

Retrievability bias in explaining the hurdle rate premium puzzle

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Dear Editor

Thank you for your letter of 21 January and your encouragement to submit a revision. We are pleased to note that the reviewers are very supportive of the paper; we are grateful for their suggestions and believe that the changes we have made have significantly improved the paper. Our responses to their comments are shown in *italics* below:

Reviewer: 1

Thank you very much for your positive comments.

Additional Questions:

Implications. What I lack in the paper is a better discussion on the potential empirical ways in which the model presented could be tested. It should not be too hard to derive clear testable hypotheses. For instance, if the bias is as on page 8 suggested, related to a revision of the hurdle rate due to prior experience of incorrect decisions (an underestimation of risk or cash flows), decision makers in firms where such risks have been realized should be using higher hurdle rates. The hurdle rates might thus be related to past success/failure. Also behavioral variables such as prior experience and age might influence the decision making. I encourage the authors to include a discussion around testable implications of their model.

I like their conclusion on a better follow up of the investments made, both those projects chosen and some major rejected, in order to better communicate information on hurdle rates used vs actual outcomes, in order to reduce potential cognitive biases.

We have followed your suggestion and added a discussion on testable hypotheses in the final section.

Reviewer: 2

I like very much the idea of using behavioural finance ideas to explain the hurdle rate premium puzzle. As noted above I think there is a major gap in the argument presented. Also, as noted, I think the gap cannot easily be fixed since the assumption used appears to be false. However, I believe the author is onto something valuable with the idea of using the retrievability bias as part of an explanation for the HRP puzzle. I think a stronger more water-tight argument supporting a weaker claim along the lines of the paper could be publishable.

Thank you for your valuable feedback particularly about our insufficient assumption. We have taken your comment very seriously and have made changes to strengthen the argument in the paper. In addition please see our more detailed responses below.

Additional Questions:

The main weakness in the argument is that the paper assumes that when a project is reviewed, it can be determined, from the success or failure of the project whether a hurdle rate that is too high or too low has been used. No details of the review process are discussed. It is not explained how the success or failure of completed or partially completed projects is measured, or how this measurement process can lead to the conclusion that the hurdle rate used was too high, appropriate for the project risk, or too low.

The assumption in any case appears to be false. "Risk", "correct hurdle rate", etc. are all theoretical concepts, not observables. They are probabilistic concepts, and can be estimated only by using samples, not by taking a single observation. Many factors determine the success or failure of a project, so that a particular project fails does not directly lead to the conclusion that a too low hurdle rate was used when accepting the project.

Thank you for pointing this out. We accept that the point on 'determining' the 'true' HR ex-post was

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3 *weak. We agree that one cannot know 'ex post' in a mechanical way whether a hurdle rate that was*
4 *applied in an appraisal was too low. In S2.3 we now explain our assumption that within organizations*
5 *there are generally widely accepted perceptions about whether or not individual past investment*
6 *decisions were good decisions, satisfactory decisions or bad decisions. Where an investment is*
7 *perceived to be regrettable then there will be informal/unconscious individual and group thinking*
8 *about what was incorrect in the appraisal process. (Note: we are not saying that all completed or*
9 *partially completed projects will have their success/failure formally measured - though sometimes*
10 *this will happen)*
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13 *We hope that the revised draft, with its substantial changes to Sections 2.3 and 2.4 addresses your*
14 *concerns. One notable addition is that the paper now identifies two categories as to why a project*
15 *may fail and how this may be recognized. Although the risk and correct hurdle rate are not*
16 *observable, we believe that the perceptions of decision-makers and/or formal processes allow some*
17 *understanding of what the principal error in the appraisal had been. We argue that, whatever the*
18 *understanding, there will be a recognition that, the proposal would have been less likely to have been*
19 *given the 'go ahead' if the hurdle rate had been higher. These perceptions are unlikely to be solely*
20 *focused on cash flows since even a cash flow projection error reinforces an awareness of risk, and the*
21 *discount rate is likely to be implicated.*
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24 *Where there is a formal process, 'failure of a project' may mean a loss in company value measured*
25 *by a negative NPV. A decision-maker may seek to identify what type of risk had been recognized and*
26 *what type had not been anticipated. However, even if there is no formal process, the perception of*
27 *the project being a mistake will serve as feedback to the decision-maker. Thus, this measurement is*
28 *not a necessary requirement for our explanation.*
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31 *We agree that "many factors determine the success or failure of a project" and now take care not to*
32 *claim that a too low hurdle rate at the time of the appraisal may be the only reason for a project to*
33 *fail. Our new material in S2.3 argues inductively; but we hope it shows that failure in general or*
34 *failure due to false risk appraisal (not necessarily the hurdle rate alone making the project fail) can*
35 *make a project appear riskier than it actually was, which may in turn lead to an overcompensation.*
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38 *We also agree with your point about probabilities and that one draw from a distribution (one*
39 *project's outcome) does not tell about the risk of a project. However, from a behavioural rather than*
40 *statistical perspective, we now more explicitly argue that the decision-makers may not view it as just*
41 *one draw but as information on the "actual risk of the project"; and may draw incorrect conclusions*
42 *(such as 'the risk was higher than I thought') which may affect future appraisals as stated before.*
43 *Thus, a decision-maker would be biased by the single salient observation of the outcome of a project*
44 *and subjectively revise their perception of risk.*
45

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47 *There are some, more minor criticisms. I won't go through these in detail, since if the major gap in*
48 *the retrievability argument can be fixed, any minor problems can easily be tweaked away too.*
49 *However, I did feel that the author dismissed a bit too readily some of the existing institutional*
50 *arguments for the HRP puzzle. For example, that top managers deliberately overstated the hurdle*
51 *rate to compensate for over-optimism in project proposers.*
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54 *Yes, we may not have given adequate recognition of the existing institutional explanations of the*
55 *HRPP. We do not deny the existence or validity of these arguments, and in S1.3 now more explicitly*
56 *state our limited contention that the discussion of the HRPP also deserves acknowledgement of*
57 *unconscious adjustments and explanations which have not been sufficiently addressed. Moreover, in*
58 *Section 2.3 we pick up arguments that justify a higher hurdle rate (e.g. over-optimistic cash flows) in*
59 *our new discussion on potentially unrecognized risks. Further studies will have to clarify how the*
60 *different arguments function together or which ones may be stronger or weaker.*

Retrievability Bias in Explaining the Hurdle Rate Premium Puzzle

1 Investment appraisal and setting the hurdle rate

Making correct investment decisions poses an important challenge for senior management. In particular, capital investments and consequently the appraisal of potential projects significantly affect a company's long-term performance and survival. The optimal decision, i.e. choosing the most profitable investment project, requires a non-distorted decision process with accurate data and rational decision-making. This paper revisits the phenomenon that "a hurdle rate in excess of the corporate cost of capital is often used to appraise divisional project proposals" (Harris, 2000, p. 91), and aims to provide a novel explanation based on managerial cognitive behaviour and corporate post-audit feedback processes.

Götze *et al.* (2015) model the ideal investment decision process and identify seven typical stages, of which Stages 5 and 7 of Figure 1 are particularly relevant to this study. Stage 5 refers to the investment appraisal methods applied and the acceptance decision made; Stage 7 refers to the monitoring and 'post audit' of projects and the resulting feedback and learning process. The setting of hurdle rate and the potential systematic error, as argued later in this paper, affect both stages.

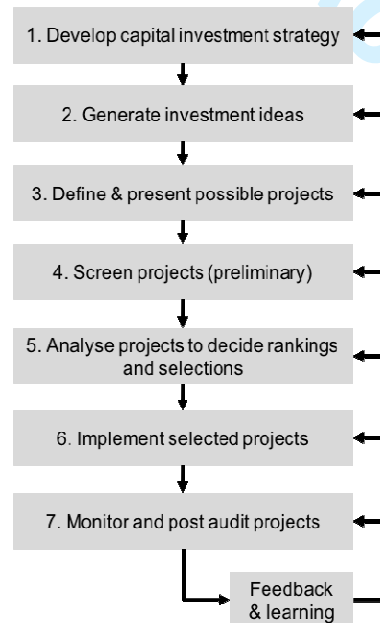


Figure 1 An investment decision process model based on Götze *et al.* (2015).

As regards Stage 5 of the process, discounted cash flow appraisal methods such as Net Present Value (NPV) and Internal Rate of Return (IRR) methods are widely recommended and used (see for example Haka, 2007; Meier and Tarhan, 2007; Pike, 1996). They require the following parameters: the discount rate and the project's forecast cash flow profile. The decisions about the parameters will affect the projected profitability of the considered investment projects and thereby the outcomes of the investment appraisal. This paper particularly focuses on the discount rate and what has become known as the Hurdle Rate Premium Puzzle.

The NPV and IRR methods are related. The former seeks to identify the 'value' that would be created, i.e. the present (discounted) value of all current and future cash flows. A project should be adopted if the NPV is positive, i.e. the project's rate of return exceeds the discount rate applied. Hence, the discount rate represents a minimum rate of return or hurdle rate. The IRR method calculates the rate that would lead to an NPV of zero, i.e. the rate of return of the investment project. A project should be supported if its IRR exceeds an appropriate hurdle rate. For both NPV and IRR methods the cost of capital typically serves as the hurdle rate. In our analysis, we will concentrate on the NPV method and assume a typical stream of cash flows; that is, where initial outflows are followed by (mainly) inflows, so that the higher the discount rate, the lower the estimated NPV.

The values of the parameters utilised in investment appraisal derive from information in accounting records and knowledge and, in practice, from the decision-maker's memory and wider experience that can influence subjective parameter estimates (Luft and Shields, 2010). When making judgements the human cognitive system – exhibiting limited rationality – often uses decision rules that simplify a complex task and may incorporate cognitive biases, which will lead to suboptimal capital investment decisions. This paper examines one decision rule and reveals how its application under certain conditions can lead to suboptimal decision-making.

To detect a distortion in setting the hurdle rate, the rate actually chosen by the corporate decision-maker can be compared with an estimate of the optimal hurdle rate, i.e. an objectively appropriate one. Therefore, in Sections 1.1 and 1.2 we will discuss the determination of the hurdle rate in theory and in practice and consider the Hurdle Rate Premium Puzzle as practical phenomenon. Section 2 introduces the 'availability' decision rule and argues how this rule of thumb can lead to distorted judgement in the context of setting the hurdle rate. An illustrative example shows how a so-called heuristic might guide a corporate decision-maker's judgement and the bias that can result. The retrievability bias can systematically lead ~~decision-maker~~ decision-makers to apply a discount rate higher than the cost of capital, and thus partially explains the boundedly rational hurdle rate premium.

1.1 Determination of the optimal hurdle rate

Discount rates play a major role in most investment appraisal methods. They are of crucial importance in enabling comparability of cash flows occurring at different points in time and permit comparisons between investment alternatives. They are applied to balance out differences in tied-up capital and in economic lives and reflect how much the future cash flows will be devalued.

The cost of capital approach is considered suitable for determining an appropriate discount rate. It is the minimum average rate of return needed to satisfy the requirements of the providers of funds and should recognise the effect of the project on the overall level of risk to the company's funders. It can be determined by the weighted average cost of capital (WACC) with the cost of debt derived from debt financing agreements, and the risk-adjusted company or project-specific cost of equity¹ based on the Capital Asset Pricing Model (CAPM). Using WACC as hurdle rate appears rational. Assuming that the projects being considered have the same risk as the company's current projects on average, there is no better indicator of the company's future risk than the current cost of capital which reflects the expectations of creditors and shareholders given the current level of information.

