Great Minds Think Alike, and Fools Seldom Differ: A Theory on the Moments of Firms' Performance Distributions.

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Abstract
The association between mean and variance of firm performance is widely believed to be generated by decision makers that deliberately and accurately choose preferred levels of risk. Nevertheless, there is growing dissatisfaction with this explanation, due to the unrealistic assumption about human cognition, on which it is based, and in this paper we challenge that perspective by introducing a new. We model price negotiation between firms that utilize information similarly, share dispositions to invest more heavily upon discovery of greater perceived margins, but have diverse judgment abilities within environments they find uncertain. We explicitly generate, and do not merely assume, the performance distributions of firms, and demonstrate associations between the mean, variance, skewness, and kurtosis of these distributions, which all resemble empirical observations. Our study disputes the validity of prospect theory and behavioral theory in explaining observed aggregate performance patterns within industries, while arguing the importance of explaining not only the first two moments of performance distributions, but higher moments too.

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1. **Introduction**

Firms document their historical performance within financial accounts. When data on the mean and variance of historical performance is obtained from such accounts, and examined to discover systematic relationships across firms, such relationships are found, but their character is not constant and new investigations regularly contradict what was earlier discovered. Since Bowman’s (1980) observation of negative correlation, which contradicted the teachings of traditional finance and was called ‘paradoxical’ for that reason, numerous alternative theories have been developed within the field of strategy to explain what is observed, but no theory has achieved general acceptance.

The most widely accepted theories assume that observed patterns accurately reflect preferences for risk held by either individual decision makers within organizations – the prospect theory view – or by organizations as aggregates of decision making individuals – the behavioral theory view. In either case, the implicit assumption is that decision makers behave in accordance with their risk preferences and that market interaction conserve such preferences simultaneously for all firms, so that all preferences emerge unscathed into financial accounts, where they can be viewed after calibrating the relative performance among firms within the particular industry.

That story is exceedingly implausible, not only because it implies that decision makers have perfect knowledge of every firm’s performance before market interaction has actually generated these outcomes (Lee, 1997; Denrell, 2008), but also because the explanation hinges on the dubious assumption that all preferences can be granted simultaneously, despite there being interdependencies between firms.

A more plausible story is that individual decision makers have expectations about market outcomes, deliberately vary their exposure to risk based on such expectations, but often find their judgments to be fallible. When researchers then examine the mean and variance of reported
performance, what they see is not an accurate description of every decision maker’s preference for risk, but patterns that reveal the ability of firms to achieve their goals within environments characterized by uncertainty.

This is a story of unforeseen rather than deliberate outcomes. It is a story where neither variable risk preferences at the individual level, nor the organization level, are necessarily disputed. What is being disputed, however, is that such preferences, while they may exist and be easily deciphered pre-market, do not generate the patterns observed post-market. Rather, we suggest that Knight’s (1921) work on the relationship between risk, uncertainty and profit, Brunswik’s (1943) work on achievement and environmental probability, and Simon’s (1955) work on bounded rationality, concern the essence of what generates the performance distributions of firms, and are essential for understanding not only the association between mean performance and variance of performance, but the association between performance distribution moments in general.

Broadly we argue that performance distributions obtain their specific characteristics because the following are true:

(i) Performance distributions are generated within competitive environments, which are uncertain for decision makers, because these individuals or organizations have limited information processing capacities (cf. Simon, 1955).

(ii) Decision makers demonstrate perceptual compromise, whereby they utilize informational cues according to ecological validity (cf. Brunswik, 1943).

(iii) Decision makers behave according to their confidence in judgments (cf. Knight, 1921).
(iv) Decision makers have diverse information processing capacities, which creates heterogeneity in the number of informational cues they can utilize to form their judgments.

Brunswik’s principle of perceptual compromise deserves special mention here, because it is perhaps the least known among strategy scholars and because it implies a phenomenon, which, if present, has central importance for competition within social systems based on judgments – the phenomenon of correlated expectations.

Rationality implies that expectations are identical across all decision makers, which implies perfectly correlated expectations. However, the principle of perceptual compromise implies that correlation will occur among decision makers in general, because they process informational cues in order of their accuracy as predictors. It follows that decision makers with identical information processing capacities will tend to form identical expectations, whether that capacity is sufficient for perfect rationality or not. The thesis, which we would like to convey in this paper, is that such phenomenon is particularly important for understanding the outcome of trade.

