The Cost of Capital for Financial Firms

by Jon Exley and Andrew Smith

"Charlie [Munger] and I have not the faintest idea what our cost of capital is and we think the whole concept is fairly crazy, frankly"

Warren Buffett, May 2003

Abstract

Most businesses have assets financed by capital providers. The cost of capital is a measure of the returns required by those capital providers. Its main use is to set a target for the profits, which must be achieved on the firm's assets in order to satisfy equity and bond holders.

This paper describes the classical theory of the cost of capital, and then applies it to the special case of banking and insurance firms. We develop implications for product pricing, performance measurement and capital structure optimisation.

1. What is the cost of capital?

1.1. Company Model

Let us start where the literature starts. Modigliani and Miller (1958?) consider a simple company with a set of assets, for example representing plant and inventory. The assets are financed partly out of borrowed money (debt) and partly by shareholders (equity). A possible balance sheet is shown below:

Assets	€m	*Liabilities*	€m
Plant and inventory	500	Debt	400
		Equity	100
Total	500	Total	500

The lenders may be banks providing overdraft facilities, or may be subscribers to an issue of commercial paper or corporate bonds. The shareholders and lenders are, in aggregate, known as *capital providers*.

1.2. Making Money and Adding Value

Company management requires the setting of targets or budgets. These budgets would include *operating cash flows* such as the cost of materials and labour, turnover and profit margin. They may also include *financing cash flows* such as in interest cost and shareholder dividends. Finally, there are some *frictional costs* such as taxation, which cream off some of the profit that would otherwise flow to shareholders.

Companies used to set budgets to ensure they make money. In other words, the operating cash flows need to exceed the interest cost. This results in a positive profit (ignoring, for the moment, any depreciation on the assets). A company was considered broadly healthy provided it makes money.

More recently companies have focused on *adding value*. This means covering not only the interest cost but also providing an acceptable return to equity providers. To emphasize this element, some economists refer to a *cost of equity* as the profit required to satisfy shareholders. This terminology is controversial and sometimes confusing. The cost of equity is not a cash flow. Neither accounting standard setters nor taxation authorities recognise cost of equity as a cost. Cost of equity does not accumulate arrears if you miss a payment, and cannot trigger default or bankruptcy. Nevertheless, describing required returns on equity as a cost has fallen into common usage and we follow that here.

1.3. *Cost of Debt, Cost of Equity*

The cost of debt is the rate of interest charged by the lender or the rate of return on bonds issued into the capital markets. In our example, that might be 6%.

The cost of equity is more difficult to estimate. Let us first point out that the dividend cash flow is not the only way in which shareholders are compensated. Capital growth

is also important. Analysts sometimes used retained earnings as a proxy for capital growth in a share price. This is one of several tenuous links between accounting measures and share prices, which we will come to question and improve.

The total return to equity holders is then measured as the profit after interest cost. To set a return target, management must resort to a body of research known as *asset pricing theory*. The starting point is that equity is riskier than debt, so the required shareholder return will be the cost of debt plus something to allow for risk. We examine these theories in more detail later; for the moment we suppose that such a theory has been applied and results in a required return of 10% per annum.

We can then tabulate the returns required for capital providers as follows:

Source of capital	Value €m	Cost of Capital	
		%	€m
Debt	400	6%	24
Equity	100	10%	10
Total	500	6.8%	34

The €34m cost of capital represents the required profit before interest. If we regard the operating cash flows as a return on the assets, the required asset return is 6.8%. This is known as the *weighted average cost of capital*, or WACC.

The WACC is also useful for assessing new projects. Let us suppose we had a project requiring an initial investment of €100m. Management can project the cash flows, and then use discounted cash flow techniques to evaluate the project – and in particular to establish whether the present value of cash flows exceeds the initial €100m cost. We know that assets must earn the WACC to satisfy capital providers. Therefore, the WACC is a useful guide to the discount rate for project evaluation.

Cost of Equity and Cost of Capital. In classical corporate finance, these tools provide two alternative but consistent ways of valuing a company:

- The cash flows from a project, after allowing for any borrowing, are the residual flows to shareholders. These can be discounted at a cost of equity to obtain a shareholder value.
- The cash flows from a project before allowing for financing represent flows to capital providers – both equity and debt. The value of these cash flows can be assessed at a cost of capital, which is a weighted average of the costs of equity and of debt. The shareholder value is then the present value of the project minus the value o any debt.

The assets of financial companies are frequently financed partly by a form of debt to customers – for example in accepting deposits or insurance premiums. This complicates calculations of the cost of debt. It is therefore more straightforward to use pure equity measures for financial companies.

1.4. Financial Services

How then can we apply cost of capital ideas to financial firms? Many of the ideas are applicable, but only after some conversion in terminology.

The main additional complication is that financial firms typically have significant customer liabilities, either in the form of bank deposits accepted or provisions for insurance claims and associated expenses. There may also be additional borrowings, usually subordinated to (ie lower priority than) the customer commitments.

In classical corporate finance parlance, all of these are sources of capital, and should be taken into account in a cost of capital calculation. On the other hand, when financial firms talk about capital they usually mean equity and subordinated debt, excluding policyholder liabilities. Confusion can easily arise from these conflicting uses of the word "capital".

It is difficult to assign a cost of debt to customer liabilities, especially insurance liabilities. Bank deposits may appear to be a cheap source of capital, if customers demand an interest rate below that of the capital markets. However, this overlooks the high front-end costs in terms of marketing and commission for attracting the customers in the first place. The notion of interest cost applies easily to annual payments but it is unclear how to spread the acquisition costs over a customer lifetime. Insurance liabilities are even more problematic. We might value them using a discounted cash flow calculation, but where does the discount rate come from? Whatever discount rate is chosen, this will turn out to be the cost of debt – so we apparently have a circular argument.

As a result of difficulties in debt cost measurement, WACC and associated measures are challenging to apply to financial firms. Instead, analysts prefer to analyse return on equity, treating debt service as a cost and considering shareholders as the chief capital providers.

For insurers, there are also challenges on the asset side. Unlike industrial companies, most insurance assets are investments traded in markets. There is little an insurer can do to control the return on these investments. Indeed, most insurers regard themselves as price takers in the investment markets. On the other hand, they actively price their insurance contracts on the liability side.