It can be argued that companies utilizing the CAPM should conduct project-specific risk assessments and hence adjust the company WACC upwards or downwards to find the most appropriate hurdle rate – a key understanding of corporate finance theory since Modigliani and Miller (1958). The resulting tailored discount rates follow the logic that different projects or company divisions are associated with different levels of risk and therefore require adjustment.² However, a company's overall risk is the result of the individual capital investment projects' risks, and thus a company's WACC always represent the average project- (or division-)³ specific hurdle rates.

In summary, the determination of a company-wide cost of capital – potentially adjusted for a project's specific risk – is a well-established, objective and accurate approach to approximate the optimal cost of capital (see for example Modigliani and Miller, 1958; Modigliani and Miller, 1965; Elton, 1970; Myers and Turnbull, 1977).

1.2 Determination of the hurdle rate in practice

Empirical research confirms that companies apply company-wide as well as project-specific discount rates – the majority applying a single company-wide discount rate only (see for example Meier and Tarhan, 2007; Graham and Harvey, 2001; Brounen *et al.*, 2004; Bruner *et al.*, 1998). In doing so, they typically use WACC.

Of particular relevance to this paper, the self-reported discount rate – and therefore the hurdle rate – often considerably exceeds the computed cost of capital (Brunzell *et al.*, 2013; Meier and Tarhan, 2007; Poterba and Summers, 1995; Gup and Norwood, 1982). Those studies contrast optimal and actual, i.e. self-reported, hurdle rates. Optimal rates were approximated by externally calculating WACC with data derived from the market and financial statements. This paradox that the self-reported hurdle rate exceeds the optimal one is known as the Hurdle Rate Premium puzzle. Evidence for this paradox is provided in studies of US companies by

¹ It builds on 'classical' research, for example originated by Sharpe (1964) and Lintner (1965), followed by publications of Black (1972), Black *et al.* (1972), Rubinstein (1973), Fama and MacBeth (1973), Black and Scholes (1973), Merton (1973), Ross (1976), and Ross (1977) and has been further developed for example by Dolde *et al.* (2012). It has seen serious criticism and justifications, for example by Jagannathan and Meier (2002), Wood and Leitch (2004) or Fama and French (2004).

² However, in practice there are problems in objectively determining an appropriate project-specific hurdle rate (see, for example, Titman and Martin, 2010). Moreover, conducting project-specific risk adjustments is questioned by corporate finance literature. For example, Reimann (1990) suggests establishing a regularly updated cost of capital based on CAPM principle, applied as a common hurdle rate. Risk adjustments should be made at the cash flow level. Risk adjustments can be made in various ways. This is not picked up in this paper; for empirical findings about different approaches applied see for example Lindblom *et al.* (2010).

³ In the following, company WACC will be contrasted to project-specific cost of capital, but the same logic applies for divisional cost of capital.

Meier and Tarhan (2007) and Poterba and Summers (1995) and in Nordic companies by Brunzell *et al.* (2013).

A higher than optimal hurdle rate reduces profitability and implies a bias against lower-risk projects relative to riskier projects (Titman and Martin, 2010). It can also lead to a short-termism; companies may systematically favour projects with relatively high cash inflows in the close future by more strongly discounting cash flows that occur at a later point in time (Dobbs, 2009).

1.3 Existing explanations for the Hurdle Rate Premium

The Hurdle Rate Premium (HRP) has been known for many years and various explanations have been put forward.

Brunzell *et al.* (2013) empirically find that the sophistication of a company's investment appraisal method is inversely related to the hurdle rate premium (the more sophisticated the method, the lower the hurdle rate). Additionally, they find that short-term pressure felt by decision-makers has a positive impact on the hurdle rate (Brunzell *et al.*, 2013). Meier and Tarhan (2007) suggest that the growth potential and financial situation of a company are positively associated with the hurdle rate premium. However, these are merely statistical observations, and do not provide logical explanations for the paradox.

Titman and Martin (2010) note the potential scenario of capital rationing with mutually exclusive projects in which the hurdle rate might be raised to equal the opportunity cost, i.e. the rate of return of the next-best project, but this interesting concept does not provide a generic explanation for the HRP.

A relatively high hurdle rate might also be chosen to compensate for managerial overconfidence and overoptimism, which typically lead to inflated cash flow projections (see for example Gervais, 2010; Dobbs, 2009). This explanation could be valid where different level managers are involved in generating proposals from those making the investment decisions, since the higher level might want to adjust for biased behaviour below. However, instead of increasing the hurdle rate to correct for overconfidence and overoptimism, it would be more straightforward for the decision-maker to reduce the projected cash inflows across the project term; this would also avoid unintended compounding of the correction beyond the planning horizon.

Studies finding a hurdle rate premium (Meier and Tarhan, 2007; Poterba and Summers, 1995; Brunzell *et al.*, 2013) compare the (theoretically required) cost of capital to the hurdle rate self-reported by companies. There is, however, Yet there is no evidence no argument in the HRP literature that the reason for the premium is only attributable to a conscious (upwards) adjustment of the cost of capital to derive a hurdle rate – the premium maymay also appears to be applied without much thought or awareness.

The adjustment of hurdle rates due to the explanations above mostly require conscious adjustment, and they may do not fully solve the puzzle. In the following section we argue that the premium may arise due to unconscious intuitive judgements and cognitive biases; that is, it may be caused by decision-makers using simplified decision rules, so-called heuristics, to facilitate decision-making (Tversky and Kahneman, 1974, Kahneman, 2003, Dobbs, 2009). This would imply, though none of the approaches outlined above has extensively dealt with

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7 this aspect, that distorted judgement may be an explanation. The hurdle rate premium could,
8 at least partly, be attributed to limited (bounded) rational behaviour in that cognitive
9 reasoning systematically and unconsciously guides decision-makers to make suboptimal
10 decisions.

11 12 13 **2 The relevance of cognitive biases to explain the Hurdle Rate Premium**

14
15 Despite normative views that the optimal hurdle rate for appraising projects should equal the
16 cost of capital, empirical surveys of practice do not confirm this. The arguments outlined in
17 1.3 above may provide partial explanations for the HRP but we maintain it has another
18 explanation, based on decision-makers' bounded rationality and biased intuitive judgements.

19 Intuition may be involved whenever judgements are incorporated in the decision process
20 thereby influencing the decision: When a manager determines the discount rate or hurdle rate
21 for evaluating an investment project, he or she may subjectively use different sources of
22 information including his or her⁴ own experience, thereby deviating from the 'optimal'
23 process. The optimal process or outcome may be disputed but the tendency to set hurdle rates
24 higher than can be explained by standard corporate finance theory, has been shown.

25
26 As indicated above, a decision-maker's memory, knowledge and experience almost always
27 play a role in the process of searching and selecting the information from accounting records
28 and knowledge (Luft and Shields, 2010). This may vary between a fairly objective, 'close to
29 optimal' choice of the hurdle rate where only few or no pieces of information are subjectively
30 searched and selected on the one hand, and a highly subjective choice of the hurdle rate on the
31 other hand. Even the 'close to optimal' case implies some subjective considerations.

32 33 34 **2.1 The heuristics and biases concept – some background**

35 From psychology-based research it is known that in decision situations under uncertainty,
36 decision-makers often use 'heuristics' or 'heuristic principles' when their complex task is to
37 make a judgement (and eventually make a decision) where a probability or value has to be
38 estimated or predicted (Tversky and Kahneman, 1974). Heuristics are often described as
39 decision shortcuts, rules of thumb or simple decision rules. Generally, a decision-maker –
40 deliberately or (more typically) unconsciously⁵ – simplifies the problem (i.e. uses simpler
41 judgemental operations) in order to solve it. This can be due to various reasons such as
42 limited information, time constraints and bounded cognitive capacity to store, retrieve and
43 process information. As a consequence, the decision-maker forfeits an optimal result, which
44 otherwise – if at all – might only be reached by a thorough and rational analysis, and accepts a
45 satisfying and sufficing non-optimal decision instead. This bounded-rational behaviour is
46 known as 'satisficing' (Simon, 1955).

47
48 To arrive at a judgement about an event that the decision-maker has limited information
49 about, and that is not available to perception, the heuristic serves to search and choose the
50 informational sources and information to utilise (Hastie and Dawes, 2010). Brunswik's Lens
51 Model provides a framework for judgement (Brunswik, 1952; Cooksey, 2001). The hurdle
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54 ⁴ For simplicity, in future, the male pronoun is used but this is not intended to imply any significance.

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60 ⁵ For a discussion on the extent to which heuristics are deliberate or unconscious processes, see for example Sloman (2002).

rate is the to-be-judged criterion for which a judgement, i.e. an estimate, has to be made. The decision-maker uses the cues (the ‘lens’ that connects the environment with internal psychological processes) that are available to him or her such as information in accounting records, knowledge about how hurdle rates should be set and also from memory and wider experience (Luft and Shields, 2010). Cues may be unconscious, interrelated and interdependent and involve ‘limited ecological validity’ due to uncertainty in the environment and limited time (Brunswik, 1952; Hastie and Dawes, 2010). The decision-maker then processes the cues’ information and makes an inference as to what the criterion should be, i.e. he makes an estimate of the criterion (the hurdle rate) and thus arrives at a judgement (Hastie and Dawes, 2010). Heuristics can be described as the way cues are combined and processed.

Generally, heuristics can be very helpful tools; intuitive thinking is not wrong in general but deemed to be skilled and successful (Kahneman, 2003). Heuristics save time and simplify a problem and may lead to generally good judgements (Gigerenzer and Brighton, 2009), unless – consciously or unconsciously – a cognitive bias occurs, that can result in severe and systematic decision distortions. Setting the hurdle rate might be such a complex decision task. The following example will illustrate where subjective judgement represented by a heuristic is involved in setting the hurdle rate. It will be shown how a heuristic might influence a manager’s judgement and the bias that can result.

2.2 Example

Consider a situation where a decision-maker such as a manager or a CFO of a large⁶ company, who is responsible for making capital investment decisions, has data about previous investment projects and their outcomes, as well as about the cash flow projections of a potential investment project. The manager is well-educated in corporate finance, experienced in his job and has decided upon, and can recall, a number of investment projects of similar nature (e.g. with respect to the project’s features and investment frequency). The company routinely applies a project-specific discount rate based on company WACC adjusted for project-specific risk.

Imagine the manager’s task is to determine the discount rate and thus the NPV to appraise a potential investment opportunity. Being experienced in his job, he is not inclined to conduct an explicit detailed analysis of the project’s risk; instead, he usually intuitively considers all risks associated and prefers a prompt decision. “With today’s dynamic business environment, executives must have cost-effective and user-friendly analysis techniques that they can apply easily but not mechanically, which are embedded in their everyday thought processes.” (Harris, 2000, p.103). As stated the manager has decided upon several projects of similar nature in the past and *ex post* considered whether parameters such as the cash flows and the level of risk had been correctly estimated, the deviations between the parameters such as the cash flows planned versus actual and the anticipated risks to the actual outcomes, hurdle rates chosen ex ante versus the actual cost of capital of these projects.

