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Risk and the discount rate

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Version:	2.0
Date:	July 15, 2018

1   Problem statement and introduction

It is common practice to relate the perceived risk associated with an investment opportunity to the discount rate to be used to evaluate the net present value (NPV). We may see differentiation by technology or investment project type, by country, by individual opportunity with its unique risks or even at the line item level within a cash flow analysis. In this way, it is assumed, the NPV is appropriately 'adjusted for risk'.

It is asserted that this is a flawed approach.

There is no discussion about the discounting principle. The concept of the weighted average cost of capital (WACC) is generally accepted as an appropriate way to set a corporate discount rate. However, the role of the discount rate should only be aimed at accounting for the **time value of money**. The link to 'risk', whilst present, is weak. In fact, simply translating the complexity and associated risk of the (future) business environment into an idiosyncratic discount rate for evaluating investment opportunities reduces the incentive to get to grips with this complexity.

The problem is sometimes circumvented by focusing on the internal rate of return as a decision metric. It should however be realized that this metric has some conceptual problems and is inferior to NPV and DROI[1] as a project selection tool.

This note explores the argumentation against this practice and provides a compelling alternative.

It should be noted that this discussion can be confused by different interpretations of the term 'risk'. For example, sometimes risk is interpreted as 'degree of volatility'. In this article we mean with risk: the exposure to an unfavourable outcome.

2   Cost of capital and risk

Usually a company uses the so-called cost of capital as the basis for the discount rate to evaluate its investment opportunities. Quite often an opportunity-related 'risk premium' will be added on top of that to account for project-specific risk (which is the practice that we argue against). The WACC is generally approximated by the weighted average of the cost of equity and the cost of debt. The relative weights result from the financing structure of the company in question. The Capital Asset Pricing Model (CAPM) is usually applied to determine the cost of equity. Whilst the use of the CAPM is not undisputed and has many practical issues, it is still widely used because of its relative simplicity.

Below we comment on the relationship between the cost of debt and risk before we explore various dimensions of the relationship between cost of equity and risk.

The relationship between lender risk and interest rate is not straightforward

Normally the debt part of a company's financial structure consists mainly of bank loans and bonds issued by the company. The company has a legal obligation to service its debt: payment of principal and interest on loans, and payment of coupon rate on the face value of bonds. The general notion is that if the lender, i.e. the bank or the bond holder, assesses that there is a possibility that the company may not be able to service its debt, he will require a higher interest rate, or coupon rate as the case may be. In this sense the cost of debt will have a relationship to risk of default on the part of the company in question. In practice the cost of debt is based on the company's credit rating by the relevant agencies (Standard & Poor's, Moody's and Fitch Group).

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[1] Discounted return on investment = NPV divided by discounted capital investment

The risk-free interest rate is usually taken from the yield of the US Treasury bonds. However, there are more factors that will influence the interest rates, coupon rates and bond yields. For one, the rates established by the central banks have a large impact on the interest rates in the market, with even an inverse relationship between prescribed rate and macro-economic risk: in times of low economic growth or high unemployment, central banks may choose to keep the interest rate low. Treasury bonds also used as collateral in financial transactions in the global financial system i.e. subjected to supply and demand. This affects the interest rates associated with these bonds, which thus are not solely reflective of credit risk and inflation.

The full array of risks a company is exposed to is not observable by investor

An individual or legal entity who invests in a listed company expects a return that is commensurate with perceived risk. This return consists of periodic dividends and share appreciation. The return can be expressed as a rate and represents the **cost of equity**.

Investor's perceived risk, that should be balanced by an appropriate return level, is not precisely defined. It is likely mainly related to the possibility that the share price may drop, that dividends may not be forthcoming or that the company in question may go bankrupt. It is primarily an expression of the exposure to the downsides associated with exogenous uncertainties such as market conditions, political and macroeconomic developments. However, there may also be internal risks that could affect the fortunes of the investor, such as issues around (mis-)management, fraud, reputation, cyber risks, etc. In addition, the company may be assumed to have multiple assets and investment opportunities. The idiosyncratic, endogenous risks of these individual opportunities will on portfolio basis be attenuated (not eliminated) but sometimes the overall company performance can be very heavily affected by mishaps in a single investment project.

