Decision-Making Processes in Equity Investing: Implementing Investment Frameworks

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Following our 2010 paper, Decision-Making Processes in Equity Investing: The Case for Investment Frameworks, we continue our analysis of cognitive and behavioral tendencies relevant to investors. Decision-making processes can be an important source of investing success, but there is little consensus on the best approach to making investment decisions. Many investors rely on subjective decision making, which tends to produce overconfident choices that are driven by intuitive narratives, or automatically generated stories that seemingly explain the immediately available information. At the other end of the spectrum, "black box" quantitative, factor-based investing, driven by statistical inputs and purely algorithmic processes, typically forgoes the benefit of differentiated forward-looking views based on fundamental research and expertise.

In this research paper, we advocate the use of investment frameworks that adopt a hybrid approach, taking inputs based on forward-looking expert insight, and mechanically combining them to drive investment decisions. We believe such an approach should reduce the influence of narrative biases without relinquishing the potential added value from proprietary forward-looking expertise. We also argue that investment frameworks are potentially much more effective if their forward-looking inputs incorporate multiple scenarios, which should further mitigate biases and overconfidence.
Summary

Decision-making processes can be an important source of investment success. In fact, we believe that superior decision making may be a much more powerful asset than an information advantage in equity investing, particularly with the advent of electronic dissemination of information and regulations intended to control differential access to information. However, there is little consensus on the best approach to making investment decisions.

Many equity investors rely on relatively unstructured, subjective decision-making processes that are largely driven by narrative intuitions—which are stories generated quickly and automatically that seemingly explain the immediately available evidence. Some investors embrace the intuitive nature of their decisions, believing their intuitions represent a competitive advantage. Indeed, there is some evidence of successful intuitive decision making in fields outside of investing, as discussed by Malcolm Gladwell in his best-selling book *Blink*. Other investors believe that they can overcome the potential pitfalls of intuitive biases by conducting thorough, objective analyses of the evidence before arriving at any conclusions. However, scientific research suggests that both camps are operating on questionable premises.

As we shall explain, human intuition alone is unlikely to produce successful judgments in the field of investing. What’s more, we generally cannot detect, let alone correct, the influence of intuition on our decisions. In fact, we tend to interpret evidence as artificially coherent with our dispositions, enabling us to rationalize mistakes. As a result, we tend to overconfidently reach decisions that are consistent with misleading intuitive narratives, so informal subjective decision-making processes are unlikely to produce optimal choices.

At the other end of the spectrum, some equity investors strive to avoid the influence of cognitive biases by eliminating all subjectivity from their processes. “Black box” quantitative factor-based investing is typically driven by statistical inputs and purely algorithmic processes. Such approaches may mitigate the impact of intuitive biases, but they may do so at a great cost, forgoing the benefit of any differentiated forward-looking views based on fundamental research and expertise. Because the value of a stock is a function of future cash flows, we believe forward-looking fundamental views are crucial to adding value in equity investing, even if they are inherently subjective—thus purely quantitative automated approaches also have drawbacks.

In this report, we advocate the use of investment frameworks that adopt a hybrid approach—using forward-looking expert insight and mechanically combining them to drive investment decisions. Scientific research suggests that the primary weakness of unstructured subjective decision making is that humans are unable to make consistently good decisions when informally combining multiple data points. On the other hand, an objective combination of inputs by a model has a much stronger track record.

An investment framework that mechanically combines expert-driven inputs should reduce the impact of biases to more consistently produce optimal decisions and make it more difficult to rationalize poor choices, without relinquishing the value of expert insights and out-of-consensus views. We also hold that investment frameworks are likely to be much more effective if their forward-looking inputs incorporate multiple scenarios, which should further mitigate biases and overconfidence.

Despite our enthusiasm, we recognize that a framework by itself is not a panacea, nor does it diminish the investor’s importance as a valuable source of expert insight. Rather, it is a tool for handling certain types of mechanical processing, much like a calculator or spreadsheet. No matter how well we design a framework, the quality of the decisions it produces can be only as good as the quality of the inputs provided. A framework is unable to remedy faulty inputs reflecting inadequate research or expertise.
A Story of Two Systems

As noted in our Decision-Making Processes in Equity Investing: The Case for Investment Frameworks (2010) report, researchers have identified a host of cognitive biases that may compromise objectivity on virtually any issue, potentially leading to irrational decisions and severe errors—all while one remains blissfully unaware. Early in the decision-making process, one may be unduly swayed by factors such as emotional state, pre-existing expectations and desires, innate heuristics (simplifying “rules of thumb” that serve as mental shortcuts), the earliest data points encountered, framing effects, or social dynamics. Once biased in the direction of a particular choice, in many cases one’s mind is effectively made up, even if not consciously. From that point forward, the rest of the decision-making process becomes largely an exercise in rationalizing and building overconfidence in the choice.