Let us assume that the project-specific risk premium applied for all similar projects in the past has been the same due to a similar level of riskiness. Also that the decisions to invest

⁶ Decision-makers in large companies might have a more significant level of experience due to high investment volume, a high number of projects and standardised processes. Moreover, there can be more than one manager deciding on projects (e.g. each one responsible for another field) so that the “knowledge pool” and feedback to investments might be greater and better.

turned out to be reasonable *ex post* since the cost of capital applied as hurdle rate for these projects appeared to be a good approximation – except for one project: One of the comparable projects, on which the manager participated in the investment decision, failed and led to a loss in company value. The (relatively unlikely or not anticipated) worst case ‘state of nature’ happened and the cash flows failed to materialise as expected. Thus, as regards the project’s risk assessment, the hurdle rate chosen for the initial appraisal still seemed appropriate objectively justifiable. An ‘outlier’ risk-outcome of low probability (such as a plant burning down) may have occurred but was not present in the decision-maker’s mind; the event had never occurred and its probability was underestimated. From thea subjective point of view of the manager, this scenario can lead to a different risk assessment ex post and biased judgement in a similar future situation as will be explained in the next section.

2.3 The retrievability bias and its surprising effect

The ‘availability heuristic’ is a simple decision rule that may be applied by the manager in such a situation. It implies that, when a decision is to be made about the probability of an event, an individual ‘searches’ the memory and concludes that those events which come to mind more easily appear to be more frequent and therefore probable (Tversky and Kahneman, 1974; Kahneman, 2003).

Assuming that the managerial decision-maker is not inclined to conduct an explicit thorough analysis but feels able to evaluate the risks informally in his mind, he may unwittingly employ the availability heuristic in making a judgement about the appropriate hurdle rate. He must judge which hurdle rate (i.e. higher, lower, or equal to the WACC and by what amount) appears to be the correct-adequate one given uncertainty about the future and thus which one ensures a good decision about the project’s value. In practice, board decision-making plays an important role. However, boards consist of individuals each having been involved in good or bad prior decisions so the process described, though incomplete, remains valid.

In this process, the availability heuristic suggests the following reasoning for an *unbiased* mind: The decision-maker recalls all projects of similar nature from the past and assesses the extent to which the appraisals – including the assessments of risk withand the applied hurdle rate – wereas appropriate. “Decision makers use their own experience, and evaluate new opportunities by comparing them with a reference point from personal knowledge.” (Emmanuel *et al.*, 2010, p. 481). He might conclude that for projects, except one, his judgement of the risks and his resulting decision, i.e. the selected hurdle rate, was appropriate; and thus this hurdle rate seems *ceteris paribus* to be a good starting point for a rate to be applied to the current project. However, some minor amendment of the hurdle rate might seem necessary due to his experience with the incorrect decision that was made (underestimation of the risk of fire) because he underestimated risk (e.g. the risk of fire) and thus the hurdle rate applied by the company was-seemed too low. For appraising future similar projects the hurdle rate should be slightly revised upwards correcting for the neglected type of risk.

One *bias* that can occur due to the availability heuristic is the so-called ‘bias due to the retrievability of instances’ developed by Tversky and Kahneman (1974): When some events

are more vivid than others or have occurred recently, they can more easily be recalled from memory and thus appear more frequent and therefore probable than others. Other events might have occurred equally frequently in the past but, as they are less vivid in the decision-maker's memory or occurred a longer time ago, they appear less likely (see Tversky and Kahneman, 1974; Bazerman and Moore, 2013). This bias will occur if the manager's decision is overly influenced by the very salient exceptional project (such as a production site fire). That event can make him believe that his assessment of the project's risk and thus his determination of the project's hurdle rate was may have been incorrect/inappropriate; it led the company to experience a loss in value, and should have been set significantly higher.

We assume that organisations generally have widely accepted perceptions about whether or not individual past investment decisions were good decisions, satisfactory decisions or bad decisions. Given the assumption that an investment is perceived to be regrettable and to have 'failed', there will be formal and informal, or even unconscious, individual and group thinking about what was the reason for the failure or what had been incorrect in the appraisal process.

There are two broad causes for the failure of an investment project: cash flows that turn out to be worse than forecast, and a risk assessment that may result in inappropriately low risk-adjusted cost of capital, i.e. actual risk-adjusted costs of capital that exceed expectations. As regards the risk assessment of a project as the cause of failure, the following two categories have been identified:

Category I: The appraisal process was correct and all the risks were adequately recognised (including the level of uncertainty about cash flows), but the actual 'state of nature' turned out to be bad. Enterprises will inevitably have projects that go wrong despite correct quantification of risk, and they need to accept some failures; if they set the hurdle rate so high that no projects ever failed, this would also screen out many good projects.

Category II: In the appraisal process, risk was not adequately recognised with regard to:

- The cash flows were over-optimistic given the facts that were known at the time; thus there was a greater organisational information risk (related to the reliability of the forecasting) than recognised.
- The project had inherent flaws that were not known at the time of the appraisal; thus the project information risk was not adequately recognised.
- The costs of capital were underestimated at the time (procedural risk), or they increased more than was anticipated (information risk).
- The operating (internal) environment deteriorated more than was anticipated (e.g. key staff left, the factory was flooded); thus the operating risks were not adequately recognised.
- The external environment changed more than was anticipated; thus the business risk was not adequately recognised.

In all of the above Category II issues, the hurdle rate applied is likely to be seen to have been inappropriate. For example, not recognising over-optimistic cash flows or not recognising potential changes in the market (external environment) represents an underestimation of risk. The firm's policy and the decision-maker's motivation may now increase efforts that all Category II reasons will be eliminated in a subsequent appraisal to improve decision-making.

Learning from, and adjusting to the inappropriate appraisal components will be central to a project review; and a flawed investment appraisal that led to project failure represents a salient event to the decision-maker.

To a different decision-maker it may not be obvious whether the project failure was a 'poor draw' from the correctly specified distribution (Category I) of the project's outcomes, or whether there was a cash flow error or a risk was inadequately recognised (Category II). Conceivably, a decision-maker may realise that risk had been adequately recognised (Category I) and thus it was not their mistake and should not influence their future judgement. Despite this reservation, there may still be a high enough proportion of projects that are perceived to be in Category II for the retrievability bias to irrationally upwardly skew hurdle rates:

The bias arises if ~~now~~, due to the 'painful' experience of a project failure in general or of a false appraisal, the perceived risk and thus hurdle rates for the subsequent projects under consideration are set higher than appropriate and what the 'availability' rule of thumb suggests. In other words, prior mistakes are overcompensated. The systematic setting of inappropriately high hurdle rates gives distorted estimates of projects' profitability and leads to underinvestment. The feedback to the decision-maker due to false project appraisal will be discussed in the next section.

2.4 Systematisation of scenarios, outcomes and feedback

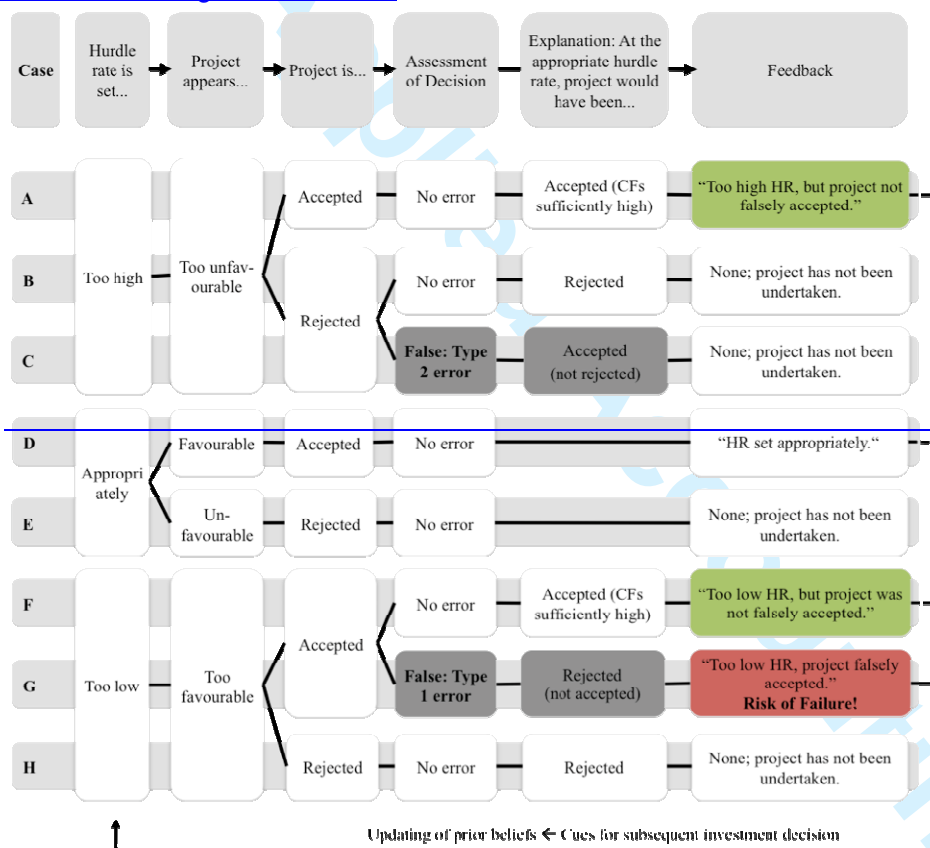
Figure 2 systematises and graphically depicts the problem by identifying eight cases, their decision outcomes and interpretations by the decision-maker. In Cases A, B, F and H decision mistakes were not made because even with the appropriate hurdle rate, the decision (accept or reject project) would have been the same. Cases D and E ~~refer to~~ represent appropriate risk assessments and the correct settings of the hurdle rate and are therefore not considered further.

In Case A, the decision-maker has ~~– depending on his or her~~ based upon their risk assessment – set the hurdle rate too high but the project nevertheless is accepted and will not lead to a loss in company value, i.e. with hindsight, it will ~~be~~ seen to be 'good'. This implies that the projected cash flows must have been sufficiently high to compensate the inappropriately high hurdle rate effect. Error does not result from the hurdle rate being set too high in this case. The same logic applies to Case F which was correctly accepted, due to strong positive cash flows, despite an underestimation of risk and an inappropriately low hurdle rate.

With regard to the feedback provided to the decision-maker we should now consider the investment decision-making process and its final step (see Stage 7 in Figure 1): the follow-up monitoring phase of a project and in particular of the cash flows and the ~~discount rate~~ risk assessment (target-actual comparison and resulting analyses) followed by feedback and learning. This stage is illustrated in the right column in Figure 2. If a ~~regular~~ routine mechanism is established which *ex post* explicitly analyses projects that have been accepted (the hurdle rate i.e. the cash flows and whether the risks were adequately considered and thus the reasons why a project may not have turned out as projected); then decision-makers will get feedback on projects that have been accepted, such as Cases A, D, F and G. The analysis

will then reveal that the cash flows had been estimated too high, too low or appropriately and what risks were considered adequately or not and why (cf. Category II).

hurdle rate had been set too high, too low or appropriately. In doing so, the a false setting appraisal of the hurdle rate in Cases A and F will become evident (green feedback fields). This information perception about a non appropriate risk assessment and as one consequence thereof, a potentially non appropriate hurdle rate does not necessarily appear as a significant mistake to the decision maker, since the decision would not have been altered using a different the correct hurdle rate. However, the decision-maker is unlikely to perceive the non-appropriate risk assessment and hurdle rate as significant because the decision would not have been altered using the 'correct' rate.



