

-

=

+

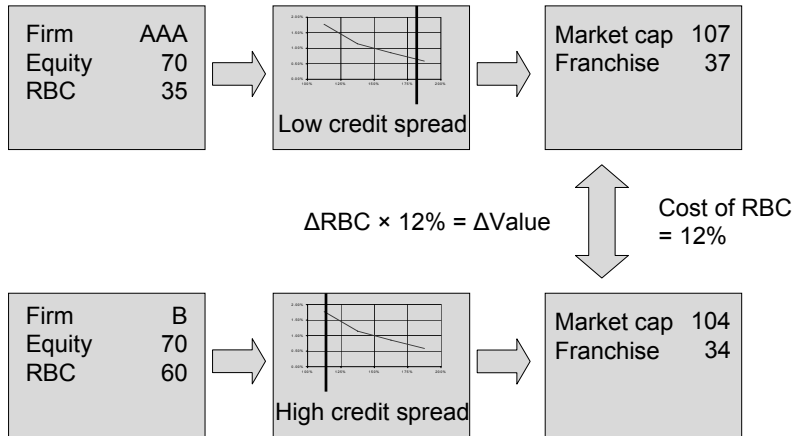
I invest some of my fund in equities, so the higher the equity risk premium, the less the annuity costs me to manufacture.

Axiomatically in a **Q** world, risk premiums cannot affect prices. The equity risk premium is irrelevant to annuity prices.

If the equity risk premium increases, that means that my shareholders require higher returns. I must increase annuity prices to meet my cost of capital.

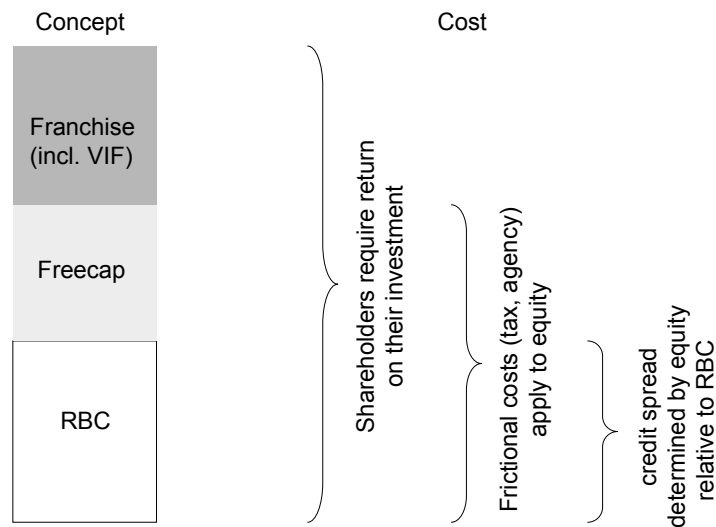
Its good to embed risk adjusted performance measurement throughout the business – but if the theory is not robust then every extra embedding makes things worse!

# The Cost of RBC



Note: no reference to CAPM, equity risk premium or beta.

# Key components of a better approach to capital costs



# Conclusions

- Credit markets tell us the price of insuring against rare events, not the probability that the event will occur.
- If you want a capital structure to optimise your market value, then use market prices to define and calibrate your capital models.
- Until recently, “market consistent” meant equities and interest rates, but credit spreads must now also be included.
- Capital charges for product pricing reflect frictional cost and not (P-world) expected shareholder returns.
- Some firms operate internal cross subsidies by over-charging for capital and under-charging for franchise.
- Business demands a robust framework with a consistent view of pricing, capital and performance.

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