Specifically, within the broad framework thus defined, we revisit Bowman’s seminal paper to pursue his rarely quoted idea that inefficient price setting negotiations among firms may, at least in part, explain the ‘paradoxical’ association between mean performance and variance of performance that he famously observed. Using the methodology of computer simulation, we model price negotiation between bounded rational firms in markets for resources, who utilize informational cues similarly, share dispositions to invest more heavily upon discovery of greater perceived margins, and have diverse judgment abilities.
Our investigation explicitly generates, and does not merely assume, the performance distributions of firms, demonstrating associations between the mean, variance, skewness, and kurtosis of these distributions, which all resemble empirical observations. Particularly, we account for empirical observations about (a) the slope of correlation between mean and variance of performance (b) the position of turning points in this correlation, (c) the number of turning point within this correlation, (d) the association between mean performance and skewness, and (e) performance distribution kurtosis.

2. **Prior research**

2.1. *Bowman’s Paradox*

By the time Bowman (1980) observed the negative relationship between mean performance and variance of performance across firms, Conrad and Plotkin (1968), Fisher and Hall (1969), and Hurdle (1974), had all made significant observations to the contrary. Bowman’s observation was called paradoxical, not because it was dissimilar to these prior observations per se, but because it was incongruent with traditional finance theory. In financial markets, so this traditional theory states, participants may actively take higher risk, but only when they get higher returns.

Bowman (1980:2) noted that traditional finance theory assumes risk carries its own reward, and speculated (Bowman, 1980:17) that financial markets, being free, open, and sizable, will compensate investors with higher mean returns for purchasing securities with greater variance. This is an interesting remark, because it indicates that Bowman believed pricing efficiency was integral to the relationship between mean performance and variance of performance, although he (Bowman, 1980:17) tentatively speculated that performance of firms within their markets was only obliquely linked to performance of investors in financial markets.
Nevertheless, despite his caution, it is certainly not uninteresting to further note that in explaining why there might be a negative relationship between the mean performance and variance performance of firms within industries, Bowman (1980:22) conjectured that good management may bring higher returns and lower variance through negotiations with external parties. In other words, contrary to belief aggregating auctions within financial markets, the price setting mechanisms of discussion may be so inefficient, that some managers can negotiate prices, which result in high returns consistently.

2.2. *Prospect Theory View*

Bowman arguably went further in explaining the relationship between mean performance and variance of performance than what is generally recognized. On the other hand, he did not address those inconsistencies with prior observations that still remained. How could negative relationships between mean performance and variance of performance exist in some industries, when in other industries the relationship was positive? The answer given by Fiegenbaum and Thomas (1988) was essentially that it could not.

Fiegenbaum and Thomas (1988) divided firms into equal groups according to mean performance relative industry medians, and thereby classified high and low performers. For each industry, and each group, correlation analysis of mean performance and variance of performance was then conducted. These revealed systematic differences in the character of correlations. More specifically, Fiegenbaum and Thomas discovered that regions of below median performance were associated with negative correlation, while for regions of high performance the correlation between mean performance and variance of performance was positive. Moreover, the former correlations were steeper than the latter.
Instead of considering the possibility that price setting could explain their more refined observations, Fiegenbaum and Thomas interpreted their findings through prospect theory. The patterns discovered, so they argued, were consistent with the existence of reference points for risk within industries, with firms seeking risk when positioned below this point, and being averse to risk when positioned above. Moreover, the differential steepness on either side of the reference point was consistent with loss aversion, as was the overall pattern of correlation, which were argued to be curvilinear, or more precisely, quadratic. In this way, Fiegenbaum and Thomas apparently reconciled observations of both positive and negative correlations.

But their arguments are not without problems. The trouble is not the empirical observations made by Fiegenbaum and Thomas, for they have since been confirmed on numerous occasions, for different industries, countries, and at different times in history (Fiegenbaum, 1989; Chang and Thomas, 1989; Jegers, 1991; Chou, Chou and Ko, 2009). The problem is the internal validity of prospect theory in generalizing from psychological experiments on individual participants, to large systems.