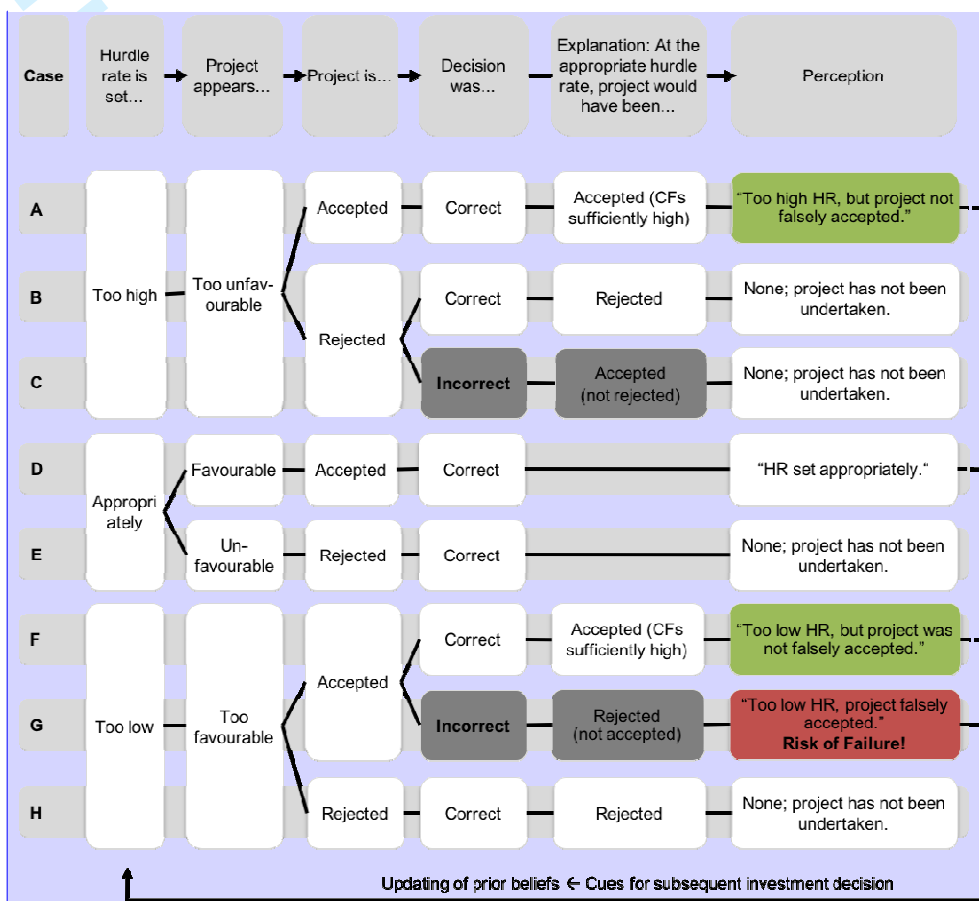


Figure 2 Decision-maker's feedback-perception of the setting of the hurdle rate (HR).

When evaluating a similar project next time, this analysis with its insights on the (false/inappropriate) risk assessment and thus setting of the hurdle rate (should and) probably will be taken into account by the decision-maker. The bottom arrow of Figure 2 represents learning about one's ability and updating one's prior idea about the appropriate risk and hurdle rate when new information arrives (see Gervais, 2010). New information comes particularly from post audit feedback on projects that get adopted (A, D, F and G); this will affect the decision-maker's subsequent estimates of the most appropriate hurdle rates. We note that the feedback that managers get can be of low quality as it is imprecise and slow, and investment decisions are made infrequently and irregularly, which complicates learning (Gervais, 2010). Knight (1921) cautions that "in business management no two instances, perhaps, are ever very closely alike, in any objective, describable sense." However, we can assume that experienced decision-makers have capacity to integrate new information and compare it to previous situations so that learning does happen. A formal or an informal post audit of projects may provide information about the mistakes in the appraisal; realising that the initial risk assessment was insufficient may happen consciously but, more importantly, also unconsciously.

Comment [author1]: Please note that this is now a revised Figure 2:

5th column:
 "Assessment of Decision" --> "Decision was"
 "No error" --> "correct"
 "Error" --> "incorrect"

Last column:
 "Feedback" --> "Perception"

As indicated above, the essential point is that the feedback on some investment decisions, such as G, which ‘go wrong’ might be more salient and vivid than on others such as A and F which turn out as successes; this is elaborated in the following paragraphs.

With regard to Case B (H): The ~~project’s risk is not adequately recognised and may be underestimated (overestimated); thus the~~ hurdle rate is set too high (low) and the project is rejected due to a negative NPV, but the erroneous rate is not obvious; the decision-maker will not be aware of the false setting of the rate, because companies seldom organise follow-up monitoring on projects that have been rejected; ~~insight gained is typically outweighed by the additional cost of such an analysis.~~ The decision-maker is thus not in a position to use this information when assessing the next project. Furthermore, even if *ex post* reviews were carried out on B and H, they would show that despite the ~~incorrect-inappropriate~~ hurdle rates the appraisal outcomes were, in fact, the right ones.

Our model contains two scenarios for incorrect accept-reject decisions: First, a false positive case can be illustrated by the fire example in Section 2.2, ~~is represented by. It may correspond to~~ Case G in Figure 2 ~~and reveals a Type 1 error in that it incorrectly rejected the hypothesis (H_0 : The project under consideration is rejected).~~ The project was not rejected but with an appropriate rate it would have been rejected. The hurdle rate was set too low, which resulted in insufficient discounting of future cash ~~(in)flows.~~ This can result in accepting a project which is later seen to generate a negative NPV. ~~As the poor decision enforced/evidenced by a poor outcome~~ is likely to be a salient event (red feedback field in Figure 2) ~~and, it~~ can generate the ~~previously described retrievability bias due to retrievability as described before~~ and an incorrectly raised hurdle rate ~~for appraising a comparable project next time in future appraisals.~~

Secondly, a false negative case is given in Case C of Figure 2. ~~In this so-called Type 2 error, the process fails to reject the null hypothesis because~~ ~~the project risk may be overestimated, the~~ hurdle rate ~~is therefore~~ set too high, ~~and and~~ the project is rejected due to a negative ~~estimated~~ NPV. With an appropriate (lower) hurdle rate, the appraisal would have correctly shown a positive NPV for the proposed project and the project might have turned out to be successful *ex post*. However, the decision-maker will not realise the false decision because the project will not be undertaken. The decision-maker is unlikely to get feedback on ~~the mistaken risk assessment and~~ having set the hurdle rate too high and so does not learn from the experience. This case illustrates the long-term consequences of setting the hurdle rate too high; projects are falsely rejected resulting in underinvestment. Moreover, and as indicated above, risky projects are systematically preferred to low-risk projects (Titman and Martin, 2010) and a short-term bias is induced (Dobbs, 2009).

Figure 2 summarises the different combinations of ‘too high/too low’ and ‘accept/reject project’ and shows the cases in which feedback is provided to the decision-maker on ~~the investment project and on their project appraisal that may influence the~~ setting of the hurdle rate. As indicated above, perception and cognitive processes, reinforced by the one-sidedness of the post-audit process in concentrating only on adopted proposals, will impact the decision-maker’s judgement and subjective reasoning when evaluating future projects. As Case G is a much more salient event, the false ~~risk assessment and thus inappropriate~~ setting of the hurdle

rate (too low) will influence the judgement more severely than Cases A (too high, but project succeeded nevertheless) and F (too low, but project succeeded nevertheless).

Furthermore, we can assume that projects which proved to be successful are subjected to investigations less frequently and thoroughly than those, which fail. I.e. cash flows and discount rates might not always be evaluated in a detailed and comprehensive way for positive NPV projects *ex post*. If so, then Cases A ~~and (F)~~ will result in even less feedback to the appraisal including the risk assessment hurdle rate being set too high (low) than will Case G and the argument is strengthened further.

Our analysis to this point has referred to the determination of absolute profitability of an investment project. However, relative profitability, i.e. the comparison of different (mutually exclusive) projects will reveal the same systematisation of cases and errors as derived from the original example. Due to a suboptimal setting of the hurdle rate (too low or too high), the project which appears relatively profitable is not necessarily the objectively more profitable one.

2.5 Discussion

The two extremes of *ex post* feedback – on the one hand, no (or lax) follow-up in the case of non-adopted or successful proposals and, on the other, a thorough follow-up mechanism on bad investments – give different levels of information to the decision-maker. A rigorous follow-up monitoring of all proposals could uncover the false setting of hurdle rates. However, these procedures might still not overcome the disproportionate effect that an accepted project's failure due to a false erroneous formal or informal risk perception leading to an inappropriate setting of the hurdle rate (as obvious in the Type 1 error Case G) has on the decision-maker's intuition and the retrievability bias may persist. Failure of the project in general, and the failure of a project due to a false appraisal as regards the setting of the hurdle rate, as, e.g. in the risk of Case G, remains the most influential events and will be more available in memory for the next project decision when events like these are retrieved. It will serve as a strong cue to influence cognitive reasoning and thereby the judgement.

Because of humans' retrievability bias, the event 'hurdle rate has been set too low' – additionally associated with a negative affect – stays in memory more easily. The event '(possible) failure' is likely to come to mind more easily and thus a higher hurdle rate appears to be more suitable, and is therefore more 'probable', than the truly appropriate one. To the decision-maker, it seems it might help to avoid a decision mistake and wrong acceptance of a project, and will thus influence judgement. In other words if, next time, information on which hurdle rate to set is retrieved from memory, a Type 1 error, the setting of an underestimation of risk (and thus a too low rate) leading to an error, will be the cue that is intuitively more promising. Hence, the decision-maker will tend to revise the previous hurdle rate upwards but would not systematically set a hurdle rate too low; this explanation is in accordance with empirical findings relating to the hurdle rate premium.

Strategies do exist for correcting cognitive biases, i.e. debiasing, include motivational, cognitive and technological strategies or decision aids (see for example Larrick, 2004). Moreover, awareness of potential biases and the situations where they can occur is the most important requirement for correcting biases (see for example Kahneman, 2003; Milkman *et*

al., 2009). However, this debiasing process can be long and requires constant review and vigilance in the decision process, particularly the more complex the context, and is up to the individual decision-maker (Bazerman and Moore, 2013). Thus, even though an individual is aware of a cognitive bias, efforts are needed to correct it. A well-structured investment appraisal process with a post audit stage can serve as a good starting point for developing decision aids providing awareness. However, the biases inherent in the setting of the hurdle rate may not be easily corrected and are therefore still be observable in practice.

3. Conclusion and Outlook

Our analysis requires empirical testing to validate the relevance of the retrievability bias in the setting of the hurdle rate. Experiments could address the effect of past experience of failed investment projects, and of the review process, on future risk assessments and thus the hurdle rate decisions. A first testable hypothesis may be:

H₁: The more failures of investment projects a decision-maker has experienced, the higher the risk premium incorporated into the hurdle rates applied in future project appraisals.