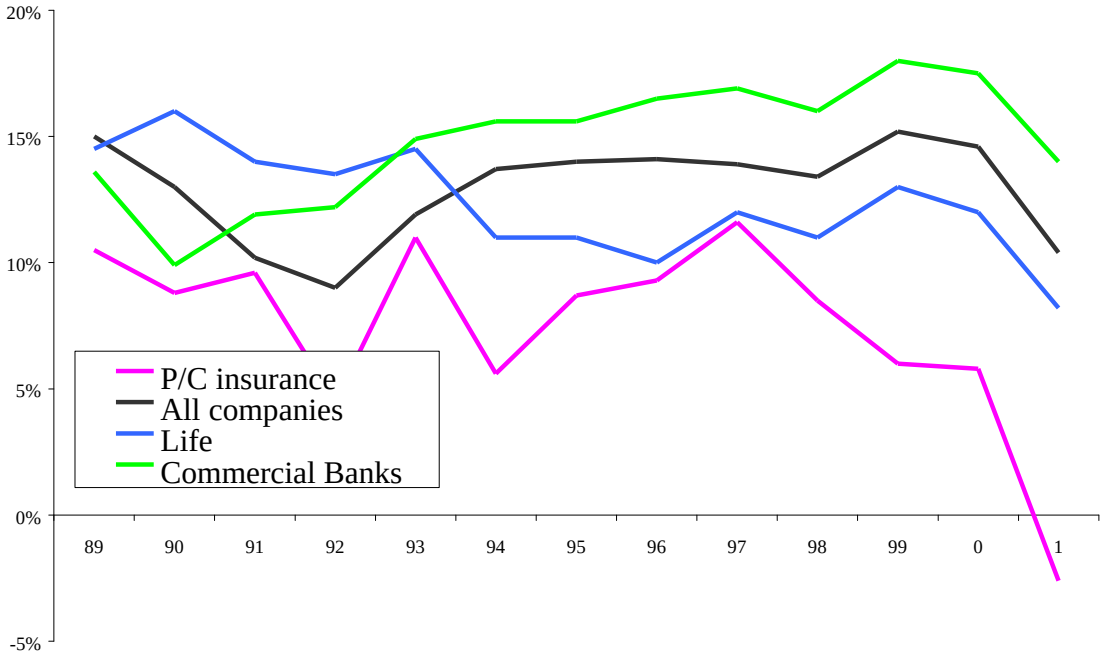
So for insurers, the management flexibility affects the cost of debt, not the return on assets. An insurer might enjoy a competitive advantage in providing insurance services to customers, but is unlikely to enjoy a similar advantage in asset selection.

So insurers need to do the cost of capital calculations back to front – looking at the return available on investments, subtracting the cost of equity and thus producing an upper bound on the acceptable cost of debt.

2. What is Equity?

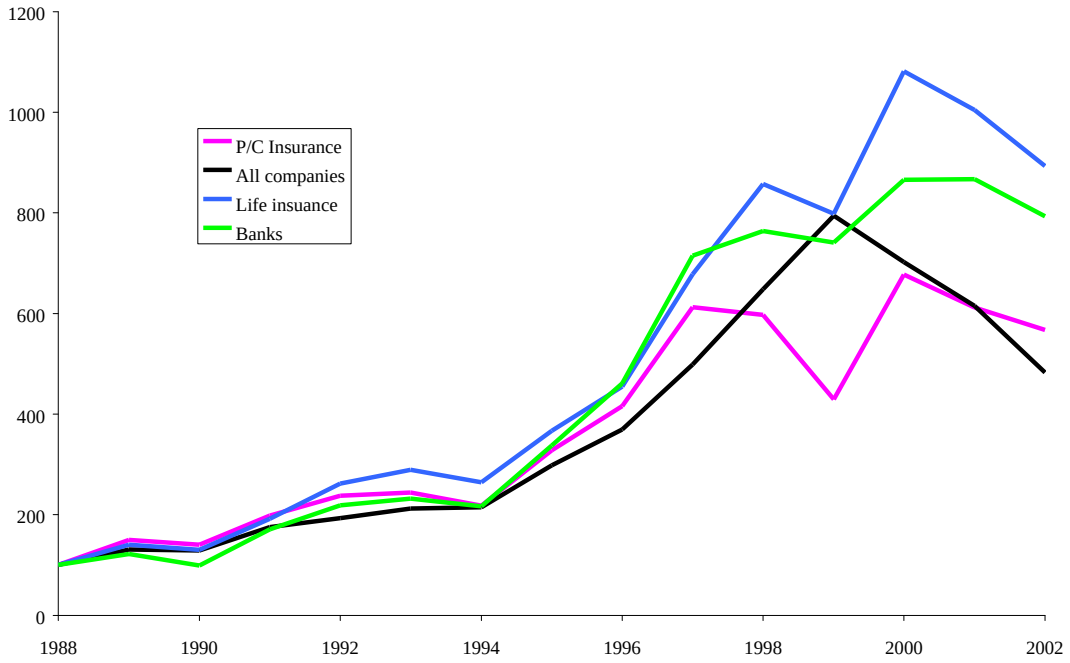
2.1. Historic experience

The chart shows historic return on equity, based on US figures, for banks, insurers and industry as a whole. Dr. Hartwig at Insurance Information Institute has kindly provided the data. It is clear that insurers, both life and P/C have under-performed industry as a whole over this period, while banks have outperformed. The return on equity is defined as post-tax profit divided by balance sheet net assets.



2.2. Biases in ROE

The question analysts face is whether the low ROE from property / casualty insurers implies they are under-performing as businesses, or are poor investments. Another way to assess this is to investigate shareholder total returns on $100 invested at the start of the period. This is shown in the chart below (source: Datastream):



The table contrasts the two measures:

Sector	Historic Performance relative to Total Market	
	ROE	Total Return
Property / Casualty	Consistent under-performance	Initial out-performance, then falling behind to give comparable overall return.
Life Assurance	Initial out-performance, deteriorating and finally under-performing towards the end of the sample period	consistent out-performance
Banks	Consistent out-performance	Initially flat, out-performing in the last few years.

It is clear that the ROE bears little resemblance to stock market performance.

There is an established literature starting from Soloman and Laya (1967) investigating so-called "biases" in accounting measures of return. They consider whether some of the ROE differences between different industries are due to imperfections in measurement rather than differences in management performance.

Case Study: Accounting for a Savings Policy

Suppose a customer sets up two savings policies – one with a UK bank and one with an insurer. In each case, the policyholder contributes premiums of £100 per month, and receives in 10 years the value of premiums invested in the stock market, minus a 1% charge applied to the funds under management each year. An employed salesman receives initial commission of £500 in either case.

- The bank recognises an initial cost of £500, then reports an increasing profit of 1% of funds, less expenses, for the next ten years.
- The insurer calculates a present value of the 1% charges, sets up a provision for expenses and deducts the £500 commission to declare an up-front profit. Future profits or losses will emerge to the extent that expense experience is different from the original assumptions.

In the case of the bank, there is a strongly negative ROE impact in the first year, and a positive impact thereafter.
The insurer shows a positive ROE impact in year 1, but in subsequent years the ROE is lower than for the bank, because the present value of future charges is recognised as an asset, which increases the equity relative to which the ROE for other products will be calculated.

The classic example in Brealey & Myers (section 12.5) compares pharmaceutical and chemical companies. Chemical companies have mostly fixed assets, consisting of bricks and mortar. Pharmaceutical companies have many intangible assets such as intellectual property (research and development) and patent rights.