The prospect theory view implicitly assumes that preferences of individual managers emerge clearly from the organization, in spite of process complexity and competing political agendas, entering the accounts of firms intact, having also survived any confounding effects of competitive interaction with interdependent firms, whose position within the overall pattern, not to forget, simultaneously satisfies the risk preferences of their managers too, all the while the reference point of all individuals across all industries and for all time, is equal and identical to median performance. It appears very unlikely to be true.
2.3. **Behavioural Theory**

While prospect theory may have dubious validity at high levels of aggregation, it remains one of the most widely accepted theories, arguably because patterns at the individual level really do resemble those seen across industries.

But an arguably more realistic, yet clearly related attempt to reconcile empirical observations is the behavioral theory view. Like prospect theory, behavioral theory explains empirical observations by arguing for the existence of changing risk attitudes, but unlike prospect theory, focuses on aggregates of individuals, with relevant risk preferences being those emerging for the organization from its internal processes. In that sense, behavioral theory achieves greater realism, because it accounts for every pre-market level of aggregation.

Nevertheless, just like prospect theory, behavioral theory assumes that preferences are clearly reflected in company accounts through deliberate choice, with these preferences being those of the firm, rather than those of any given individual within the firm. Almost needless to say, this is problematic considering that Cyert and March (1963:226), who conceived the behavioral theory of the firm, argues that judgments about the consequence of action, and judgments about preferences with respect to those consequences, will be imperfect because of bounded rationality on the part of those who make such judgments. In that sense, behavioral theory has dubious internal validity, just like prospect theory.

Moreover, when it comes to prediction, it turns out that empirical observations made at the industry level, are not entirely consistent with those predicted by behavioral theory at the organization level. More specifically, there is strong evidence (March and Shapira, 1992) to suggest that organizations have preferences for reduced risk when performing at levels threatening survival. If preferences of organizations indeed are reflected clearly in their financial accounts, then such inhibiting effects should also be evident there, but they are not, and it
appears that prospect theory has an edge in terms of its predictive ability. Nevertheless, that conclusion would be made too soon, because behavioral theory explicitly accounts for the position of turning points in the correlation between mean performance and variance of performance, while prospect theory does not.

The behavioral theory of the firm argues for changing aspiration levels at the firm level, not inert reference points emerging at the industry level, and Gooding, Goel, and Wiseman (1996) indeed find evidence of turning point variability. More precisely, there is strong evidence to suggest that variability appears to exist through time for individual industries, and across industries, typically being positioned above median performance.

2.4. Statistical Artifact

There is little question that empirical observations of mean performance and variance of performance resemble the predictions made by prospect theory and behavioral theory remarkably well, on the condition that variance of performance indeed measures deliberate risk. Nevertheless, even if that condition was satisfied, the possibility remains that observed correlations are statistical artifacts, which therefore lack the economic meaning bestowed upon them by strategy scholars.

Henkel (2009) presents the most convincing of these arguments. He demonstrates formally that sampling from negatively skewed performance distributions may result in correlation between mean performance and variance of performance that are negative, when the true relationship is really positive. Similarly, positive correlations may appear when sampling from positively skewed distributions, when the true relationship is really negative.

The troublesome implication of Henkel’s argument is that observations from company accounts cannot be relied upon to make credible inferences. This is problematic for theorizing in
general, not just for prospect theory and behavioral theory. While the argument does not rule out the existence of systematic relationships between the mean and variance of performance, it does imply that actual observations cannot be trusted at face value. Instead, relationships observed from company accounts must be disentangled from the effect of skewness, which is precisely what Henkel attempts to do.

In addition to his formal analysis, Henkel examines the relationship between observed correlations and skewness among firms in particular industries, finding evidence that predominantly positive skew is associated with positive correlation while predominantly negative skew is associated with negative correlation. On the basis of these observations, Henkel (2010:297) concludes that on average, skewness therefore explains the larger part of correlations between mean performance and variance of performance.

But this conclusion hinges on the assumption that negative skewness is not associated with true negative correlation between mean performance and variance of performance, and that positive skewness is not associated with true positive correlation between mean performance and variance of performance. If true effects exist, they should not be disregarded.