We often cannot detect, let alone correct, the impact of biases on our decisions because an autopilot-like system that operates outside of our awareness performs so much of our mental processing. There is a tendency to erroneously attribute our decisions solely to our conscious thought processes because they command our attention and effort. Daniel Kahneman, Nobel Prize recipient in Economics and an authority in the field of judgment and decision making, explains the two contrasting modes of thought in his recent book Thinking, Fast and Slow. System 1 refers to the unconscious, automatic system, while System 2 describes our conscious, deliberate thinking. In Exhibit 1, we summarize some of the key characteristics of the two systems.

<table>
<thead>
<tr>
<th>System 1</th>
<th>System 2</th>
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<tbody>
<tr>
<td>Fast</td>
<td>Slower</td>
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<tr>
<td>Automatic</td>
<td>Controlled</td>
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<tr>
<td>Effortless</td>
<td>Requires effort</td>
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<tr>
<td>Autopilot</td>
<td>Requires attention</td>
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<tr>
<td>Unconscious (invisible to us)</td>
<td>Conscious (who we think we are)</td>
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<tr>
<td>Influences System 2</td>
<td>Often unaware of System 1’s influence</td>
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For illustrative purposes only

It may be surprising to learn the extent to which System 1 influences our conscious judgments and decisions. It seems as though we can make unbiased choices based purely on our deliberate analytical reasoning, but to Kahneman that is just an illusion. Although we may be oblivious to its influence, the intuitive System 1 clearly holds significant sway. Specifically, according to Kahneman, System 1 operates by spontaneously constructing stories that, based on the evidence at hand, are as coherent as possible. Because System 1 does not account for information that it does not have and is not prone to doubt, System 1 tends to suppress ambiguity. As a result, Kahneman refers to System 1 as a “machine for jumping to conclusions.” Indeed, it “runs ahead of the facts in constructing a rich image on the basis of scraps of evidence” and “will produce a representation of reality that makes too much sense.”

System 1’s artificially coherent narrative can be problematic because, unless there is overwhelming evidence to the contrary, System 2 tends to endorse or rationalize this narrative as the basis for our judgments and decisions. In other words, in the absence of clear-cut evidence, System 1 is often the de facto decision maker. In such situations, System 2 generally will be confident that it has arrived at an unbiased, analytical decision, but in reality, it has merely rubber-stamped an intuitive response. The evidence is rarely one-sided in stock picking, so investors are particularly susceptible to decisions guided by System 1’s unreliable stories rather than an objective analysis of risk and reward.

Any doubts that System 1’s intuitions can exert such influence over our decisions may be dispelled by the results of an intriguing experiment, highlighted by Kahneman, in which researchers showed subjects “pictures of men’s faces, sometimes for as little as one-tenth of a second, and asked them to rate the faces on various attributes, including likability and competence.” The subjects did not know this, but the pictures happened to be the campaign portraits of politicians. It turns out that, in 70% of electoral races, the winner was the candidate whose face had received a higher competency score, which happened to correlate with a strong chin and a slight smile. This type of study has been replicated in numerous countries, so the result was neither a fluke nor driven by cultural factors.

In this experiment, the face ratings were reflexive snap judgments, clearly the domain of System 1, but they were significantly predictive of actual voting choices, presumably analytical decisions controlled by System 2. It seems that, in this context, System 1 quickly jumps to a conclusion about a candidate’s competency based simply on facial appearance, and, more often than not, System 2 endorses that view of the candidate, unaware that the voting decision actually was guided by the candidate’s facial structure. Because System 1 operates outside of our consciousness, we cannot tell when its intuitions drive our decisions, but they often do.

A Preference for Coherence

At this point, you may be thinking that System 1’s intuitions may mislead us if our decision-making is careless, but that we can overcome such specious influences if we simply take our time and conduct a thorough, objective analysis before settling on a decision. However, that is not nearly as easy as it sounds due to a phenomenon called pre-decisional distortion, which is described in a recent paper by Cornell University’s Edward Russo. He explains that, “After a tentative disposition emerges based on the initial
information, new information is biased or ‘distorted’ to support it. That is, the new information is interpreted and evaluated as more supportive of the emerging, tentative disposition than it should be” (Russo and Yong 2011). In other words, if System 1 has already planted a bias, it is no longer possible to be truly objective during subsequent analysis, as illustrated in Exhibit 2.