Financial statements typically capitalise fixed assets but do not recognise intangible assets. Therefore, the pharmaceutical company will produce a higher return on equity number than the chemical company, even if the underlying cash flows are the same. The same issue arises for comparing products across financial services firms, as shown in our savings policy case study. This shows that the definition of equity is not absolute, and may not be applied consistently even within a single organisation.

Brealey and Myers outline the theoretical solutions to ROE bias in terms of discounted cash flow valuations for assets and liabilities, using methodologies consistent with the market value of the firm. However, they then dismiss these tools for practical use, arguing that the cost of preparing the discounted cash flow projections would exceed any benefit of improved management.

For financial firms the situation is different. Discounted cash flow valuations are already available for most assets and liabilities, and these are increasingly prepared under market consistent methods as part of principles and practice of financial management. Therefore, the kind of improvements in performance measurement which elude pharmaceutical companies can still benefit financial firms.

2.3. Valuation Supported

We can understand the biases better if we think in terms of supportable valuations. In other words, for a given profit target, we can ask "how would the market value a company which is expected to meet its profit targets?".

Let us suppose initially that a company seeks only to break even, that is, make zero profit. Shareholders therefore have no prospect of return, either in dividends or in growth. Shares in such a company would be worthless. To put this differently, a target merely to make a profit would support a share price of zero. This is clearly inadequate from a shareholder perspective.

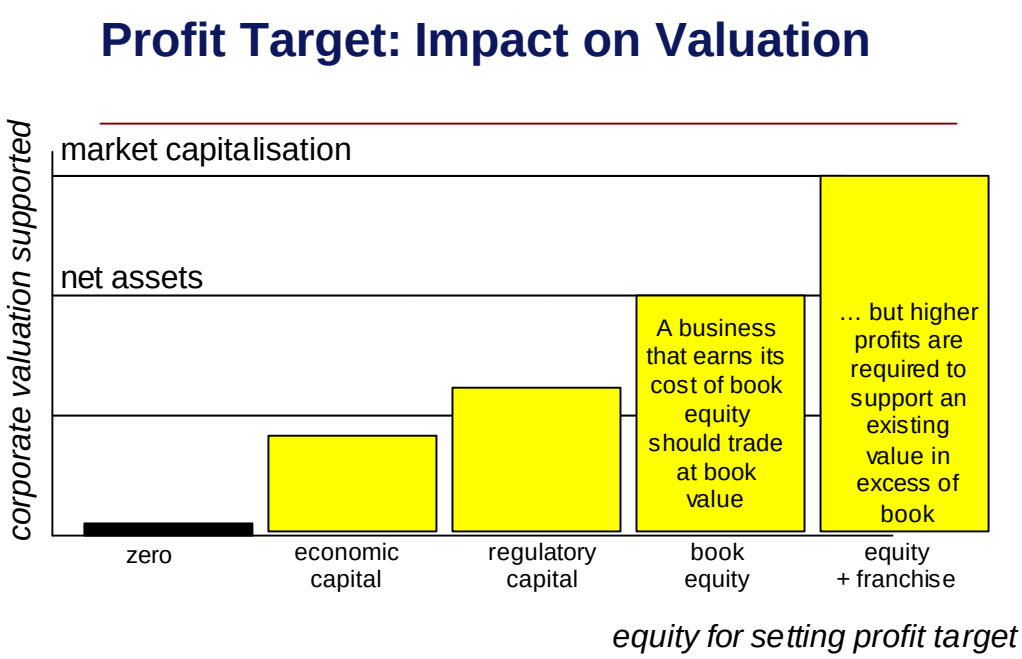
Let us suppose instead that a company's target is to earn its own cost of capital, measured on its accounting net assets. Such a target could provide adequate compensation for a shareholder who entered at net asset value. In other words, it could support a share price equal to net assets. In popular terminology, any profit in excess of the cost of capital is "value added". This means that management gain credit for anything they do to support a share price in excess of net assets.

Let us return to our original example of a company with €500 of assets and €400 of liabilities, and so €100 of equity. This does not mean that the company trades at €100 in the market. Maybe the company trades at €150. It makes little sense to assume that shareholders require a return only on the €100. Previous management actions have persuaded the market that a return on €150 is achievable, and it is up to current management to deliver are return to support the total market value. It is misleading to regard everything above a return on €100 as "value added". The market gives a clear signal, in the market price, of the future returns required.

From a lazy manager's point of view, easy targets are a good thing. There is not much enthusiasm for targets based on market capitalisation. Instead, there have been various conspiracies to *reduce* the capital on which a return is required, eve below the level of accounting net assets. In insurance, there is a history of *locking in adjustments*, which implicitly charge a cost of capital only on that part of net assets required as a legal minimum – in our example this might be €60. Banks have gone further in their use of *economic capital*, which seeks to identify the capital required to achieve a given probability of financial distress – which might, in our example give an economic capital of €40. Both of these approaches would support a share price significantly below net assets – so probably represent a poor deal for shareholders.

Of course, we are not disputing the use of economic capital. It is useful to know how much capital is at risk from various sources of unexpected loss. Capital budgeting requires not only an appreciation of current risks, but how they may develop over time. The fallacy is using this number as a basis for return on capital calculations or performance measurement. Despite this fact, a number of ingenious devices have been attempted to overcome the worst distortions of using economic capital for performance measurement. We have discussed these methods in an appendix.

These values supported by different capital definitions are illustrated in the chart below:



2.4. Equity and Franchise Value

We have seen that ROE is a poor measure of shareholder value created because it correlates poorly with total returns experienced by shareholders.

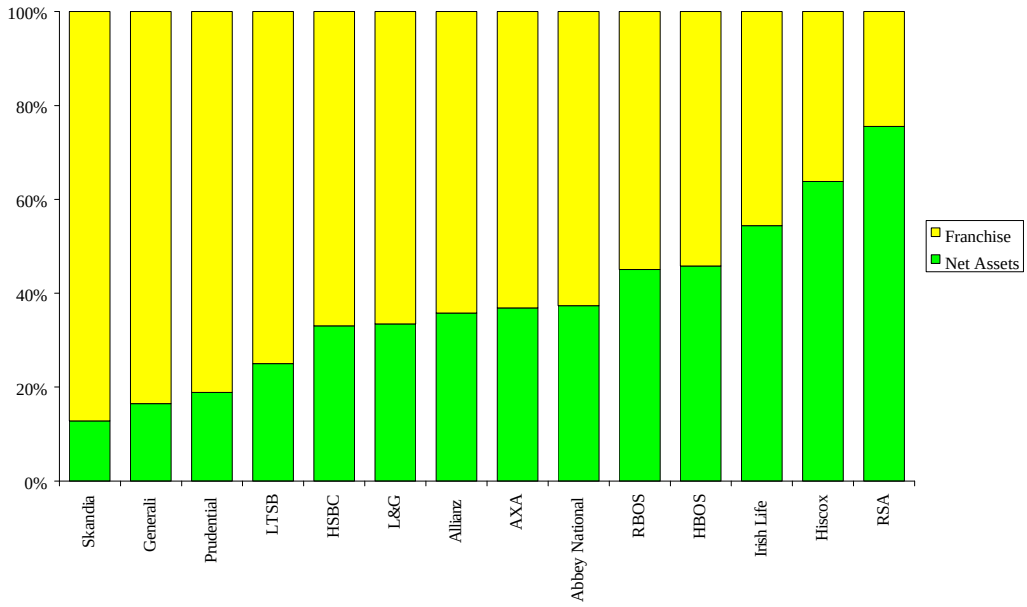
The reason is this. The market value of a company (that is, the total market value of shares in issue) can be decomposed into two portions:

- equity, that is, the net assets on the balance sheet
- franchise value, that is, the company's market value in excess of equity

The shareholder requires a return on both of these measures: equity plus franchise value. Return on equity measures only one part of the return shareholders require.