Hence, the company will be exposed to a wide array of different types of risks. These are generally not well observable by the investor. The risk perception of the investor will operate at a higher level of abstraction focusing on a general sense of the market developments, snippets of company information available in the public domain and the published financial performance. Somehow, the investor needs to translate this aggregate of rather high level risk information into a specification of desired return. This is operationalized through buy, hold or sell decisions with regard to his shareholding position. In this way, as it were, the collective global investor community converts a risk perception into a quantitative measure: the share price development.

The cost of equity is usually derived using historic data from multiple comparable companies

In practice, the cost of equity is indeed derived from historic data using the performance of the shares of a set of representative, comparable companies. Of course, one could consider the historic share performance of the company in question, but this may be affected by particular unrepresentative conditions in the past. It is usually assumed that some averaging out is necessary to arrive at meaningful results. This implies that general market conditions as these have played out in history, and not company specific considerations, drive the cost of equity assessed in this way.

The calculated cost of equity is only partially representative of future risk exposure

As the calculated cost of equity is based on historic data, there is no explicit incorporation of a risk assessment of the future outlook of the company in question except to the extent this has been priced in the share performance in recent years. It may be that the market share price indeed takes into account some perception of the future viability of the market in question, but this usually stretches across a limited future outlook period. Therefore, any long term risk exposure, for example due to possible technological or geopolitical developments, will not be incorporated in the calculated cost of equity.

The cost of equity is not only driven by risk

The asset share performance is not only related to risk perceptions of investors. It also has to do with instantaneous market conditions and the availability of alternative investment opportunities. For example, a low interest rate will have a positive effect on the performance of equities whilst their risk profiles do not change. Some of this may be mitigated by indeed looking at multiple comparable companies and by considering a long enough time period in the past. Nevertheless it is clear that the cost of equity as a measure of risk when derived from share performance data will be distorted when using data from for example the current decade, with its low interest rates[2].

The conclusion must be that the direct relationship between the cost of capital and the risk exposure of a company is not very well defined and notional at best. This does not mean that the WACC is not a useful concept. It can certainly be translated into a company discount rate as a reference benchmark for opportunity evaluation. For properly and fully considering the risk dimension we should be looking at completely different approaches.

3   Discount rate differentiation: some practices

In practice one may find that schemes are applied that further refine the concept of equating risk to rate, detailing this at the opportunity or country level and even at line item level in a valuation model.

The opportunity cost of capital

The opportunity cost of capital is a similar concept as the cost of capital of a company, but then specific for a single opportunity within the portfolio of investment projects. The thought is that opportunities within the portfolio of a company will have different risk profiles. By differentiating the discount rate per opportunity it is assumed that the valuations (NPVs) are better comparable as the risk element has been 'factored in'. Numerical values for discount rates per opportunity

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[2]At the same time it should be noted that in the WACC calculation the effect of low interest rates on the share prices (up) will be offset by the impact on the cost of debt (down). The important observation is nevertheless that policy is the driving factor in this example, and not risk.

are obtained by using the share performance data of companies that specialize in that specific class of activities. For example if an energy company invests in a wind park, the discount rate for that investment would require historic share price data of companies that **only** invest in wind parks.

Country risk

It is not uncommon for companies to differentiate the discount rate for opportunity evaluation on the basis of the so called country risk. The thought is, again, that NPVs should be adjusted in the light of specific risk conditions in a country, related to for example political, economic, social or regulatory issues. Country risk indicators supplied by specialized consultancies may be used to guide the derivation of a mark-up on top of the standard corporate discount rate. This could mean that opportunities in high risk countries are evaluated at for example double the company discount rate.

Line item differentiation

Sometimes one may come across advocates of discount rate differentiation at the line item level within an economic cash flow model. For example, a cost element which is more uncertain or 'risky' than another cost element may get discounted at a different rate. Or tax repayments or subsidies from the government (which are assumed to be risk free) should be incorporated in the valuation model using a lower discount rate. Another example is the treatment of leases in valuations.

We consider all of the above examples to be inappropriate practices for reasons outlined below.

4   Why discount rate differentiation is not a good idea

The basis for the discount rate, the WACC, has an ill defined relationship to risk to start with

In section 2 above we have looked at the relationship between (future) risk exposure and WACC and concluded that this is notional at best. The WACC is not a precise measure for systemic or market risk but is also influenced by other factors.