Russo also notes that this pre-decisional distortion “seems to be nearly ubiquitous. It has been found in decisions made by professionals and in the evaluation of single options as well as in choices between options. Further, it is material, and not some curiosity of the decision-making process that has no impact on the decision itself.” In fact, it has proven nearly impossible to eliminate. Individuals remain unaware of pre-decisional distortion as it automatically occurs, so they are “likely to be just as unaware that the resulting confidence in their final position is unjustified. Indeed, one can almost describe them as having talked themselves into that final confidence,” he elaborates.

In one study, which involved the subjects choosing between pairs of restaurants, Russo was able to “show that participants can be induced to select a self-identified inferior alternative merely by using information order to establish a leader and then allowing pre-decisional distortion to build support for it” (Russo et. al. 2006). The experiment required two sessions, with the first used to determine each subject’s true preferences. Then, in the second session, researchers altered the order in which the attributes were presented. When they targeted the inferior restaurant to become the early leader by presenting the attributes most favorable to that option first, it was usually chosen as the tentative leader. Measurements confirmed that subsequent attributes were in fact distorted to support this early leader, and the majority of subjects actually selected it. Russo concludes that “Thus, participants were manipulated into selecting the targeted inferior restaurant over one that they had preferred two weeks earlier.” Clearly, pre-decisional distortion can lead to suboptimal choices.

We already noted System 1’s tendency to quickly generate coherent stories based on whatever little evidence it can access, and pre-decisional distortion can be viewed as an innate tendency to maintain the coherence of those stories framing our decisions. One scientific study notes, “Research has shown that decisions unfold in a series of coherence shifts, by which decision makers transform both new information and prior beliefs to align with each other and the emerging choice” (Bond, et. al. 2007). Similarly, the findings of another study “support the view that decisions are determined by constructions of representations rather than by the ‘raw evidence’, that the emerging story serves to direct interpretation of the evidence, and that confidence in the decision is a function of the coherence of the reconstruction” (Simon, et. al. 2004). Research indicates that we do our best to distort evidence to fit with our coherent story, abandoning it only when it becomes impossible to reconcile with clearly conflicting evidence.

This natural preference to maintain cognitive coherence as we make decisions continues after we have chosen, contributing to confirmation bias and overconfidence, both of which are discussed at length in our previous report. Confirmation bias is similar to pre-decisional distortion, except that it involves the distortion of new evidence to be consistent with a decision that has already been made, rather than one about to be made. Overconfidence arises because, “The subjective confidence we have in our opinions reflects the coherence of the story that System 1 and System 2 have constructed. The amount of evidence and its quality do not count for much, because poor evidence can make a very good story,” Kahneman explains. “Paradoxically, it is easier to construct a coherent story when you know little, when there are fewer pieces to fit into the puzzle” (Kahneman 2011). As a result of overconfidence and confirmation bias, we are stubbornly slow to realize that we have made poor decisions, as illustrated in Exhibit 3.

**Constrained by Reality**

Fortunately, our powers to distort evidence are not limitless, so our abilities to both make poor judgments and stick with them are somewhat constrained by reality. A remarkable experiment by academic researchers demonstrated both the pervasiveness of self-deceptive distortions as well as how they may be limited in magnitude by rigid reality constraints (Epley and Whitchurch 2008). In this study, the researchers took pictures of subjects’
faces, and these photographs were “subjected to a procedure designed to systematically alter their facial attractiveness, namely, by morphing their photograph with a highly attractive or unattractive face.” Specifically, they created morphs that ranged from 50% actual/50% attractive to 100% actual to 50% actual/50% unattractive, in 10% increments, for a total of 11 images. The participants “were shown each picture in isolation on the computer screen (in random order) and asked to estimate the likelihood that each image was their actual image, on a scale ranging from 0% (not at all likely) to 100% (certain).”

It turns out that these likelihood judgments were, relative to reality, tilted toward the attractive morphs. In fact, the participants indicated that the 20% attractive/80% actual morph was most likely to be them, assigning it a significantly higher likelihood than their 100% actual image. “Few aspects about the self are more readily observable and objectively verifiable than one’s own facial image,” the researchers noted, yet the subjects distorted their perception to recognize themselves as more attractive. Still, their distortions were not boundless. Although they may have wanted to, they did not identify the 50% attractive/50% actual morphs as the most likely to be themselves. They tended to pick more realistic, albeit still inaccurate, choices. This and other studies have demonstrated that reality constraints will permit us to distort our perception only so far.