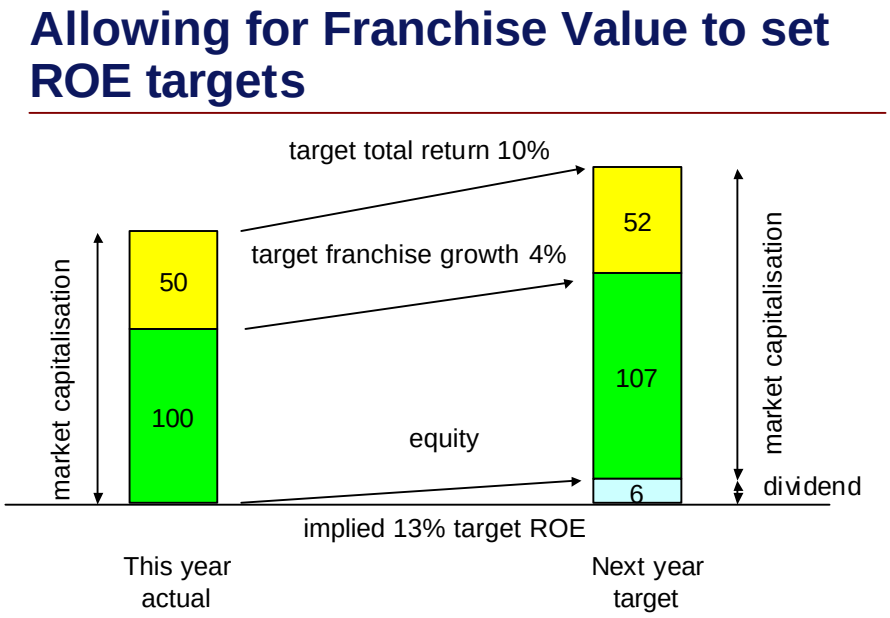
Franchise value typically describes the value to shareholders of future business opportunities to be transacted by the firm. As we calculate it in practice by subtraction of net assets from market capitalisation, franchise value as measured may also contain other bits and pieces – for example, unrealised capital gains or unrecognised options embedded in liability structures.

We can analyse companies according to how much of their value is made up of franchise value. The chart below shows this breakdown for a range of financial companies as at December 2000:



2.5. Setting ROE Targets

We have described why it makes sense to apply a required return to the whole market value. An alternative is to apply a higher required return to the balance sheet equity component alone. In this calculation, account must be taken of that part of total return provided by franchise growth. If we assume this is 4%, then the grossed-up ROE target can be calculated as follows:



2.6. The Illusion of Equity Efficiency

A focus on ROE, rather than total shareholder returns, creates two biases.

(i) a failure to recognise activities which build franchise value.

(ii) an artificial incentive to reduce reported equity.

The desire to reduce "expensive" balance sheet equity has been a major plank of financial strategy not only for banks but also other financial institutions. The growing market in credit derivatives and asset securitisation is driven largely by the desire for a leaner, more highly geared balance sheet. Similar patterns are seen elsewhere, for example airlines, who increasingly lease rather than buy their aircraft. The main noticeable effects on these are neither higher share prices nor more efficient capital usage, but instead increased financial distress costs.

The search for a lean balance sheet would make perfect sense if shareholders required a return only on balance sheet equity. But this would be a misrepresentation. The shareholder return is required on the whole share price. A financial engineering solution may reduce balance sheet equity and leave share prices unchanged. In that case, shareholder required returns would also be unchanged. There is no shareholder saving from what is essentially an accounting restatement of the balance sheet.

2.7. Implications for Monopoly Regulation

There is an interesting regulatory twist to this discussion. Some competition regulators, both sides of the Atlantic, swear that a loading for profit, of, say $10, is evidence of market failure. The solution, apparently, is regulation of the price of financial services to eliminate the $10 margin. The stated and no doubt well-intentioned aim is to protect consumers from exploitative financial firms. Most recently we have seen such intervention in lending to small and medium sized enterprises.

The predictable effect of such price regulation is to discourage firms' investment in brand or service etc that develop the franchise value. This results in reduced customer loyalty and a homogeneous commoditised market with greater switching between insurance providers. And here is the irony – the switching generates additional administrative and acquisition costs of, say, $20, which are recognised in the regulatory formula thereby permitting insurers to pass them on to consumers. The monopoly regulators' impact is to confiscate $10 from consumers, $10 from shareholders and spend the $20 on avoidable administration.

2.8. Multi-period Models

A major limitation of textbook ROE methods is that they are single period models. This means that, at the end of a year, the net assets are assumed equal to the market value of the firm. We have already overcome that limitation by introducing the concept of franchise value.

In this section, for completeness, we extend the ideas to a full multi-period discounted cash flow setting. These equations were first described in Chapman, Gordon and Speed (1991).

Definition. The cost of equity for an enterprise is the rate at which the market discounts projected dividend streams to arrive at the market value of the enterprise.

This cost of equity is the link between business cash flow projections and the way in which the market values an enterprise. To measure this cost of equity, you need both a dividend projection and a market value. The cost of equity is then the rate of return at which the market value is the present value of projected dividends. Companies use the cost of equity as a measure of the returns that shareholders require. This, in turn, is useful in project appraisal and performance measurement.

Value based management means managing a business to increase the value to shareholders. In other words, it means taking account not only of the cash flow impact of a transaction, but also any impact on how the market values the enterprise.

2.9. Cost of Capital and Profit Valuation

The cost of equity is defined in terms of the most fundamental of economic calculations – discounted cash flow, in this case the present value of dividends. It is often difficult to establish the dividend impact of a transaction. For example, an insurance contract may have a known distribution of claims, but to model the dividend impact we would need to know whether a future claim reduces dividends or retained profit. It would be more convenient to study the value impact by looking at the profitability of a contract, rather than at its dividend impact.

Fortunately, there are some simple algebraic rearrangements of the dividend discount model, which enable us to measure profits instead of dividends. In this section we describe these ideas.