The failure of an investment project could result from either false investment appraisal or from one of the anticipated states of nature (independent of the appraisal).- The awareness of a false appraisal assumes that some kind of review or post audit of the project has been performed – either formally or informally/unconsciously. Thus, we could consider the effect of a formal versus a subjective informal review of the failed investment appraisal:

H_{2a}: The more incorrect assessments of investment projects' risks (disclosed in a formal post-audit process) a decision-maker has made, the higher the risk premium incorporated into the hurdle rates applied in future project appraisals.

H_{2b}: The more incorrect assessments of investment projects' risks a decision-maker has perceived, the higher the risk premium incorporated into the hurdle rates applied in future project appraisals.

Further potential avenues to explore in this context, but which we will not lay out as formal hypotheses include: There may be a relationship between the level of detail of a company's review process and its impact on hurdle rate premia. More sophisticated review processes will disclose more details and thus more mistakes in the appraisal, which in turn could affect the decision-maker's risk and hurdle rate assessment. Secondly, given that the more investment appraisals an individual has been involved in, i.e. the higher a decision-maker's work experience in this field, the more failed investment projects s/he may have experienced. Thus one might investigate associations between HRP's and demographic variables such as age, years of work experience, or personality traits such as confidence of attitudes to risk.

To conclude, the determination of parameters in investment appraisal, particularly estimating a project's risk and thus setting the hurdle rate, necessarily involves a certain degree of subjectivity. From this it follows that heuristics, which to some extent rely on intuition, may guide a decision-maker's judgement, and cognitive biases can systematically distort decisions. This paper shows the effect of the retrievability bias on the judgement of experienced managerial decision-makers. It provides a reasoned explanation of how managers deciding on investment projects may be biased in tending to systematically set hurdle rates

higher than suggested by theory. While we are not claiming to provide a complete explanation of the paradox, we believe that cognitive biases and the noise in feedback on adopted investment proposals play a systematic part in explaining why hurdle rates are set above the rationally advocated discount rate, and we thus help solve the Hurdle Rate Premium Puzzle. The policy implications of this study are that corporate success could be enhanced, firstly, by making executives aware of the premium phenomenon and of its behavioural causes; and, secondly, by widening the scope of the post-audit programme to include significant rejected investment proposals, and communicating the opportunity cost of 'false negative' decisions on proposals not adopted.

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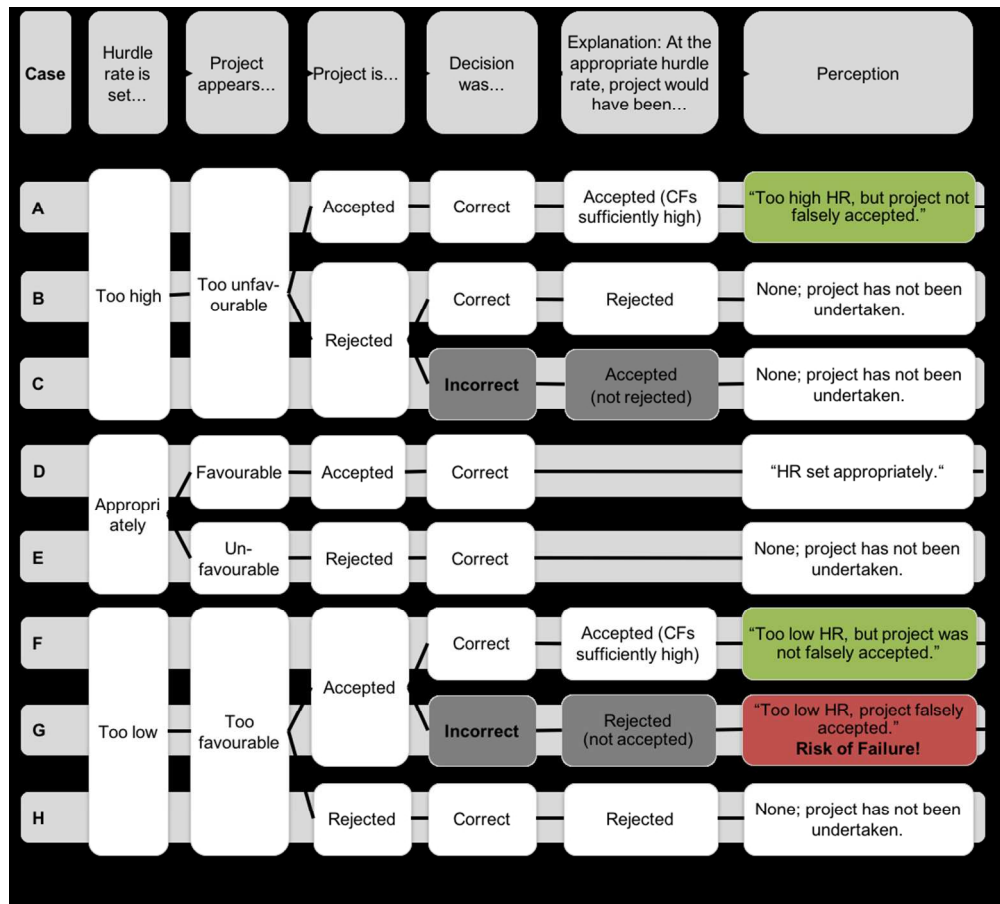
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Retrievability Bias in Explaining the Hurdle Rate Premium Puzzle

1 Investment appraisal and setting the hurdle rate

Making correct investment decisions poses an important challenge for senior management. In particular, capital investments and consequently the appraisal of potential projects significantly affect a company's long-term performance and survival. The optimal decision, i.e. choosing the most profitable investment project, requires a non-distorted decision process with accurate data and rational decision-making. This paper revisits the phenomenon that "a hurdle rate in excess of the corporate cost of capital is often used to appraise divisional project proposals" (Harris, 2000, p. 91), and aims to provide a novel explanation based on managerial cognitive behaviour and corporate post-audit feedback processes.

Götze *et al.* (2015) model the ideal investment decision process and identify seven typical stages, of which Stages 5 and 7 of Figure 1 are particularly relevant to this study. Stage 5 refers to the investment appraisal methods applied and the acceptance decision made; Stage 7 refers to the monitoring and 'post audit' of projects and the resulting feedback and learning process. The setting of hurdle rate and the potential systematic error, as argued later in this paper, affect both stages.

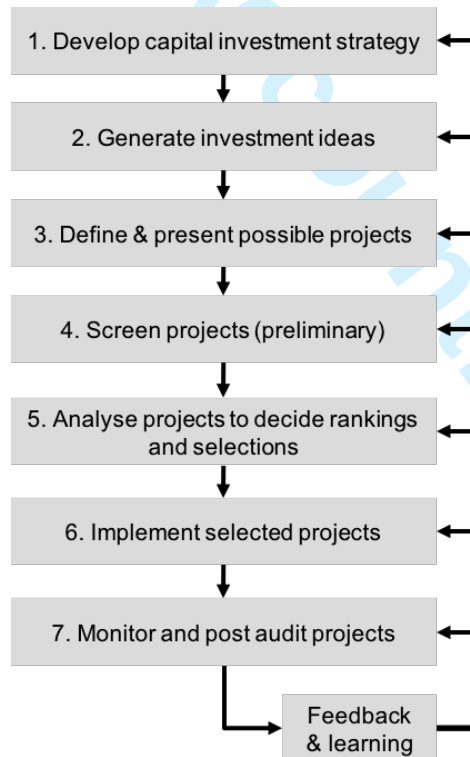


Figure 1 An investment decision process model based on Götze *et al.* (2015).

As regards Stage 5 of the process, discounted cash flow appraisal methods such as Net Present Value (NPV) and Internal Rate of Return (IRR) methods are widely recommended and used (see for example Haka, 2007; Meier and Tarhan, 2007; Pike, 1996). They require the following parameters: the discount rate and the project's forecast cash flow profile. The decisions about the parameters will affect the projected profitability of the considered investment projects and thereby the outcomes of the investment appraisal. This paper particularly focuses on the discount rate and what has become known as the Hurdle Rate Premium Puzzle.

The NPV and IRR methods are related. The former seeks to identify the 'value' that would be created, i.e. the present (discounted) value of all current and future cash flows. A project should be adopted if the NPV is positive, i.e. the project's rate of return exceeds the discount rate applied. Hence, the discount rate represents a minimum rate of return or hurdle rate. The IRR method calculates the rate that would lead to an NPV of zero, i.e. the rate of return of the investment project. A project should be supported if its IRR exceeds an appropriate hurdle rate. For both NPV and IRR methods the cost of capital typically serves as the hurdle rate. In our analysis, we will concentrate on the NPV method and assume a typical stream of cash flows; that is, where initial outflows are followed by (mainly) inflows, so that the higher the discount rate, the lower the estimated NPV.

The values of the parameters utilised in investment appraisal derive from information in accounting records and knowledge and, in practice, from the decision-maker's memory and wider experience that can influence subjective parameter estimates (Luft and Shields, 2010). When making judgements the human cognitive system – exhibiting limited rationality – often uses decision rules that simplify a complex task and may incorporate cognitive biases, which will lead to suboptimal capital investment decisions. This paper examines one decision rule and reveals how its application under certain conditions can lead to suboptimal decision-making.

To detect a distortion in setting the hurdle rate, the rate actually chosen by the corporate decision-maker can be compared with an estimate of the optimal hurdle rate, i.e. an objectively appropriate one. Therefore, in Sections 1.1 and 1.2 we will discuss the determination of the hurdle rate in theory and in practice and consider the Hurdle Rate Premium Puzzle as practical phenomenon. Section 2 introduces the 'availability' decision rule and argues how this rule of thumb can lead to distorted judgement in the context of setting the hurdle rate. An illustrative example shows how a so-called heuristic might guide a corporate decision-maker's judgement and the bias that can result. The retrievability bias can systematically lead decision-makers to apply a discount rate higher than the cost of capital, and thus partially explains the boundedly rational hurdle rate premium.

1.1 Determination of the optimal hurdle rate

Discount rates play a major role in most investment appraisal methods. They are of crucial importance in enabling comparability of cash flows occurring at different points in time and permit comparisons between investment alternatives. They are applied to balance out differences in tied-up capital and in economic lives and reflect how much the future cash flows will be devalued.

The cost of capital approach is considered suitable for determining an appropriate discount rate. It is the minimum average rate of return needed to satisfy the requirements of the providers of funds and should recognise the effect of the project on the overall level of risk to the company's funders. It can be determined by the weighted average cost of capital (WACC) with the cost of debt derived from debt financing agreements, and the risk-adjusted company or project-specific cost of equity¹ based on the Capital Asset Pricing Model (CAPM). Using WACC as hurdle rate appears rational. Assuming that the projects being considered have the same risk as the company's current projects on average, there is no better indicator of the company's future risk than the current cost of capital which reflects the expectations of creditors and shareholders given the current level of information.

It can be argued that companies utilizing the CAPM should conduct project-specific risk assessments and hence adjust the company WACC upwards or downwards to find the most appropriate hurdle rate – a key understanding of corporate finance theory since Modigliani and Miller (1958). The resulting tailored discount rates follow the logic that different projects or company divisions are associated with different levels of risk and therefore require adjustment.² However, a company's overall risk is the result of the individual capital investment projects' risks, and thus a company's WACC always represent the average project- (or division-)³ specific hurdle rates.