The derivation of 'risk premiums' is problematic

Whilst we have concluded that directly relating the corporate discount rate to risk perception is not without issues, the further differentiation at country, category or opportunity level will be even more complicated. There will be operational difficulties in deriving credible discount rate levels for opportunity classes and countries. How realistic is it to find a representative group of companies

with sufficient share performance data that specialize in a specific class of investment projects? Is there a credible method to translate country risk indicators to rates? It is very questionable whether the translation from country risk 'scores' to discount rate premiums can be done in a credible way.

A variable discount rate is a one-dimensional approach

Upsides and downsides are not made visible. By choosing a discount rate, and assuming this incorporates all the relevant risking, we can only calculate one number. Presumably the risk premium that is added to the WACC focuses specifically on the downside of the risk exposure. It is then not possible to illuminate the upside.

Aggregation at company level becomes a complicated calculation

One would expect that the aggregation of NPVs of all company projects and assets, across different types and countries, would add up to the total value of the company. This would need to be the same as the aggregate company future cash flow discounted at the company WACC. Clearly this would be highly impractical to achieve.

A variable discount rate disincentivizes the understanding of risk

The accounting-for-risk-through-the-discount-rate approach hinges on unspecified risk perceptions in the market with regard to 'comparable' investments elsewhere. If analysts and decision makers assume that by using a specific 'risk adjusted' discount rate the project specific risks and uncertainties are accounted for in the calculated NPV, then this will discourage an approach where the real risks are systematically identified, assessed, quantified, if possible mitigated and if not, incorporated in the decision metrics.

Assuming that risk can be precisely reflected in the discount rate is a superficial approach that blurs a clear line of sight to the real issues. Small changes in the discount rate have a large impact on the NPV calculation. Application of this practice may hence misguide proper investment decision making.

5   The alternative

So what is the alternative?

The primary step is not to judgementally look at a company or opportunity from a distance, and simply slap some risk premium on top of the WACC, but to get closer and to examine the various risks and uncertainties associated with an investment project in good detail.

In other words, open up the hood and get in there!

Ways to do that include the following.

Think in ranges rather than in single numbers

Investment specific uncertainties/risks can be addressed by using probability distributions (ranges) for the estimates that are incorporated in the project cash flow analysis. The analysis is done in a probabilistic way. There are a number of techniques to do this: Monte Carlo simulation, decision trees, analytical methods. In particular the latter can be very efficient and transparent. Such analysis results in ranges of the key financial indicators of investments. The extent of such a range is reflective of (some of) the 'risk' associated with the investment opportunity. A wide range will indicate a lot of uncertainty and hence potentially a risk of a disappointing outcome.

Use the risk management tool kit but quantify the risks rather than talk about them

Many companies have established risk management practices. There are ways to, reasonably credibly, quantify the key risks as recorded in the risk register. This quantification is useful for developing risk mitigation plans. It is also important to integrate the assessments of the residual (unmitigatable) risk in the probabilistic investment analysis to ensure the financial opportunity metrics presented to decision makers are as 'honest' as possible.

But yes, there are also contextual risks that are difficult to quantify

For the understanding of the broader future business environment and its inherent risks, **scenario thinking** or **scenario planning** is powerful. This will guide a disciplined discussion of possible relevant future developments and will provide insight in future outlooks, but not predictions, of relevant commodity prices. Project investment evaluations can be put in the context of such alternative futures in order to illuminate what scenarios mean for investment choices.

When developing the business it is of course important to take a portfolio view

There are usually multiple investment opportunities which will require ranking and selection. The project specific risks will not cancel out but will certainly be attenuated at portfolio level. There may be opportunities for risk mitigation or hedging across the portfolio. Investment opportunities can be categorized and viewed according to risk profile. It will be of specific interest to take a look at the systemic risks, i.e. issues that can affect the entire portfolio. Such issues can in particular also be examined through a scenario planning approach as mentioned above.

Despite all analysis, judgement on the part of decision makers remains important

In the end, sound judgement will always be a crucial element, whatever amount of analysis is done. Good decision makers will combine a deep understanding of the analyses presented to them with their own experience and intuition.

And what about the discount rate?

This remains an important tool to account for the time value of money. It should roughly be considered reflective of the risk and return relationship for the business that the company is in. But it is not a sole and precise measure of risk. It should be used as a minimum stable yardstick for assessing all investment opportunities in value terms that a company may have, approximately equating to the cost of capital using a rounded, fixed number. Updating this yardstick annually with small changes, for example as a result of interest rate developments, does not make sense. And neither does differentiation driven by project investment risk perceptions.