Henkel (2009) himself presents evidence that firms occupying regions of performance below the industry median tend to have performance distributions that are negatively skewed. While this does not imply any actual negative correlation between mean performance and variance of performance in this region, the observation is consistent with such patterns within the framework of the present paper, as we shall see.

Besides highlighting the spurious effects of skewness, Henkel’s (2009) work does something else important. It draws attention to fundamental empirical observations, which neither prospect theory nor behavioral theory explicitly account for. Given that analyses of
correlation between mean and variance of firm performance within particular industries are equivalent to analyses of correlation between the first and second moment of performance distributions within particular industries, it is curious that relationships between the first and the third moment, or the first and the fourth, or the relationship between any combinations of these moments, have not been considered in greater detail. As Henkel (2009:298) rightly asks, why do the performance distributions of firms have their particular shape?

2.5. Adaptive Risk Preferences

We conclude by reviewing what is perhaps the most plausible of all theories published to date explaining empirical observations of mean performance and variance of performance, namely Denrell’s (2008) model of adaptive risk preferences.

Instead of assuming that choices made by firms are based on anticipation of future returns and risks, Denrell examines the patterns of mean and variance of firm performance that emerge when firms simply make choices based on past performance. More specifically, Denrell argues that firms have aspirations levels, and when their performance falls below this level, tend to search for alternative action, while they tend to keep their current actions when things are going relatively well. Not only is the adaptive risk preference model realistic in many regards, it also predicts most key observation about the correlation between mean and variance of performance, without assuming variable risk preferences.

While this is quite remarkable, the adaptive aspiration model generates its predictions by assuming the performance distribution from which experience is sampled. In other words, this distribution is exogenous to the model, and the model therefore cannot explain why performance distributions have their particular shape.
From that perspective, there is room for another model which, like the adaptive risk preference model, is based on realistic assumptions about human cognitive capacities, yet which furthermore explains why performance distributions obtain their particular shape. A model satisfying those criteria is developed in the following section.

3. Model

3.1. Trading resources of varying objective value

Consider $N_B$ buyers and $N_S$ sellers with identical preferences. Buyers and sellers are matched randomly to negotiate transactions involving resources. Outcomes of negotiations are a function of subjective expectations about resource value that buyers and sellers have, and associated reservation prices.

Each resource has a true value, completely determined by a linear function of $k$ proximinal cues:

$$V_T = \alpha + \sum_{j=1}^{k} \beta_{T,j} X_j,$$

where each $\beta_{T,j}$ represents the ecological validity of the different cues $X_j$, and where $\alpha$ is a commonly known constant indicating the average historic price.\(^1\)

3.2. Cognitive constraint cue learning

Judgments made are based on prior experience learning about ecological validities of resource cues in signaling objective value. Actual resources have many of attributes that vary depending on the type of resource, and the cues utilized by agents can be regarded as such

\(^1\) The constant also serves keeps negotiated prices positive.
attributes. Some attributes provide negative signals, while others provide signals that are positive.

An agent utilizing all proximinal cues will evaluate without error. Nevertheless, buyers and sellers have cognitive constraints, and can make mistakes. The judgment of buyers and sellers, denoted $V_{S,B}$, is a linear function of $c$ proximinal cues, where $c$ may vary among agents. Thus,

$$V_{S,B} = \alpha + \sum_{j=1}^{c} \beta_{S,B,j}X_j,$$  \hspace{1cm} [2]

where each $\beta_{S,B,j}$ is the weight individuals place on different proximal cues when forming their judgment. The value of $c$ may be smaller, equal to, or greater than $k$, and to use Arthur’s (1992) terminology, the individual may consequently face a problem beyond, on, or within its problem complexity boundary, where this boundary exists at $c = k$.