In general, as we find it increasingly difficult to reconcile compelling new evidence with an emerging or prior choice in our coherent mental story, we eventually override our biases and shift our viewpoint in favor of that newly convincing evidence, adjusting our narrative accordingly. However, in equity investing, such reality constraints are decidedly ineffective. If we are able to distort our perception enough to incorrectly identify our own faces, which we see every day, just imagine the degree to which we can misrepresent the attributes of a stock. The value of a stock is highly sensitive to assumptions regarding future growth, profitability, and capital spending, so it is nearly always possible to justify a valuation that is significantly higher or lower than the current market price. Even when it is difficult to justify substantial further downside, or upside, to a stock’s price, investors can typically create narrative rationalizations unrelated to intrinsic value, such as an overhang or lack of catalysts that, as the story goes, will prevent a re-rating by the market, at least in the near term. In other words, equity investors usually can talk themselves into almost any decision, so reality constraints may be of little help.

**Investors Are Human Too**

The combination of ineffective reality constraints with a propensity for pre-decisional distortion makes the use of seemingly coherent mental narratives to frame decisions a dangerous strategy for equity investors. Nonetheless, a recent study suggests that, in general, many investors use exactly that approach. In his book, *Minding the Markets*, David Tuckett of University College London interviewed 52 money managers, nearly all dealing in equities (mostly stock pickers), and systematically analyzed the interview transcripts. Each manager had spent at least 10 years in their role, and controlled at least $1 billion in assets.

Tuckett’s analysis demonstrated that these investors tend to use stories to frame their decisions. He noted that they told him “stories about their decisions they had made because narrative is the framework within which they thought.” Furthermore, it appears that the coherence of their narratives, which is not a reliable indicator of accuracy, was a key driver of the investors’ confidence. According to Tuckett, “One of the essential properties of narrative is that it allows diverse elements of fact and interpretation to be woven together in scripts so that they coalesce meaningfully and feel right. Narrative provides a sense of conviction and truth. Their stories thus made manager decision making sensible and coherent, underpinning their conviction about their choices.” The problem with this type of decision making is that, when one can distort the evidence to enhance coherence, basing convictions on that artificial coherence is a recipe for overconfidence in choices of questionable quality.

This approach is certainly not unique to stock pickers. In fact, the “story model” of decision making was largely developed by studying the behavior of jurors in the context of legal trials, where the cognitive challenges are similar to those faced by investors. Such
research suggests that, “When the body of evidence relevant to a decision is large, complex, and the implications of its constituents are interdependent, the decision process is explanation-based… In explanation-based decisions, decision makers begin by constructing a causal model to explain the available facts and then base subsequent decisions on the causal explanation they have imposed on the evidence” (Pennington and Hastie 1992). In other words, when dealing with complicated problems, we tend to create a narrative explanation that compromises our objectivity and influences our decisions. Not surprisingly, given the risks inherent to such an approach, the researchers found that story-based decision making leads to a perception of stronger evidence, more extreme judgments, and higher confidence in those more extreme judgments.

How can investors avoid such pitfalls associated with the narrative framing of decisions? According to Warren Buffett, the legendary Chairman and CEO of Berkshire Hathaway, “What’s needed is a sound intellectual framework for making decisions and the ability to keep emotions from corroding that framework” (Graham 2003). In our view, a well-designed investment framework is a formalized, structured, numerically-based method that serves as a decision support tool. Such a structured framework, because it offers less room for emotions and biases to distort our perception and influence our choices, can supplement the constraints of reality, making it more difficult to rationalize and remain overconfident in poor decisions.

**Mechanical Decisions are Better**

Importantly, an investment framework is not something one should use simply to organize one’s thoughts before making a decision. To be effective, the framework must mechanically translate inputs into actionable decision recommendations, as scientific research has clearly demonstrated that decisions produced by mechanical formulas or models are generally superior to those based on “clinical” global evaluations, meaning those in which we informally and subjectively weigh all of the evidence in our heads. A meta-analysis of 136 research studies, from a wide variety of fields, “identified no systemic exceptions to the general superiority (or at least material equivalence) of mechanical prediction” over informal clinical procedures (Grove et. al. 2000). In fact, less than five percent of those 136 studies showed clinical global evaluations to be more accurate.

Such research, according to Kahneman, has suggested that “informal clinical evaluations should not be trusted and that statistical summaries of separately evaluated attributes would achieve higher validity” (Kahneman 2011). He attributes the inferiority of clinical predictions to their inconsistency, noting, “Unreliable judgments cannot be valid predictors of anything… Because you have little direct knowledge of what goes on in your mind, you will never know that you might have made a different judgment or reached a different conclusion under very slightly different circumstances. Formulas do not suffer from such problems. Given the same input, they always return the same answer.”