In summary, the determination of a company-wide cost of capital – potentially adjusted for a project's specific risk – is a well-established, objective and accurate approach to approximate the optimal cost of capital (see for example Modigliani and Miller, 1958; Modigliani and Miller, 1965; Elton, 1970; Myers and Turnbull, 1977).

1.2 Determination of the hurdle rate in practice

Empirical research confirms that companies apply company-wide as well as project-specific discount rates – the majority applying a single company-wide discount rate only (see for example Meier and Tarhan, 2007; Graham and Harvey, 2001; Brounen *et al.*, 2004; Bruner *et al.*, 1998). In doing so, they typically use WACC.

Of particular relevance to this paper, the self-reported discount rate – and therefore the hurdle rate – often considerably exceeds the computed cost of capital (Brunzell *et al.*, 2013; Meier and Tarhan, 2007; Poterba and Summers, 1995; Gup and Norwood, 1982). Those studies contrast optimal and actual, i.e. self-reported, hurdle rates. Optimal rates were approximated by externally calculating WACC with data derived from the market and financial statements. This paradox that the self-reported hurdle rate exceeds the optimal one is known as the Hurdle Rate Premium puzzle. Evidence for this paradox is provided in studies of US companies by

¹ It builds on 'classical' research, for example originated by Sharpe (1964) and Lintner (1965), followed by publications of Black (1972), Black *et al.* (1972), Rubinstein (1973), Fama and MacBeth (1973), Black and Scholes (1973), Merton (1973), Ross (1976), and Ross (1977) and has been further developed for example by Dolde *et al.* (2012). It has seen serious criticism and justifications, for example by Jagannathan and Meier (2002), Wood and Leitch (2004) or Fama and French (2004).

² However, in practice there are problems in objectively determining an appropriate project-specific hurdle rate (see, for example, Titman and Martin, 2010). Moreover, conducting project-specific risk adjustments is questioned by corporate finance literature. For example, Reimann (1990) suggests establishing a regularly updated cost of capital based on CAPM principle, applied as a common hurdle rate. Risk adjustments should be made at the cash flow level. Risk adjustments can be made in various ways. This is not picked up in this paper; for empirical findings about different approaches applied see for example Lindblom *et al.* (2010).

³ In the following, company WACC will be contrasted to project-specific cost of capital, but the same logic applies for divisional cost of capital.

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3 Meier and Tarhan (2007) and Poterba and Summers (1995) and in Nordic companies by
4 Brunzell *et al.* (2013).

5
6 A higher than optimal hurdle rate reduces profitability and implies a bias against lower-risk
7 projects relative to riskier projects (Titman and Martin, 2010). It can also lead to a short-
8 termism; companies may systematically favour projects with relatively high cash inflows in
9 the close future by more strongly discounting cash flows that occur at a later point in time
10 (Dobbs, 2009).
11
12

13 14 15 **1.3 Existing explanations for the Hurdle Rate Premium**

16 The Hurdle Rate Premium (HRP) has been known for many years and various explanations
17 have been put forward.

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19 Brunzell *et al.* (2013) empirically find that the sophistication of a company's investment
20 appraisal method is inversely related to the hurdle rate premium (the more sophisticated the
21 method, the lower the hurdle rate). Additionally, they find that short-term pressure felt by
22 decision-makers has a positive impact on the hurdle rate (Brunzell *et al.*, 2013). Meier and
23 Tarhan (2007) suggest that the growth potential and financial situation of a company are
24 positively associated with the hurdle rate premium. However, these are merely statistical
25 observations, and do not provide logical explanations for the paradox.
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27

28 Titman and Martin (2010) note the potential scenario of capital rationing with mutually
29 exclusive projects in which the hurdle rate might be raised to equal the opportunity cost, i.e.
30 the rate of return of the next-best project, but this interesting concept does not provide a
31 generic explanation for the HRP.
32

33 A relatively high hurdle rate might also be chosen to compensate for managerial
34 overconfidence and overoptimism, which typically lead to inflated cash flow projections (see
35 for example Gervais, 2010; Dobbs, 2009). This explanation could be valid where different
36 level managers are involved in generating proposals from those making the investment
37 decisions, since the higher level might want to adjust for biased behaviour below. However,
38 instead of increasing the hurdle rate to correct for overconfidence and overoptimism, it would
39 be more straightforward for the decision-maker to reduce the projected cash inflows across
40 the project term; this would also avoid unintended compounding of the correction beyond the
41 planning horizon.
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46 Studies finding a hurdle rate premium (Meier and Tarhan, 2007; Poterba and Summers,
47 1995; Brunzell *et al.*, 2013) compare the (theoretically required) cost of capital to the hurdle
48 rate self-reported by companies. There is, however, no argument in the HRP literature that the
49 premium is only attributable to a conscious (upwards) adjustment of the cost of capital to
50 derive a hurdle rate – the premium may also be applied without much thought or awareness.
51

52 The adjustment of hurdle rates due to the explanations above mostly require conscious
53 adjustment, they may not fully solve the puzzle. In the following section we argue that the
54 premium may arise due to unconscious intuitive judgements and cognitive biases; that is, it
55 may be caused by decision-makers using simplified decision rules, so-called heuristics, to
56 facilitate decision-making (Tversky and Kahneman, 1974, Kahneman, 2003, Dobbs, 2009).
57 This would imply, though none of the approaches outlined above has extensively dealt with
58 this aspect, that distorted judgement may be an explanation. The hurdle rate premium could,
59
60

at least partly, be attributed to limited (bounded) rational behaviour in that cognitive reasoning systematically and unconsciously guides decision-makers to make suboptimal decisions.

2 The relevance of cognitive biases to explain the Hurdle Rate Premium

Despite normative views that the optimal hurdle rate for appraising projects should equal the cost of capital, empirical surveys of practice do not confirm this. The arguments outlined in 1.3 above may provide partial explanations for the HRP but we maintain it has another explanation, based on decision-makers' bounded rationality and biased intuitive judgements.

Intuition may be involved whenever judgements are incorporated in the decision process thereby influencing the decision: When a manager determines the discount rate or hurdle rate for evaluating an investment project, he or she may subjectively use different sources of information including his or her⁴ own experience, thereby deviating from the 'optimal' process. The optimal process or outcome may be disputed but the tendency to set hurdle rates higher than can be explained by standard corporate finance theory, has been shown.

As indicated above, a decision-maker's memory, knowledge and experience almost always play a role in the process of searching and selecting the information from accounting records and knowledge (Luft and Shields, 2010). This may vary between a fairly objective, 'close to optimal' choice of the hurdle rate where only few or no pieces of information are subjectively searched and selected on the one hand, and a highly subjective choice of the hurdle rate on the other hand. Even the 'close to optimal' case implies some subjective considerations.

2.1 The heuristics and biases concept – some background

From psychology-based research it is known that in decision situations under uncertainty, decision-makers often use 'heuristics' or 'heuristic principles' when their complex task is to make a judgement (and eventually make a decision) where a probability or value has to be estimated or predicted (Tversky and Kahneman, 1974). Heuristics are often described as decision shortcuts, rules of thumb or simple decision rules. Generally, a decision-maker – deliberately or (more typically) unconsciously⁵ – simplifies the problem (i.e. uses simpler judgemental operations) in order to solve it. This can be due to various reasons such as limited information, time constraints and bounded cognitive capacity to store, retrieve and process information. As a consequence, the decision-maker forfeits an optimal result, which otherwise – if at all – might only be reached by a thorough and rational analysis, and accepts a satisfying and sufficing non-optimal decision instead. This bounded-rational behaviour is known as 'satisficing' (Simon, 1955).

To arrive at a judgement about an event that the decision-maker has limited information about, and that is not available to perception, the heuristic serves to search and choose the informational sources and information to utilise (Hastie and Dawes, 2010). Brunswik's Lens Model provides a framework for judgement (Brunswik, 1952; Cooksey, 2001). The hurdle rate is the to-be-judged criterion for which a judgement, i.e. an estimate, has to be made. The

⁴ For simplicity, in future, the male pronoun is used but this is not intended to imply any significance.

⁵ For a discussion on the extent to which heuristics are deliberate or unconscious processes, see for example Sloman (2002).

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3 decision-maker uses the cues (the ‘lens’ that connects the environment with internal
4 psychological processes) that are available to him or her such as information in accounting
5 records, knowledge about how hurdle rates should be set and also from memory and wider
6 experience (Luft and Shields, 2010). Cues may be unconscious, interrelated and
7 interdependent and involve ‘limited ecological validity’ due to uncertainty in the environment
8 and limited time (Brunswik, 1952; Hastie and Dawes, 2010). The decision-maker then
9 processes the cues’ information and makes an inference as to what the criterion should be, i.e.
10 he makes an estimate of the criterion (the hurdle rate) and thus arrives at a judgement (Hastie
11 and Dawes, 2010). Heuristics can be described as the way cues are combined and processed.

12
13 Generally, heuristics can be very helpful tools; intuitive thinking is not wrong in general
14 but deemed to be skilled and successful (Kahneman, 2003). Heuristics save time and simplify
15 a problem and may lead to generally good judgements (Gigerenzer and Brighton, 2009),
16 unless – consciously or unconsciously – a cognitive bias occurs, that can result in severe and
17 systematic decision distortions. Setting the hurdle rate might be such a complex decision task.
18 The following example will illustrate where subjective judgement represented by a heuristic is
19 involved in setting the hurdle rate. It will be shown how a heuristic might influence a
20 manager’s judgement and the bias that can result.
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28 2.2 Example

29 Consider a situation where a decision-maker such as a manager or a CFO of a large⁶
30 company, who is responsible for making capital investment decisions, has data about previous
31 investment projects and their outcomes, as well as about the cash flow projections of a
32 potential investment project. The manager is well-educated in corporate finance, experienced
33 in his job and has decided upon, and can recall, a number of investment projects of similar
34 nature (e.g. with respect to the project’s features and investment frequency). The company
35 routinely applies a project-specific discount rate based on company WACC adjusted for
36 project-specific risk.
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40 Imagine the manager’s task is to determine the discount rate and thus the NPV to appraise
41 a potential investment opportunity. Being experienced in his job, he is not inclined to conduct
42 an explicit detailed analysis of the project’s risk; instead, he usually intuitively considers all
43 risks associated and prefers a prompt decision. “With today’s dynamic business environment,
44 executives must have cost-effective and user-friendly analysis techniques that they can apply
45 easily but not mechanically, which are embedded in their everyday thought processes.”
46 (Harris, 2000, p.103). As stated the manager has decided upon several projects of similar
47 nature in the past and *ex post* considered whether parameters such as the cash flows and the
48 level of risk had been correctly estimated.
49
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53 Let us assume that the project-specific risk premium applied for all similar projects in the
54 past has been the same due to a similar level of riskiness. Also that the decisions to invest
55 turned out to be reasonable *ex post* since the cost of capital applied as hurdle rate for these
56 projects appeared to be a good approximation – except for one project: One of the comparable
57 projects, on which the manager participated in the investment decision, failed and led to a loss
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⁶ Decision-makers in large companies might have a more significant level of experience due to high investment volume, a high number of projects and standardised processes. Moreover, there can be more than one manager deciding on projects (e.g. each one responsible for another field) so that the “knowledge pool” and feedback to investments might be greater and better.