Cue values are independent and distributed normally, having a variance of 1, but having no influence on value on average. For simplicity and tractability we also assume unit ecological validity for each cue, and can therefore state the following:

$$\beta_{T,j}X_j = X_j = N \sim (0, 1),$$  \hspace{1cm} [3]

From [2] and [3] it follows that objective resource value is normally distributed with an average of 0, and a variance of $k$, given the rule of summing independent normal distributions:

$$V_T = \alpha + N \sim (0,k),$$  \hspace{1cm} [4]
We assume that each individual is so experienced, that the weight attached to the c cues utilized is equal to their ecological validity, implying that any errors in judgment made is due entirely to utilization of cues fewer than k. Thus we may subsequently state the following:

\[ V_{S,B} = \alpha + N \sim (0, c_{S,B}) \]  \[5\]

### 3.3. Correlated expectations

At this point we assume that buyers and sellers utilize proximal cues in order of ecological validity, from which it follows that expectations among buyers and sellers will be correlated. This assumption implies that two agents, having the same cognitive resources, will utilize exactly the same cues, and form exactly the same judgment about value. On the other hand, if one is endowed with more cognitive resources, then this agent will utilize the same cues as the other, but will also utilize additional cues, and thus make correlated, but nevertheless different judgments.

Given our assumptions so far, we can use the rule of summing independent normal distributions to decompose the expectation of two agents, and the objective value:

\[
\begin{align*}
\text{For } c_B > c_S & \quad \left\{ \begin{array}{l}
V_S = \alpha + N \sim (0, c_S) \\
V_B = V_S + N \sim (0, c_B - c_S) \\
V_T = V_B + N \sim (0, k - c_B)
\end{array} \right. \quad [6A] \\
\text{For } c_S > c_B & \quad \left\{ \begin{array}{l}
V_B = \alpha + N \sim (0, c_B) \\
V_S = V_B + N \sim (0, c_S - c_B) \\
V_T = V_S + N \sim (0, k - c_S)
\end{array} \right. \quad [6B]
\end{align*}
\]
3.4. *Price negotiation*

On the condition that value perceived by the buyer is greater than the value perceived by the seller, negotiations result in transactions. Nash bargaining solutions are assumed, which imply that agreed prices are exactly half way between the values perceived by the two agents.

3.5. *Elastic demand and supply*

Buyers will purchase more when they perceive larger margins between value and price, and sellers will supply more when they perceive larger margins between price and value. These dispositions create downward sloping demand, and upward sloping supply, which we model as follows:

\[ Q_D = 1 + \beta_B (V_B - P) \] \hspace{1cm} [7]

\[ Q_S = 1 + \beta_S (P - V_S) \] \hspace{1cm} [8]

Where \( Q_D \) and \( Q_S \) are quantities demanded and supplied respectively, and \( \beta_B \) and \( \beta_S \) are the slopes of demand and supply respectively, capturing the mentioned dispositions. Since Nash bargaining ensures that \((V_B - P) = (V_S - P)\), a sufficient criteria for equilibrium is \( \beta_B = \beta_S \), which we assume.

4. *Results*

We now begin our investigation of the relationship between moments of performance distributions across populations of firms, within the presented framework.
Throughout the following investigation, cognitive resources are distributed uniformly among buyers and sellers. Other distributions provide more realism, but the uniform distribution is simple and permits us to establish links between cause and effect more readily. We aggregate profits from buyer and seller transactions, and call the composite ‘firm performance’. Firms with better judgment ability in their role as buyers are also assumed to have greater ability in their role as seller.

We do not model the evolution of equity or assets, and therefore do not focus on Return on Equity (ROE) or Return on Assets (ROA) as performance measures. Instead we focus directly on profit, defined in the following way:

\[
\pi_{s,b} = \begin{cases} 
Q (V_T - P), & \text{buyer} \\
Q (P - V_T), & \text{seller} 
\end{cases} \tag{9}
\]

Nevertheless, since the numerator of both accounting ratios is profit, our results are directly comparable with empirical studies that apply ROE or ROA, including the seminal papers of Bowman (1980) and Fiegenbaum and Thomas (1988). As Bowman (1980) made clear, the reason for using ROE or ROA in empirical studies is to adjust for differences in firm size within the industry. Here this adjustment is unnecessary because firm size has no effect on behaviour.

4.1. The effect of correlated expectations and elastic demand and supply

We start by establishing the effect of correlated expectations and elastic demand and supply. In this initial investigation, neither buyers nor sellers have superiority on average, with the typical agent utilizing exactly half of all proximinal cues to form judgments, and with
extreme agents being able to utilize one cue or all cues respectively. The number of buyers and sellers are equal, and none leave or enter the market.