Critics of mechanical procedures state that, although they may be consistent, in some cases they cannot match the complexity of human judgment. However, as Edward Russo of Cornell University and Paul Schoemaker of the Wharton School observe in their book *Winning Decisions*, “Study after study—in a wide range of fields—has come to the same conclusion: the benefits of consistency provided by a model usually exceed any losses of human complexity (applied unreliably)”. Complex judgments are not reliable when they are overly swayed by intuitive responses and emerging dispositions.

The superiority of mechanical decisions is especially evident when dealing with low-validity environments, which Kahneman defines as those that entail “a significant degree of uncertainty and unpredictability.” As he observes, “The research suggests a surprising conclusion: to maximize predictive accuracy, final decisions should be left to formulas, especially in low-validity environments” (Kahneman 2011). Noisy, irregular problems are often too complicated to be solved by System 1, but it is an automatic process that cannot be turned off, so its intuitions may guide our clinical judgments anyway. An informal clinical evaluation is typically subjective, and its only hurdle to acceptance, the ability to rationalize it, is a rather modest one. Therefore, in a low-validity environment such as equity markets, it is especially important to consider a mechanical procedure for reaching decisions rather than an informal, more intuitive approach.

**Are Intuitions Always Unreliable?**

Mechanical approaches, which tend to blunt the impact of System 1’s intuitive responses, may be viewed skeptically by investors who consider their intuitions to be personal strengths, particularly if they have read journalist Malcolm Gladwell’s influential book *Blink*. Gladwell presents many examples of intuitive snap judgments, which he refers to as “thin-slicing,” and most prove to be accurate. However, not all of the examples produce successful judgments, and an academic review of *Blink* by behavioral scientists notes that the book “does not address the issue of what characteristics distinguish between situations when thin-slicing is and is not effective” (Hogarth and Schoemaker 2005). They state that “seemingly contradictory examples cry out for an explanation as to when conditions do or do not favor thin-slicing. Yet, none is offered.”

Gladwell may not have addressed what types of environments are appropriate for intuitive judgments in *Blink*, but scientific authorities subsequently did. Kahneman, a longtime skeptic of intuitive decision making, and Gary Klein, a leading proponent of intuitive “naturalistic” decisions, collaborated for a balanced effort to map out the conditions that support intuitive expertise (Kahneman and Klein 2009). They conclude that the first requirement is a high-
validity environment, which tends to be stable and predictable and offers reliable cues. They add, “Other necessary conditions include adequate opportunities for learning the environment (prolonged practice and feedback that is both rapid and unequivocal). If an environment provides valid cues and good feedback, skill and expert intuition will eventually develop in individuals of sufficient talent.” In short, intuitive decision making is appropriate in high-validity environments that offer clear, timely feedback.

To illustrate an example of such a high-validity environment, we shall consider the game of chess. The basic structure of chess, which includes the board, pieces, and rules, never changes, thus offering a highly regular environment. As a result, the current positions of the pieces represent a valid cue as to which move should be made next. Because chess players are able to practice repeatedly within that regular environment and learn from reliable feedback, they can gain intuitive expertise. Kahneman and Klein note that researchers have “described the performance of chess experts as a form of perceptual skill in which complex patterns are recognized. They estimated that chess masters acquire a repertoire of 50,000 to 100,000 immediately recognizable patterns, and that this repertoire enables them to identify a good move without having to calculate all possible contingencies.” Chess masters can read situations at a glance and intuitively know how to proceed because they have learned from repeated feedback in a high-validity environment.

The scientists who reviewed *Blink* actually analyzed Gladwell’s examples of thin-slicing, and determined that he primarily looked “at tasks where judgmental performance (typically accuracy of predictions) is high; the judges were generally experienced and operating in environments that provided good feedback; the judgmental tasks they face were generally stable (i.e., the underlying causal mechanisms do not vary much over time); and there is generally a low level of stress” (Hogarth and Schoemaker 2005). In other words, Gladwell focused on judgments in high-validity environments offering good feedback, the ideal circumstances for intuitive judgment. Equity investing, however, is clearly a low-validity environment. The stock market exhibits little regularity and stability and rarely offers reliable intuitive cues or rapid feedback. As noted earlier, in such low-validity environments, it is particularly important to use mechanical rather than intuitive decision procedures.