We need some notation. All these variables are measured at annual intervals. We assume that dividends are paid at the year-end, immediately before the accounts are drawn up.

Notation

- E_t is the shareholders' equity on the balance sheet at time t. This is the difference between the assets at time t liabilities.
- F_t is the franchise value at time t, that is, the excess of the market capitalisation over the shareholders' equity
- D_t is the dividend paid to shareholders at time t
- r_e is the cost of equity

By definition of the cost of equity, we know that the market capitalisation is the present value of dividends. This means that:

$$E_0 + F_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r_e)^t}$$

The profit during the year can be expressed as

- distributed profit, that is, dividend
- retained profit, that is, increase in equity

To make the accounting work, we need to treat new equity raised as a negative dividend. We can then rewrite the corporate valuation to refer to profit (the term in square brackets)

$$E_0 + F_0 = \sum_{t=1}^{\infty} \frac{[D_t + E_t - E_{t-1}] - r_e E_{t-1}}{(1+r_e)^t} - \sum_{t=1}^{\infty} \frac{E_t}{(1+r_e)^t} + \sum_{t=1}^{\infty} \frac{E_{t-1}}{(1+r_e)^{t-1}}$$

The last two sums cancel, except for the term E_0. This implies that

$$F_0 = \sum_{t=1}^{\infty} \frac{[D_t + E_t - E_{t-1}] - r_e E_{t-1}}{(1+r_e)^t}$$

We have therefore expressed the franchise value as the present value of profit, minus an additional term $r_e E_{t-1}$. This term is the product of the cost of equity and the equity on the balance sheet. It reflects the profit margin required to satisfy shareholders.

The expression $D_t + E_t - E_{t-1} - r_e E_{t-1}$ is sometimes called the *economic value added*. The accounting equity represents original capital subscribed plus cumulative retained earnings, that is, the historic shareholder investment. To the extent that franchise value is positive, it represents the gain to shareholders over and above their historic investment. Our identity has therefore demonstrated the following.

> **Theorem**: Franchise Value is the present value of future Economic Value Added, discounted at the cost of equity

Equity and income are functions of accounting decisions, many of which are judgmental. These decisions include the following, which is not an exhaustive list:

- whether assets or liabilities are held at book cost or marked to market
- whether spend on acquisitions and R&D is capitalised or expensed
- practice in setting provisions for contingent liabilities, including margins for prudence
- decisions regarding group consolidation, including the treatment of retirement benefit plans
- schedules for depreciation and amortisation

Our relationship between franchise value and economic value added does not depend on finding a theoretically pure set of accounting procedures. Of course, a change in accounting practice would affect reported equity and so would alter both franchise value and future reported profit. But the identity that

franchise value = present value of economic value added

holds irrespective of the chosen accounting conventions.

3. Tax and Other Frictional Costs

3.1. Myers-Cohn Model

To make our models more realistic, we allow for corporate taxation. This is covered in Modigliani and Miller (1963). The corresponding insurance reference is Myers and Cohn (1987).

Myers' and Cohn's insight came from an exploration of the different terms under which corporations can invest, relative to direct investments by shareholders. In many cases, the corporate investment is subject to double taxation, as income from investments is a source of taxable profit. As a consequence, in order for shareholders to earn an acceptable return, any insurance premiums must be sufficient not only to pay claims and expenses but also to pay tax bills arising from investment returns. Likewise, in a banking context, interest margins must be sufficient not only to compensate shareholders but also to pay taxes.

3.2. Value of Capital Efficiency

Therefore, contrary to the pure M&M findings, capital does have a cost, and capital efficiency can create value. Recent advancements in North American capital allocation regulation for insurers allows an entity to hold less capital if a reporting unit uses properly matched assets and liabilities from an interest rate risk standpoint. Banks can achieve similar savings by hedging open market risk positions or by using their own internal rating models for risk under the terms of the Basel accord. According to the Myers-Cohn model, these could be instances of a higher value of a financial firm resulting from efficient capital allocation

Under the Myers-Cohn model, pricing of insurance by line of business requires an allocation of investments between classes of business. This requires an allocation not only of liability reserves (usually a simple bookkeeping exercise) but also of the assets constituting shareholder equity. And here we have a bigger puzzle, because the net assets are a single legal pool – any part of the equity can be used to meet deficiencies in any line of business. Paper allocation does not imply any sort of ring-fencing of assets to meet claims in specific lines of business.

The need to allocate equity between lines has spawned a whole industry in capital allocation (also called "economic capital") for performance measurement. Here we encounter an immediate practical difficulty with the Myers-Cohn framework. The theoretically optimal amount of equity is zero, as this minimises tax. As in practice firms do hold equity, the amount held must be exogenous to the Myers-Cohn model. There is scope for endless argument about how equity should be allocated, with no definitive answer.

3.3. Agency costs

Later research has suggested that double taxation is only the tip of the iceberg as regards the cost of holding investments. Usually far greater in magnitude is the risk of poor stewardship of those assets in the hands of corporate managers. For example, managers may be tempted to squander shareholder resources on ambitious acquisitions, which destroy value but enhance the status of the management team concerned. Such effects are called *agency costs* (see Jensen & Meckling, 1976),

arising from conflicts of interest between shareholders and managers. This is a special case of what are more generally called *frictional costs* (see Ng and Varnell, 2003). From a shareholder perspective, agency costs act as a form of tax on assets entrusted to third party managers. To justify the existence of an insurance firm, the premiums achievable must not only offset claims, expenses and taxes but also a share of the agency costs associated with the equity in the business.

It may appear circular to expect managers to quantify their own conspiracy against shareholders when setting premiums. We argue that markets allow for such costs when pricing insurance shares; therefore it is natural to use this information also in pricing decisions.

In the model underlying this paper, we have treated two types of frictional cost, one of which is a proportion of profit and one of initial equity.