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3 in company value. The (relatively unlikely or not anticipated) worst case ‘state of nature’
4 happened and the cash flows failed to materialise as expected. Thus, as regards the project’s
5 risk assessment, the hurdle rate chosen for the initial appraisal still seemed objectively
6 justifiable. An ‘outlier’ outcome of low probability (such as a plant burning down) may have
7 occurred but was not present in the decision-maker’s mind; the event had never occurred and
8 its probability was underestimated. From the subjective point of view of the manager, this
9 scenario can lead to a different risk assessment *ex post* and biased judgement in a similar
10 future situation as will be explained in the next section.
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16 **2.3 The retrievability bias and its surprising effect**

17 The ‘availability heuristic’ is a simple decision rule that may be applied by the manager in
18 such a situation. It implies that, when a decision is to be made about the probability of an
19 event, an individual ‘searches’ the memory and concludes that those events which come to
20 mind more easily appear to be more frequent and therefore probable (Tversky and Kahneman,
21 1974; Kahneman, 2003).
22
23

24 Assuming that the managerial decision-maker is not inclined to conduct an explicit
25 thorough analysis but feels able to evaluate the risks informally in his mind, he may
26 unwittingly employ the availability heuristic in making a judgement about the appropriate
27 hurdle rate. He must judge which hurdle rate (i.e. higher, lower, or equal to the WACC and by
28 what amount) appears to be the adequate one given uncertainty about the future and thus
29 which one ensures a good decision about the project’s value. In practice, board decision-
30 making plays an important role. However, boards consist of individuals each having been
31 involved in good or bad prior decisions so the process described, though incomplete, remains
32 valid.
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36 In this process, the availability heuristic suggests the following reasoning for an *unbiased*
37 mind: The decision-maker recalls all projects of similar nature from the past and assesses the
38 extent to which the appraisals – including the assessments of risk and the applied hurdle rate –
39 were appropriate. “Decision makers use their own experience, and evaluate new opportunities
40 by comparing them with a reference point from personal knowledge.” (Emmanuel *et al.*,
41 2010, p. 481). He might conclude that for projects, except one, his judgement of the risks and
42 his resulting decision, i.e. the selected hurdle rate, was appropriate; and thus this hurdle rate
43 seems *ceteris paribus* to be a good starting point for a rate to be applied to the current project.
44 However, some minor amendment of the hurdle rate might seem necessary due to his
45 experience with the incorrect decision that was made because he underestimated risk (e.g. the
46 risk of fire) and thus the hurdle rate applied by the company seemed too low. For appraising
47 future similar projects the hurdle rate should be slightly revised upwards correcting for the
48 neglected type of risk.
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54 One *bias* that can occur due to the availability heuristic is the so-called ‘bias due to the
55 retrievability of instances’ developed by Tversky and Kahneman (1974): When some events
56 are more vivid than others or have occurred recently, they can more easily be recalled from
57 memory and thus appear more frequent and therefore probable than others. Other events
58 might have occurred equally frequently in the past but, as they are less vivid in the decision-
59 maker’s memory or occurred a longer time ago, they appear less likely (see Tversky and
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1
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3 Kahneman, 1974; Bazerman and Moore, 2013). This bias will occur if the manager's decision
4 is overly influenced by the very salient exceptional project (such as a production site fire).
5 That event can make him believe that his assessment of the project's risk and thus his
6 determination of the project's hurdle rate may have been inappropriate; it led the company to
7 experience a loss in value, and should have been set significantly higher.
8

9
10 We assume that organisations do generally have widely accepted perceptions about
11 whether or not individual past investment decisions were good decisions, satisfactory
12 decisions or bad decisions. Given the assumption that an investment is perceived to be
13 regrettable and to have 'failed', there will be formal and informal, or even unconscious,
14 individual and group thinking about what was the reason for the failure or what had been
15 incorrect in the appraisal process.
16

17
18 There are two broad causes for the failure of an investment project: cash flows that turn out
19 to be worse than forecast, and a risk assessment that may result in inappropriately low risk-
20 adjusted cost of capital, i.e. actual risk-adjusted costs of capital that exceed expectations. As
21 regards the risk assessment of a project as the cause of failure, the following two categories
22 have been identified:
23

24
25 **Category I:** The appraisal process was correct and all the risks were adequately recognised
26 (including the level of uncertainty about cash flows), but the actual 'state of nature' turned out
27 to be bad. Enterprises will inevitably have projects that go wrong despite correct
28 quantification of risk, and they need to accept some failures; if they set the hurdle rate so high
29 that no projects ever failed, this would also screen out many good projects.
30

31
32 **Category II:** In the appraisal process, risk was not adequately recognised with regard to:

- 33 ■ The cash flows were over-optimistic given the facts that were known at the time; thus
34 there was a greater organisational information risk (related to the reliability of the
35 forecasting) than recognised.
- 36 ■ The project had inherent flaws that were not known at the time of the appraisal; thus
37 the project information risk was not adequately recognised.
- 38 ■ The costs of capital were underestimated at the time (procedural risk), or they
39 increased more than was anticipated (information risk).
- 40 ■ The operating (internal) environment deteriorated more than was anticipated (e.g. key
41 staff left, the factory was flooded); thus the operating risks were not adequately
42 recognised.
- 43 ■ The external environment changed more than was anticipated; thus the business risk
44 was not adequately recognised.
45
46
47
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49
50 In all of the above Category II issues, the hurdle rate applied is likely to be seen to have been
51 inappropriate. For example, not recognising over-optimistic cash flows or not recognising
52 potential changes in the market (external environment) represents an underestimation of risk.
53 The firm's policy and the decision-maker's motivation may now increase efforts that all
54 Category II reasons will be eliminated in a subsequent appraisal to improve decision-making.
55 Learning from, and adjusting to the inappropriate appraisal components will be central to a
56 project review; and a flawed investment appraisal that led to project failure represents a
57 salient event to the decision-maker.
58
59
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To a different decision-maker it may not be obvious whether the project failure was a 'poor draw' from the correctly specified distribution (Category I) of the project's outcomes, or whether there was a cash flow error or a risk was inadequately recognised (Category II). Conceivably, a decision-maker may realise that risk had been adequately recognised (Category I) and thus it was not their mistake and should not influence their future judgement. Despite this reservation, there may still be a high enough proportion of projects that are perceived to be in Category II for the retrievability bias to irrationally upwardly skew hurdle rates:

The bias arises if, due to the 'painful' experience of a project failure in general or of a false appraisal, the perceived risk and thus hurdle rates for the subsequent projects under consideration are set higher than appropriate and what the 'availability' rule of thumb suggests. In other words, prior mistakes are overcompensated. The systematic setting of inappropriately high hurdle rates gives distorted estimates of projects' profitability and leads to underinvestment. The feedback to the decision-maker due to false project appraisal will be discussed in the next section.

2.4 Systematisation of scenarios, outcomes and feedback

Figure 2 systematises and graphically depicts the problem by identifying eight cases, their decision outcomes and interpretations by the decision-maker. In Cases A, B, F and H decision mistakes were not made because even with the appropriate hurdle rate, the decision (accept or reject project) would have been the same. Cases D and E represent appropriate risk assessments and settings of the hurdle rate and are therefore not considered further.

In Case A, the decision-maker has – based upon their risk assessment – set the hurdle rate too high but the project nevertheless is accepted and will not lead to a loss in company value, i.e. with hindsight, it will be seen to be 'good'. This implies that the projected cash flows must have been sufficiently high to compensate the inappropriately high hurdle rate effect. Error does not result from the hurdle rate being set too high in this case. The same logic applies to Case F which was correctly accepted, due to strong positive cash flows, despite an underestimation of risk and an inappropriately low hurdle rate.

With regard to the feedback provided to the decision-maker we should now consider the investment decision-making process and its final step (see Stage 7 in Figure 1): the follow-up monitoring phase of a project and in particular of the cash flows and the risk assessment (target-actual comparison and resulting analyses) followed by feedback and learning. This stage is illustrated in the right column in Figure 2. If a routine mechanism is established which *ex post* explicitly analyses projects that have been accepted (i.e. the cash flows and whether the risks were adequately considered and thus the reasons why a project may not have turned out as projected) then decision-makers will get feedback on projects that have been accepted, such as Cases A, D, F and G. The analysis will reveal that the cash flows had been estimated too high, too low or appropriately and what risks were considered adequately or not and why (cf. Category II). In doing so, a false appraisal of the hurdle rate in Cases A and F will become evident (green feedback fields). However, the decision-maker is unlikely to perceive the non-appropriate risk assessment and hurdle rate as significant because the decision would not have been altered using the 'correct' rate.

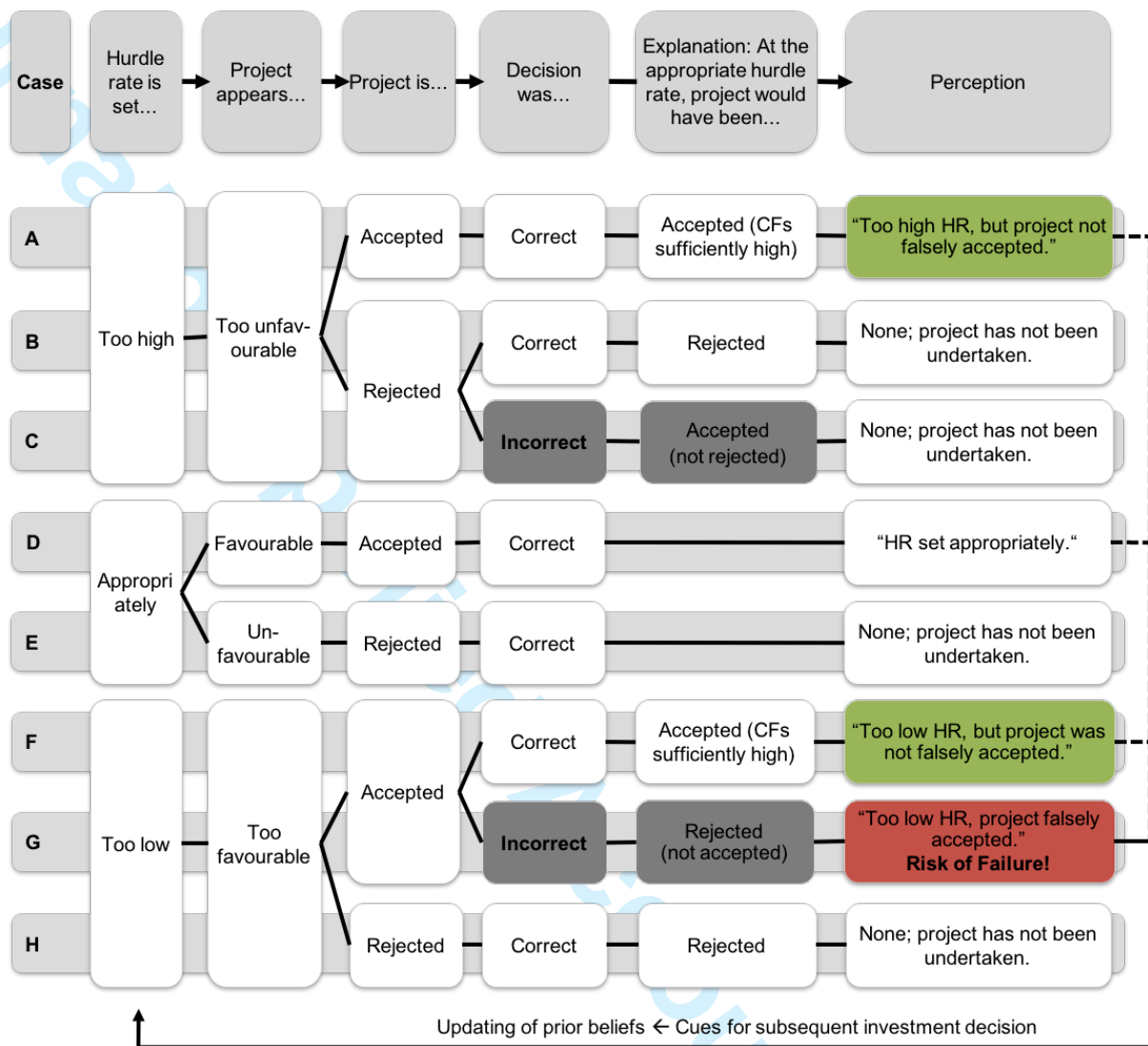


Figure 2 Decision-maker's perception of the setting of the hurdle rate (HR).