**A Hybrid Approach**

However, to be clear, we are not suggesting that investors should necessarily move to the opposite end of the spectrum and embrace purely algorithmic and automated investing based on statistical inputs. Such an approach may minimize the impact of intuitive biases, but it does so at the expense of the benefit of differentiated, forward-looking views based on fundamental research and expertise. Forward-looking views are inherently subjective, but we believe they are also crucial to adding value in equity investing, so eliminating all subjectivity from our decision drivers is not the goal.

Instead, we prefer a hybrid approach to investment frameworks, which involves a mechanical combination of inputs that reflect forward-looking views, informed by research and expertise, rather than backward-looking statistical factors. A mechanical combination of expert inputs should reduce the impact of intuitive narrative biases to produce more consistent, better decisions and make it more difficult to rationalize poor choices, without relinquishing the potential added value from proprietary expertise and out-of-consensus views. Such investment frameworks do not diminish the importance of expert insights; instead, they help us reach decisions that better reflect those insights. In other words, subjective inputs are not necessarily the problem and could in fact add significant value, but it is important that we weigh those inputs in a more consistent, objective manner to improve decision making.

This approach of relying on expert judgment to estimate inputs and then mechanically combining those subjective inputs to generate decisions is not a new concept. A 1972 study by the late Hillel Einhorn of the University of Chicago “was the first to demonstrate the advantage of expert measurement followed by mechanical combination. He found that expert pathologists’ predictions of cancer survival were improved when their component judgments of nine histological characteristics were mechanically combined into a global prediction of cancer survival. Subsequent studies have replicated this finding in contexts such as performance evaluation and auditing. This decision aid approach works because it capitalizes on a decision maker’s strength (cue measurement), while compensating for a weakness (cue combination)” (Whetcotton et. al. 1998). As such, the pairing of an expert’s insights with a model’s objective treatment is an important aspect of investment frameworks. We believe this hybrid approach has the potential to produce better decisions than either an informal narrative-based framework or a solely algorithmic procedure.

Incorporating such an approach will no doubt require an adjustment for many experienced investors. As noted in a current textbook on judgment and decision making, “Of course, professionals in any domain may be reluctant to cede decision making to a formula because this seems to be calling into question their expertise. However, it must be remembered that their expertise is required to select and code the variables of interest. On the other hand, ceding the final decision to a formula is merely to recognize that we have limitations in our ability to process information” (Hardman 2009). It is important to remember that the investment framework, as a decision aid, does not at all diminish the investor’s importance as the source of value-added expert insight. The investment framework is merely a tool for handling certain types of mechanical processing, much like a calculator or spreadsheet. Without the investor’s expert inputs, it is useless. At the same
time, no matter how well we design a framework, the quality of the decisions it produces can be only as good as the quality of inputs provided. A framework can do nothing to remedy faulty inputs reflecting inadequate research or expertise.

**How to Choose Inputs**

So, how do we implement an investment framework? The first step is to choose the factors that will serve as inputs. In general, these factors will leverage the investor’s forward-looking research and expertise to reach better decisions. If we introduce a framework to augment an existing investment strategy, the inputs will likely be the same factors that are already considered key decision drivers. Our goal is not to alter the strategy but to improve execution by considering those factors in a more consistent, objective manner.

Nonetheless, there may be certain factors that we want to prevent from influencing our decisions. For example, we may consider the price that we paid for a stock in the past as irrelevant to our decision. However, we may still find it difficult to avoid being influenced by it, despite our best efforts, when using an informal decision-making procedure. An advantage of using a framework is that we can eliminate the influence of potentially misleading factors by excluding them from the decision-making model.

Given the broad diversity of investment styles and mandates, there is no one correct answer for exactly which inputs should be included in an investment framework. However, in general, the inputs of any well-designed framework should have a forward-looking focus, given that equity values are a function of future cash flows. In turn, we believe that forward-looking views should be enhanced by considering multiple scenarios.

**The Importance of Multiple Scenarios**

We believe that using a multi-scenario lens for forecasting is crucial for a couple reasons. First, a multi-scenario approach better reflects the probabilistic nature of a problem involving uncertainty. When projecting an uncertain future, there is always a probability distribution of potential outcomes and our job as analysts is to approximate that distribution as best we can. In our view, assigning relative probabilities to multiple scenarios is an effective method for modeling the relevant probability distribution. In contrast, an intuitive story approach focused on a single narrative describes only one potential outcome, and it tells little about the potential risks and rewards if that scenario is wrong, which it almost certainly will be to some degree. A multi-scenario approach can provide a much richer understanding for future expectations.