4. Financial Distress

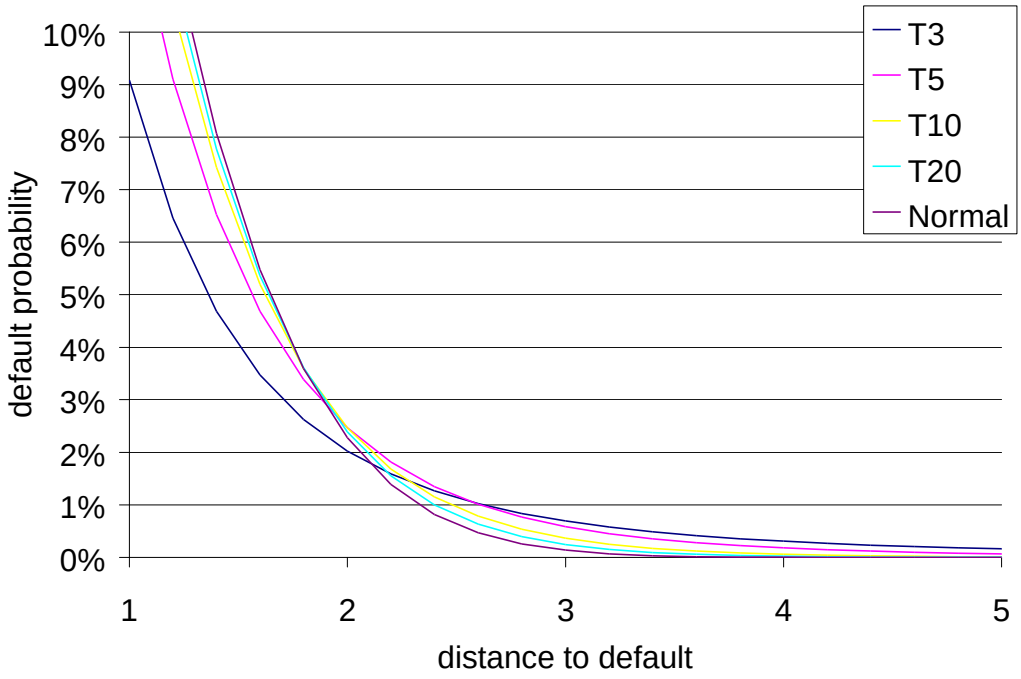
4.1. Credit sensitive customers

We have seen why shareholders associate costs with firms who hold too much capital. We now consider the consequences of having too little.

The main consequence of having too little (or even negative) capital is that customers of financial firms are credit sensitive. Insurance is supposed to help policyholders sleep at night. An insurer undermines this value if there is a material risk of default. Franchise value is therefore fragile.

4.2. Distance to default

At this point, we need to move to a more complex set of models, to capture the default risk. In particular, we need a model of the mean and standard deviation of equity in one year's time. The standard deviation, divided by the mean, is known as "distance to default". For this paper, we assume default occurs when equity becomes negative. Depending on the distributional assumptions selected, the probability of default will be a function of the distance to default. Some possible functions based on normal or t-distributions are shown below.



4.3. Default events

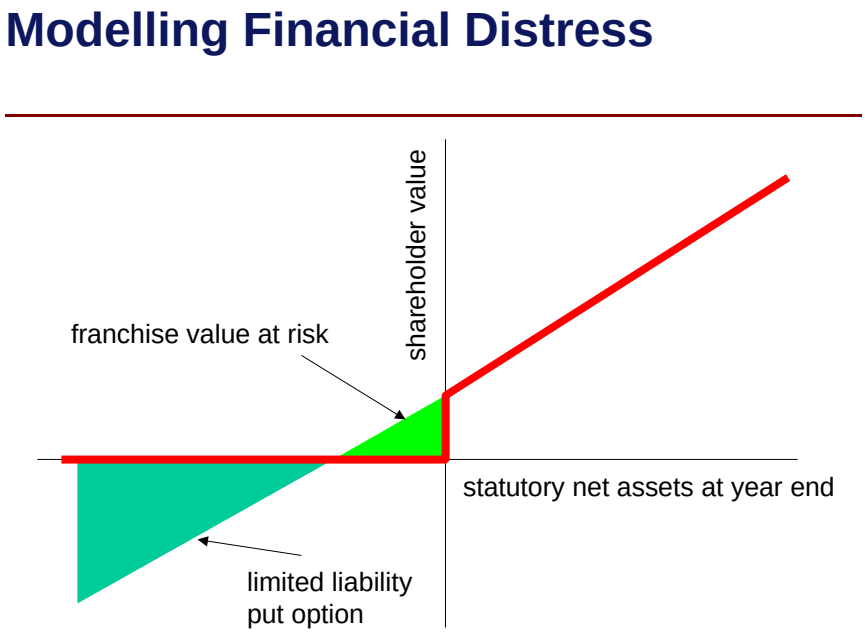
In default, a number of events take place:

(i) shareholders lose control of the firms assets

(ii) lenders take control of the firm's assets, but (given default) these are insufficient to cover the debt and furthermore must be shared with and army of professionals appointed to oversee the liquidation.

(iii) shareholders also lose any franchise value which may have built up.

A stylised payoff to shareholders under financial distress is shown in the chart below.



Classical financial theory has focused on the so-called "insolvency put" which captures items (i) and (ii).

We should recognise that our model is simplistic, but we believe it is the first serious attempt to quantify financial distress for financial firms. Possible model improvements could reflect the effect that balance sheets of marginally solvent companies tend to be overstated. They could also reflect the various steps which management can take to convert franchise value into net assets to stave off the liquidators – for example, sale of subsidiaries or financial reinsurance deals. See See for example Doherty (1997), Froot & Stein (1998), Hancock et al (2001), Merton & Perold (1999) for more details in these areas.

4.4. Insurance versus Banks

In the case of insurance, the insolvency put creates an incentive for the insurer to take risks, on the basis that the upside accrues to shareholders but the risk of default falls on policyholders. Regulators, so the theory goes, exist as a counterbalance to this moral hazard.

For banks, the situation is a little more complex, because the lenders are canny to this asset substitution risk and raise their interest rates accordingly. As a default event involves third party administrators, this is not a zero sum game, and most reasonable model parameters would indicate an increasing net cost to shareholders from an increased default risk.

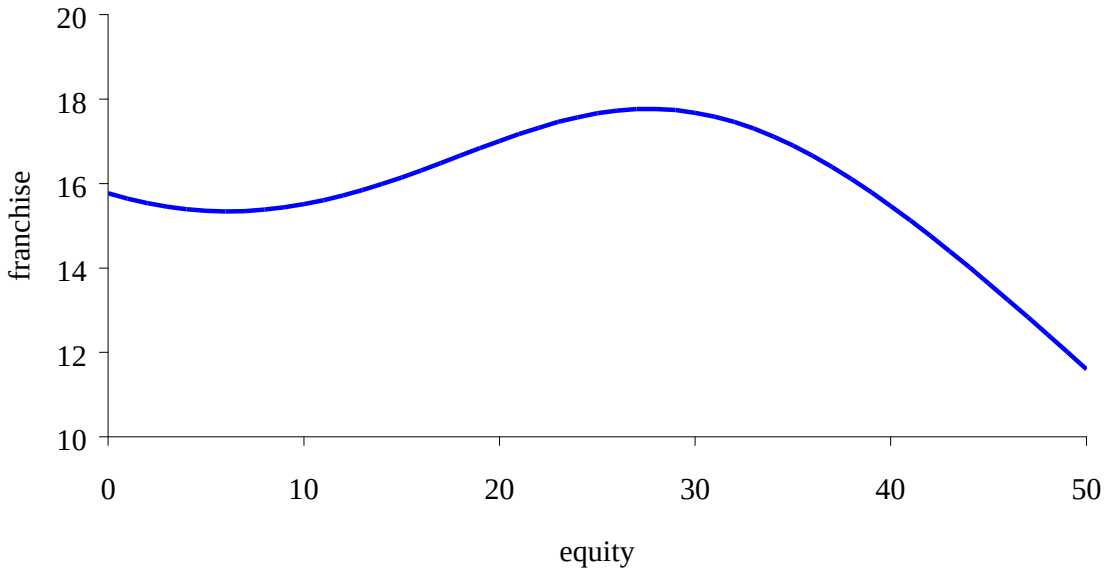
This serves to raise the cost of capital. In this case, classical financial theory suggests an optimal amount of capital, which minimises the overall capital costs. This optimum balances the tax and agency costs of overcapitalisation against the higher interest cost charged to risky firms.