When evaluating a similar project next time, this analysis with its insights on the (inappropriate) risk assessment and thus setting of the hurdle rate (should and) probably will be taken into account by the decision-maker. The bottom arrow of Figure 2 represents learning about one's ability and updating one's prior idea about the appropriate risk and hurdle rate when new information arrives (see Gervais, 2010). New information comes particularly from post audit feedback on projects that get adopted (A, D, F and G); this will affect the decision-maker's subsequent estimates of the most appropriate hurdle rates. We note that the feedback that managers get can be of low quality as it is imprecise and slow, and investment decisions are made infrequently and irregularly, which complicates learning (Gervais, 2010). Knight (1921) cautions that "in business management no two instances, perhaps, are ever very closely alike, in any objective, describable sense." However, we can assume that experienced decision-makers have capacity to integrate new information and compare it to previous situations so that learning does happen. A formal or an informal post audit of projects may provide information about the mistakes in the appraisal; realising that

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3 the initial risk assessment was insufficient may happen consciously but, more importantly,
4 also unconsciously.
5

6 As indicated above, the essential point is that the feedback on some investment decisions,
7 such as G, which 'go wrong' might be more salient and vivid than on others such as A and F
8 which turn out as successes; this is elaborated in the following paragraphs.
9

10 With regard to Case B (H): The project's risk is not adequately recognised and may be
11 underestimated (overestimated); thus the hurdle rate is set too high (low) and the project is
12 rejected due to a negative NPV, but the erroneous rate is not obvious; the decision-maker will
13 not be aware of the false setting of the rate, because companies seldom organise follow-up
14 monitoring on projects that have been rejected. The decision-maker is thus not in a position to
15 use this information when assessing the next project. Furthermore, even if *ex post* reviews
16 were carried out on B and H, they would show that despite the inappropriate hurdle rates the
17 appraisal outcomes were, in fact, the right ones.
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21 Our model contains two scenarios for incorrect accept-reject decisions: First, a false
22 positive case can be illustrated by the fire example in Section 2.2, is represented by Case G in
23 Figure 2. The project was not rejected but with an appropriate rate it would have been
24 rejected. The hurdle rate was set too low, which resulted in insufficient discounting of future
25 cash flows. This can result in accepting a project which is later seen to generate a negative
26 NPV. The poor decision evidenced by a poor outcome is likely to be a salient event (red
27 feedback field in Figure 2) and can generate the previously described retrievability bias and
28 an incorrectly raised hurdle rate in future appraisals.
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32 Secondly, a false negative case is given in Case C of Figure 2. The project risk is
33 overestimated, the hurdle rate therefore set too high, and the project is rejected due to a
34 negative estimated NPV. With an appropriate (lower) hurdle rate, the appraisal would have
35 correctly shown a positive NPV for the proposed project and the project might have turned
36 out to be successful *ex post*. However, the decision-maker will not realise the false decision
37 because the project will not be undertaken. The decision-maker is unlikely to get feedback on
38 the mistaken risk assessment and having set the hurdle rate too high and so does not learn
39 from the experience. This case illustrates the long-term consequences of setting the hurdle
40 rate too high; projects are falsely rejected resulting in underinvestment. Moreover, and as
41 indicated above, risky projects are systematically preferred to low-risk projects (Titman and
42 Martin, 2010) and a short-term bias is induced (Dobbs, 2009).
43
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47 Figure 2 summarises the different combinations of 'too high/too low' and 'accept/reject
48 project' and shows the cases in which feedback is provided to the decision-maker on the
49 project appraisal that may influence the setting of the hurdle rate. As indicated above,
50 perception and cognitive processes, reinforced by the one-sidedness of the post-audit process
51 in concentrating only on adopted proposals, will impact the decision-maker's judgement and
52 subjective reasoning when evaluating future projects. As Case G is a much more salient event,
53 the false risk assessment and thus inappropriate setting of the hurdle rate (too low) will
54 influence the judgement more severely than Cases A (too high, but project succeeded
55 nevertheless) and F (too low, but project succeeded nevertheless).
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59 Furthermore, we can assume that projects which proved to be successful are subjected to
60 investigations less frequently and thoroughly than those, which fail. I.e. cash flows and

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3 discount rates might not always be evaluated in a detailed and comprehensive way for
4 positive NPV projects *ex post*. If so, then Cases A and F will result in even less feedback to
5 the appraisal including the risk assessment than will Case G and the argument is strengthened
6 further.
7
8

9 Our analysis to this point has referred to the determination of absolute profitability of an
10 investment project. However, relative profitability, i.e. the comparison of different (mutually
11 exclusive) projects will reveal the same systematisation of cases and errors as derived from
12 the original example. Due to a suboptimal setting of the hurdle rate (too low or too high), the
13 project which appears relatively profitable is not necessarily the objectively more profitable
14 one.
15
16

17 18 **2.5 Discussion**

19 The two extremes of *ex post* feedback – on the one hand, no (or lax) follow-up in the case of
20 non-adopted or successful proposals and, on the other, a thorough follow-up mechanism on
21 bad investments – give different levels of information to the decision-maker. A rigorous
22 follow-up monitoring of all proposals could uncover the false setting of hurdle rates.
23 However, these procedures might still not overcome the disproportionate effect that an
24 accepted project's failure has on the decision-maker's intuition and the retrievability bias may
25 persist. Failure of the project in general, and the failure of a project due to a false appraisal as
26 regards the setting of the hurdle rate, as in Case G, remain the most influential events and will
27 be more available in memory for the next project decision when events like these are
28 retrieved. It will serve as a strong cue to influence cognitive reasoning and thereby the
29 judgement.
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34 Because of humans' retrievability bias, the event 'hurdle rate has been set too low' –
35 additionally associated with a negative affect – stays in memory more easily. The event
36 '(possible) failure' is likely to come to mind more easily and thus a higher hurdle rate appears
37 to be more suitable, and is therefore more 'probable', than the truly appropriate one. To the
38 decision-maker, it seems it might help to avoid a decision mistake and wrong acceptance of a
39 project, and will thus influence judgement. In other words if, next time, information on which
40 hurdle rate to set is retrieved from memory, the setting of an underestimation of risk (and thus
41 a too low rate) leading to an error, will be the cue that is intuitively more promising. Hence,
42 the decision-maker will tend to revise the previous hurdle rate upwards but would not
43 systematically set a hurdle rate too low; this explanation is in accordance with empirical
44 findings relating to the hurdle rate premium.
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46
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48

49 Strategies do exist for correcting cognitive biases, i.e. debiasing, include motivational,
50 cognitive and technological strategies or decision aids (see for example Larrick, 2004).
51 Moreover, awareness of potential biases and the situations where they can occur is the most
52 important requirement for correcting biases (see for example Kahneman, 2003; Milkman *et*
53 *al.*, 2009). However, this debiasing process can be long and requires constant review and
54 vigilance in the decision process, particularly the more complex the context, and is up to the
55 individual decision-maker (Bazerman and Moore, 2013). Thus, even though an individual is
56 aware of a cognitive bias, efforts are needed to correct it. A well-structured investment
57 appraisal process with a post audit stage can serve as a good starting point for developing
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3 decision aids providing awareness. However, the biases inherent in the setting of the hurdle
4 rate may not be easily corrected and are therefore still be observable in practice.
5
6

7 **3. Conclusion and Outlook**

8
9 Our analysis requires empirical testing to validate the relevance of the retrievability bias in the
10 setting of the hurdle rate. Experiments could address the effect of past experience of failed
11 investment projects, and of the review process, on future risk assessments and thus the hurdle
12 rate decisions. A first testable hypothesis may be:
13

14 *H₁: The more failures of investment projects a decision-maker has experienced, the*
15 *higher the risk premium incorporated into the hurdle rates applied in future project*
16 *appraisals.*
17

18 The failure of an investment project could result from either false investment appraisal or
19 from one of the anticipated states of nature (independent of the appraisal). The awareness of a
20 false appraisal assumes that some kind of review or post audit of the project has been
21 performed – either formally or informally/unconsciously. Thus, we could consider the effect
22 of a formal versus a subjective informal review of the failed investment appraisal:
23

24
25 *H_{2a}: The more incorrect assessments of investment projects' risks (disclosed in a*
26 *formal post-audit process) a decision-maker has made, the higher the risk premium*
27 *incorporated into the hurdle rates applied in future project appraisals.*
28

29 *H_{2b}: The more incorrect assessments of investment projects' risks a decision-maker*
30 *has perceived, the higher the risk premium incorporated into the hurdle rates applied*
31 *in future project appraisals.*
32

33 Further potential avenues to explore in this context, but which we will not lay out as formal
34 hypotheses include: There may be a relationship between the level of detail of a company's
35 review process and its impact on hurdle rate premia. More sophisticated review processes will
36 disclose more details and thus more mistakes in the appraisal, which in turn could affect the
37 decision-maker's risk and hurdle rate assessment. Secondly, given that the more investment
38 appraisals an individual has been involved in, i.e. the higher a decision-maker's work
39 experience in this field, the more failed investment projects s/he may have experienced. Thus
40 one might investigate associations between HRPs and demographic variables such as age,
41 years of work experience, or personality traits such as confidence of attitudes to risk.
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44 To conclude, the determination of parameters in investment appraisal, particularly
45 estimating a project's risk and thus setting the hurdle rate, necessarily involves a certain
46 degree of subjectivity. From this it follows that heuristics, which to some extent rely on
47 intuition, may guide a decision-maker's judgement, and cognitive biases can systematically
48 distort decisions. This paper shows the effect of the retrievability bias on the judgement of
49 experienced managerial decision-makers. It provides a reasoned explanation of how managers
50 deciding on investment projects may be biased in tending to systematically set hurdle rates
51 higher than suggested by theory. While we are not claiming to provide a complete explanation
52 of the paradox, we believe that cognitive biases and the noise in feedback on adopted
53 investment proposals play a systematic part in explaining why hurdle rates are set above the
54 rationally advocated discount rate, and we thus help solve the Hurdle Rate Premium Puzzle.
55 The policy implications of this study are that corporate success could be enhanced, firstly, by
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making executives aware of the premium phenomenon and of its behavioural causes; and, secondly, by widening the scope of the post-audit programme to include significant rejected investment proposals, and communicating the opportunity cost of 'false negative' decisions on proposals not adopted.

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