Second, forecasting multiple scenarios forces an individual to contemplate different narratives as being potentially correct. This helps one to overcome the pre-decisional distortion, confirmation bias, and overconfidence stemming from coherence shifts that distort perceptions to fit a single narrative. In other words, using multiple scenarios to frame investment decisions should mitigate biases to facilitate more objective consideration of evidence and more accurate calibration of confidence, resulting in more reliable judgments and decisions.

However, the goal here is not to forecast every conceivable scenario, no matter how unlikely. That approach may be helpful in scenario exercises for contingency-planning purposes, but it is not ideal for investors striving for predictive accuracy. In his landmark book *Expert Political Judgment*, University of Pennsylvania’s Philip Tetlock described his study of the impact of such scenario exercises on expert predictions. He found that they had, on average, a negative net effect on the empirical accuracy and logical coherence of forecasts. Tetlock notes that, “it is easy to overdo it when we start imagining ‘possible worlds.’ Taking too many scenarios too seriously ties us into self-contradictory knots… Imagination-driven thinking sensitizes us to possible worlds but exacts a price in confusion and even incoherence.” The confusion arising from too many scenarios may be worse than the distortion and overconfidence associated with single-scenario thinking.

In order to avoid such confusion, we prefer to focus on a limited number of scenarios judged as likely given the investor’s expertise. Based on practical experience, we believe that either three scenarios (base, pessimistic, and optimistic cases) or five (adding a more extreme scenario to each tail) is ideal. This view is sustained by an academic study in which up to thirteen forecasts were aggregated to improve the accuracy of professionals’ business predictions. The researchers found that just two to five were needed “to achieve much of the total improvement available from combining all 13 forecasts” (Ashton and Ashton 1985). As the analysis moves beyond five scenarios, this is more likely to add confusion than predictive power.

Choosing a few carefully-selected scenarios, rather than a host of marginally plausible ones, is analogous to the strategy of “considering the opposite,” which researchers have shown to be effective in improving judgment. For example, in two similar studies of evidence assimilation and hypothesis testing, participants were compelled either to “consider the opposite” of their extant beliefs, or to make a concerted effort to “be unbiased.” Specifically, “Subjects were induced to consider the opposite in two ways: through explicit instructions to do so and through stimulus materials that made opposite possibilities more salient. In both experiments the induction of a consider-the-opposite strategy had greater corrective effect than more demand-laden alternative instructions to be as fair and unbiased as possible” (Lord et. al. 1984). Thus, the authors conclude that, “the cognitive strategy of considering the opposite possibilities promotes impartiality.” Similarly, another group of researchers demonstrated the successful de-biasing effects of a counter-explanation strategy, which compelled subjects to “consider and explain a conceptually opposite
outcome” against their expectations (Anderson and Sechler 1986). Based on these results, we believe that investors with a strongly positive or negative opinion of a stock can mitigate their biases by carefully examining the case for the opposite view.

A “consider the opposite” strategy can also help reduce overconfidence. As Philip Tetlock notes, experimental psychologists “have had some success in correcting overconfidence by asking people to look for reasons that cut against the grain of their current expectations” (Tetlock 2005). For example, one study found that compelling participants to list contradicting reasons for an answer greatly improved their confidence calibration, and even requiring just one contradicting reason was enough to significantly reduce overconfidence. These results “are consistent with the idea that overconfidence derives in part from the tendency to neglect contradicting evidence and that calibration may be improved by making such evidence more salient” (Koriat et. al. 1980).

Overconfidence is driven by the coherence of mental narratives, and “considering the opposite” mitigates it presumably by attenuating artificial coherence.

In addition to helping overcome judgmental distortion and overconfidence, a multi-scenario approach can foster an enhanced appreciation of how the future may unfold. In his book Profiting from Uncertainty, Paul Schoemaker recommends developing “signposts and early warning signals that tell you which way the world is evolving… For each scenario, a rich set of indicators should be devised that lets managers gauge which way the wind is blowing before it is evident to all.” If you have already thought about such indicators in advance, you can update your outlook more responsively than someone who relies on a mental narrative and will tend to stick with that single scenario until it is clearly wrong. Schoemaker adds, “In addition to looking at how specific information either confirms or disconfirms a given scenario, you can also use each scenario as a lens for examining the implications of each piece of new information.” More specifically, “the same piece of information can have very different meanings depending on the scenario considered. By examining significant new pieces of information through multiple lenses, managers can gain a deeper understanding of their implications,” he continues. This should provide a more balanced view than interpreting information through the single lens of an artificially coherent mental narrative. To make the most out of our scenarios, according to Schoemaker, we should use them as lenses for interpreting information and as a source for milestones and other indicators.