4.5. Optimal capital structure

There are several risks to franchise value, including:

- Loss of confidence in an insurer's ability to pay claims
- Damage to a provider's reputation (or to that of a whole industry)
- New entrants or distribution channels bringing pressure on margins
- Adverse effect of regulation of product design or pricing
- General economic downturn impacting customers' willingness to spend

In this paper, we focus on the first item, that is, financial impairment. Although the literature focuses primarily on the insolvency put as the main consequence of impairment, we have found it is the franchise value that typically dominates in realistic examples. Shareholders are averse to losing the franchise value and this is a primary motivation for risk management.



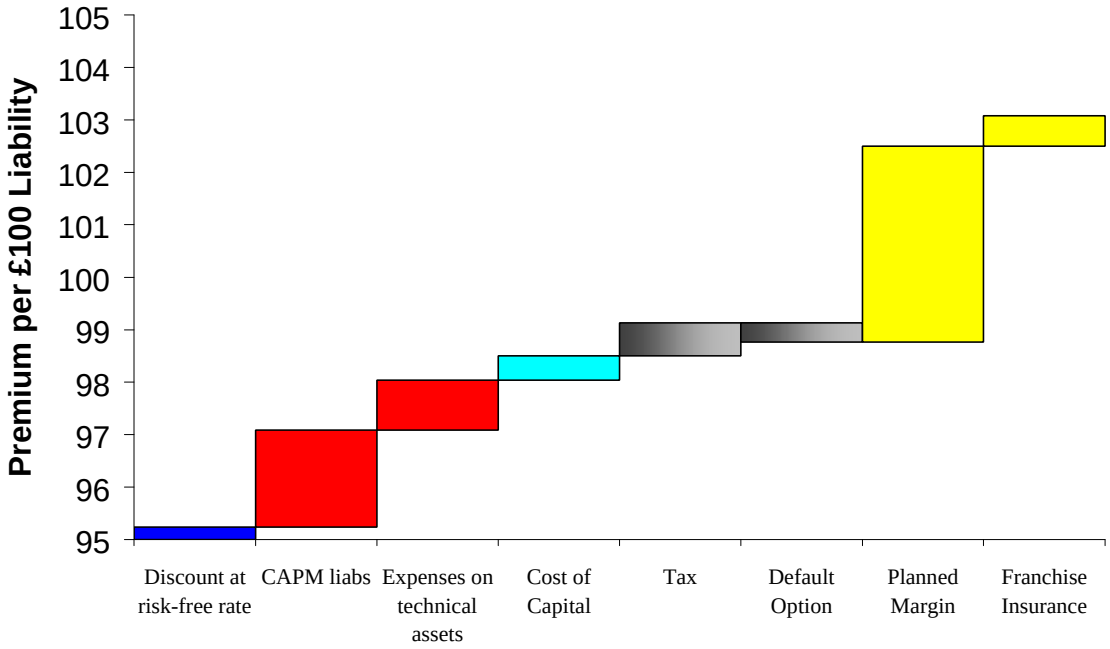
Using a normal distribution for default risk, this chart shows how the merited franchise value can vary according to initial capital structure. This is based on an insurance example, although banking is similar.

At the high equity end, the tax and agency costs reduce the merited franchise value. There is some optimal value of equity where franchise value is maximised. Then to the left, increased financial distress costs, including the potential loss of franchise value, reduces value. Finally, at the very left hand end a slight increase reflects the insolvency put option. This curve, based on real model output, is consistent with figures described in Hancock et al (2001).

This is a major step forward. In contrast to the Myers-Cohn model, we can now establish an optimal amount of capital within a single modelling framework. We avoid the need, seen in "economic capital" exercises, to define an arbitrary percentile in order to calculate capital needs. Thus, we recover a financial approach, which simultaneously delivers a pricing basis and an optimal capital structure.

5. Pricing

To illustrate the effects of the tools presented, we show an application to insurance premium rating. This chart represents the components premium for a liability with a mean future value of £100.



The components are as follows (not the vertical axis does not start at zero):

- The present value of expected claims, discounted at the risk-free rate
- The CAPM effect, discounting the liabilities at a lower rate because the liabilities are negatively correlated with stock markets
- Various expense loadings, relating to the administrative costs of investing assets to meet the liabilities
- The cost of capital element, reflecting agency costs on equity allocated to a policy
- The cost of double taxation on return on equity
- Now a negative item – the shareholder default option. Our methodology indicates that it is legitimate to reduce premiums to reflect credit risk of the issuer. Whether accounting liabilities should also be so reduced is currently a hot topic in accounting circles.
- Then the largest adjustment is the planned margin. Apparently missing from the pricing literature, this represents the shareholders' required return on franchise value. This loading is allocated between product lines at the budgeting stage. It relates to the strength of customer relationships and the margin that these relationships can sustain. It has very little to do with loadings for risk.
- Finally, there is a franchise insurance element. This is required to compensate shareholders for the increased risk to franchise value implied by writing this particular insurance policy. It is this element which may be captured indirectly by allocation of economic capital.

To summarise these charts, we can see that the required premium does increase with risk, but al so that the effect of diversifiable risk is much less severe than systematic risk. This is consistent both with accepted market pricing models such as CAPM and also with our observations regarding frictional costs.

6. Conclusions

All firms have a cost of capital. Financial firms are special because:

- Customers are particularly credit sensitive
- The firms have access to discounted cash flow projections of their products
- The franchise value can be identified in terms of customer relationships

This means that financial firms are an ideal setting for the cost of capital methodologies in developing pricing tools and target setting. Known biases in cost of capital methods for other industries are most easily remedied for financial firms. These new insights imply a method for analysing a firms market capitalisation and using this to drive profit margins used in pricing bases.

We have investigated and quantified the costs of having too much equity capital, and also the cost of having too little. We identify an optimal level of capital, which minimises the sum of these two effects.

7. References and Acknowledgements

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8. Appendix: Risk and Economic Capital

How can we allow risk in a discounted cash flow calculation? There are two popular approaches:

- Modify the equity on which a cost of capital is charged
- Modify the required return to reflect risk

The first of these routes is commonly called "economic capital", while the second route is called "contingent claim pricing". This paper has focused on contingent claim methods. Here we describe the alternative approach of economic capital.

The economic capital route also has a counterpart in the actuarial literature, where an allowance for cost of capital is sometimes called a "locking in adjustment", although typically this is defined using regulatory rather than probabilistic capital definitions.