### Problem Decomposition

Beyond incorporating multiple scenarios, another principle of well-designed investment frameworks is decomposing the problem at hand into several smaller questions. If you start by focusing on potential decisions, such as whether to buy or sell a stock, your System 1 will automatically pick a side and bias the rest of the process in that direction. Instead, we should try to keep System 1 at bay by decomposing the problem and addressing the components piece by piece, deferring consideration of actionable decisions as much as possible. Indeed, the field of decision analysis recommends “the decomposition of a decision problem into a set of smaller (and, hopefully, easier to handle) problems. After each smaller problem has been dealt with separately, decision analysis provides a formal mechanism for integrating the results so that a course of action can be provisionally selected” (Goodwin and Wright 2009).

In Exhibit 4, we illustrate the steps in an example of a framework designed to decompose equity investment decisions. This particular framework starts with fundamental analysis and valuation, incorporating scenarios to estimate the stocks’ values in base, bear, and bull cases. In the second step, relative probabilities are assigned to the valuation scenarios to calculate risk-adjusted expected returns for each stock. Next, a baseline hurdle rate is determined based on the return potential of the overall opportunity set, and then company-specific hurdle rates are adjusted based on how the stocks’ correlations affect total portfolio risk. Finally, excess expected returns, net of company-specific hurdle rates, are used to derive target position sizes, which imply recommended actions.

<table>
<thead>
<tr>
<th>Exhibit 4</th>
<th>Example of Investment Decision Decomposition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decision Component</strong></td>
<td><strong>Technique</strong></td>
</tr>
<tr>
<td>Fundamentals</td>
<td>Scenarios of a stock’s value (base, bearish, and bullish); Financial projections; Corresponding valuations</td>
</tr>
<tr>
<td>Expected Returns</td>
<td>Risk-adjusted expected returns calculated by applying relative probabilities to scenarios</td>
</tr>
<tr>
<td>Cost of Capital</td>
<td>Hurdle rate, reflecting: Return potential of opportunity set; Company-specific impact on portfolio-level risk exposures (correlations)</td>
</tr>
<tr>
<td>Sizing Position</td>
<td>Target position size: Reflecting excess expected returns (net-of-hurdle rate); Either absolute or active (relative to benchmark), depending on mandate</td>
</tr>
<tr>
<td>Action (Buy/Hold/Sell)</td>
<td>Driven by difference between target and actual position sizes</td>
</tr>
</tbody>
</table>

For illustrative purposes only

Because there are many different investment styles and mandates, there is no single correct way to decompose investment decisions, but we believe breaking the process into a series of smaller steps should produce better decisions that are more representative of forward-looking views. If the investor instead starts with a much broader question (such as whether to buy or sell a stock), this
unleashes a clinical global evaluation, which informally bundles all
the steps together in a subjective mental process, making it easier
to rationalize suboptimal decisions swayed by narrative intuitions.

Conclusion
In summary, a well-designed investment framework, incorporat-
ing both multiple scenarios and problem decomposition, offers
several benefits that, in combination with expertise, help us reach
better decisions, in our view. For example, with respect to inputs,
the framework can filter potentially misleading influences by
excluding irrelevant factors from the decision process that would
be hard to eliminate by mental effort alone. Also, it replaces infor-
mal clinical global evaluations with a model that should better
match our decisions with the selected inputs. This combination
of improved inputs and decisions that better reflect them should
make it much more difficult to rationalize mistakes, thereby sup-
plementing the constraints of reality.

Of course, the implementation of an investment decision frame-
work does not guarantee success. However, it does encourage
consistency and objectivity in a field in which just about any deci-
sion can be rationalized. If a well-designed investment framework
can help us enough to improve our decisions even on the margin,
preventing us from rationalizing mistakes even occasionally, we
believe it is well worth the effort. Clearly, a wealth of research
seems to suggest that we could use the help. Indeed, “Perhaps
the most consistent finding in more than 30 years of judgment
and decision-making research is that humans have difficulty draw-
ing inferences from multiple sources of information” (Libby and
Libby 1989). As such, it is hard to disagree with the assertion,
“Shooting from the hip when many data points are involved is
simply unprofessional” (Russo and Schoemaker 2002). Equity
investors routinely make decisions based on an incomplete but
complex and often conflicting body of evidence. In such situations,
we believe that a structured framework can mitigate the biasing
influence of intuitive narratives and help investors make decisions
that better reflect their forward-looking views, which should be
informed by fundamental research and expertise.
References


Important Information

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