> **Definition**. *Economic capital* is the amount of equity required such that a firm has a specified probability of meeting a defined liability over a defined time horizon. This is measured on a cash flow basis, ignoring the impact of regulatory or accounting constraints.

In this section, we outline common practice regarding economic capital and its use in setting targets and incentive. Strategically, economic capital has proved to be a dead-end, but an understanding is nevertheless useful in order to appreciate the merits of the alternative contingent claim approach.

Some authors have advocated the use of economic capital also for corporate valuation, and so for value-based management. The procedure is as follows:

- Split the total equity of the firm into two components: the economic capital and additional capital. There may be debt as well; in this note we consider that as a liability rather than equity.
- Value the additional capital at face value, as if it were immediately distributed
- Set the economic capital to be consistent with an aspired credit rating grade.
- Include only the economic capital within the cash flow calculation.

The methodology recognises that the appropriate rate for discounting dividends depends on their risk. Capitalising operating units to an agreed rating standard is an attempt to standardise the risk. The implicit assumption is that two units capitalised to the same rating standard would merit the same discount rate. In other words, the cost of capital is assumed to be a function of the aspired credit grade. Risk from a shareholder perspective is equated to risk of default.

Having established an economic capital benchmark, there is still a need to set an overall cost of equity. This may be set for a whole group by the board. Alternatively, a financial model such as CAPM may be applied, often using historic betas for the group. A third alternative, especially useful for unquoted firms, is to use CAPM applied to peer firms with similar credit ratings.

The cost of equity is not always a critical assumption. For example a ranking of the returns of different business units would be largely unaffected by the choice the cost of equity; the same ranking of business units will emerge whatever cost of equity. On the other hand, for valuation purposes the cost of equity is a critical assumption.

There are two ways to set economic capital to be consistent with a required credit grade. The first, and simplest, is to use the formulas published by rating agencies, working backwards to solve for the initial equity which would merit a target grade. The second, more complex approach is to solve for the initial capital, which equates modelled default probabilities to historic default rates on bonds of the aspired grade.

In practice, this second methodology is not simple to implement. Some of the concerns and possible solutions are as follows:

Problem	Possible solution
Accounting profit gives no credit for effort invested in intangibles such as brand or customer service	Modify the accounting practice for performance measurement purposes in order to take such items into account.
Need to allocate equity down to a product level	Use "economic capital" based on the risk of each business unit. The performance measure then qualifies as "risk adjusted".
Need to choose a level of security and a time horizon for measuring the economic capital required	Use a one-year time horizon and set an aspiration for credit rating grade. Set economic capital by equating the failure probability (derived from a stochastic model) to historic default rates on corporate bonds with the chosen credit grade.
Capital measures are affected by accounting, regulatory or rating agency constraints which may be arbitrary or even perverse	Measure economic capital on an "economic" basis, which transcends the effect of accounting and regulatory constraints.
Different parts of the business are accounted in different ways,	Measure financial instruments on a mark to market basis, retail loans on amortised costs and other items appropriately.
A transaction may affect not only the need for equity but also the cost of equity	Allow for product risk in the calculation of economic capital in order to equalise the cost of allocated equity
Economic capital is not additive. The capital required for a portfolio is lower than the sum of requirements of each component.	Reallocate the diversification gain as a capital credit to each contract.
Contracts may cover multiple years, and affect both profit and capital requirements for years to come.	Measure performance and economic capital over a one-year horizon. Effects on subsequent years' profit or equity are to be credited to management in those future years.

While economic capital projects have produced little benefit per se, their imposition has been a catalyst for other developments which are useful in their own right, including

- An understanding of the need to manage risk as well as to increase reported profit
- The discipline of implementing risk modelling capabilities in each business unit
- A focus on value created for shareholders, and its link to financial planning

The role of regulatory and accounting constraints is important to understand, but more challenging to model. Actuarial departments have produced such models for years, but senior management have feared the complexity involved, and have not always been prepared to spend the time required to interpret model output.

Economic capital models were devised as a work-around; by disregarding external (and sometimes arbitrary) constraints, economic capital models can be greatly simplified. Limited computational power is better deployed to capture subtleties of correlations between different market risks rather then the behaviour of regulatory formulas.

More recently, there has been a concerted effort to make a virtue out of this particular necessity. Regulatory and accounting effects are portrayed as distortions, which the "true" economic capital avoids. However, businesses are now beginning to realise that

- Regulatory, accounting and rating effects, whether distortions or not, are important for managing capital in a business, not least because default events are subject to regulatory and accounting triggers.
- More traditional actuarial models, which use Monte Carlo simulation to capture regulatory and accounting effects, have been rediscovered as a tool to answer capital questions.
- Many of the complexities and anomalies in accounting and regulation arise from genuinely difficult questions - such as attribution of renewals, cross sales, future premiums or policyholder options. These also need to be resolved in an economic capital model.
- Therefore the apparent simplification of an "economic" approach may no longer be necessary or desirable.

Furthermore, there is still a disturbing lack of consensus as to how economic capital should be used in practice. This divergence leads to the following common criticisms:

- It is impossible to compare economic capital from one organisation to another, because no two organisations use the same metric. This undermines claims that "economic" capital measures are free of arbitrary conventions or are more fundamental than accounting or regulatory capital measures.
- The need for so many fixes and counter-fixes raises the question of whether the underlying theory is sufficiently robust.
- A few financial firms have seen their share prices tumble at the same time as publishing rosy risk-adjusted performance measures. Analysts have questioned whether managers are exploiting loopholes in the economic capital methodology to produce favourable numbers.

Let us compare the economic capital approach to the contingent claim approach advocated in his paper.

Economic Capital	**Contingent Claim**
A future cash flow is discounted using a mean cash flow and the cost of equity for the entity which owns the cash flow	The present value of a cash flow depends on the payoff in each possible future state of the economy, and not on who owns the cash flow.

The controversial extensions of contingent claims methods are to the valuation of entities. These extensions use stochastic models of an entity's cash flows to estimate a market price for the entity. Conversely, analysts may seek to work backwards from an observed market price to the corresponding market-implied cash flows, and so to market-implied performance targets for corporate management.

There is an increasing trend to the use of contingent claim methods in asset and liability valuation. Mark to market accounting for financial instruments is almost universal. Forthcoming insurance accounting standards rely heavily on contingent claim tools for setting realistic balance sheets and the valuation of embedded guarantees. While banks have repeatedly asserted the impracticality of a mark-to-market regime for retail and commercial loans, many are developing tools to do precisely that.

These developments lead to a pricing dilemma for financial firms. The top down approach for allocating economic capital appears crude relative to the more sophisticated contingent claim pricing tools already in use at a product level. Too many economic capital projects have become derailed because of difficulties incorporating the top down targets into pricing models.

There is a remedy for these implementation difficulties. One answer is to use contingent claim theory to derive the cost of capital. This helps a central planning function to disseminate targets that make sense at a business unit level.