Setting:
Number of agents, $N_S = N_B = 1000$
Number of relevant proximinal cues, $k = 1000$
Distribution of cognitive resources in upstream industry, $c_{\text{sellers}} \sim U (1, 1000)$
Distribution of cognitive resources in downstream industry, $c_{\text{buyers}} \sim U (1, 1000)$
Average historical price of resources, $\alpha = 250$

To guide our investigation, we establish the 2-by-2 matrix shown below and compare results across sub-settings. Correlated expectations are contrasted with a situation where agents utilize randomly selected cues. For ease of exposition we call that sub-setting 'uncorrelated expectations'.

Table 1: Settings to study the effect of correlated expectations and elastic demand and supply*

<table>
<thead>
<tr>
<th></th>
<th>Uncorrelated Expectations</th>
<th>Correlated Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inelastic Demand</strong></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Elastic Demand</strong></td>
<td>3**</td>
<td>4**</td>
</tr>
</tbody>
</table>

* Number of transactions = 7300.
** $\beta_D$ and $\beta_S$ in [7] and [8] is set to 1.0.

We use that label despite it being increasingly imprecise for higher values of $c$, holding $k$ constant. To see this, consider that expectations will be identical in the upper limit where $c = k$ for all agents.
Figure 1: The correlation between mean and variance of profit in different settings for correlation, demand, and supply*.

* The settings match those indicated in Table 1, with elastic demand being positioned in the bottom row, and correlated expectations in the right column.
Figure 1 scatters combinations of mean and variance of profit of firms in settings 1 to 4. It is clear that mean profit and variance of profit is related negatively in settings 1 – 3 without exception and is related both negatively and positively in setting 4, with a turning point visible at the point of breakeven. Our model thus predicts the observation made by Bowman (1980) and also predicts the more nuanced observation made by Fiegenbaum and Thomas (1988), but only when expectations are correlated and demand and supply is sufficiently elastic. Cognitive constrained cue learning among agents, and the associated characteristic of correlated expectations is therefore sufficient to generate a pattern similar to that observed by Bowman (1980), but in order to also generate a pattern comparable to that observed by Fiegenbaum and Thomas (1988), supply and demand must be related to price in the normal, but sufficiently elastic way.

The predicted negative relation between mean profit and the variance of profit is caused by the negotiated outcomes of buyers and sellers, given the relative ability of typically encountered negotiating partners in terms of judgment ability. The top panel of Figure 2 scatters combinations of negotiated prices and profits obtained by sellers with high \((c = 1000)\) and low \((c = 1)\) judgment abilities. The bottom panel shows the related case for buyers. It is clear from visual inspection alone that variance of profits earned by sellers and buyers with relatively poor judgment ability is much greater than the variance experienced by their superior counterparts. At the same time, and even more clearly, the opposite pattern in evident for negotiated prices.

Consider that judgments of agents improve and vary increasingly with the number of cues utilized. While objective value may vary greatly from resource to resource, agents utilizing only few proximinal cues are unable to form expectations that are equally nuanced, tending instead to
Figure 2: Patterns of negotiated prices and ensuing profits for firms with different capabilities*. The arrows indicate the direction the scatter plot between prices and profits turn, as information processing capacities increase.

* The arrows indicate the direction the scatter plot between prices and profits turn, as information processing capacities increase.
form judgments about value close to the historic average. Subsequently, the variability of prices negotiated reflects the variability of their opponents’ beliefs much more than their own.

Now, unless they can utilize all relevant cues, the beliefs of opponents are not always more accurate and sometimes even opponents with nuanced expectations are wrong. It is on these occasions that buyers and sellers with relatively poor judgment ability make their profits. These occurrences are, however, much rarer than those events where capable opponents offer what are erroneously perceived to be extraordinary bargains at prices much different from the historical average.

In general, the lack of correlation between the objective truth and expectations of incapable sellers (buyers) explains why they refrain from trading at prices below (above) the historical average. Quite simply, when buyers offer below normal prices, incapable sellers are often blind to any value, even though value might objectively be present. On the other hand, when buyers offer prices above the historical average, these incapable sellers typically see great value and will subsequently enter an agreement. Incapable buyers are subject to the same pattern described, but with opposite sign.

As for buyers and sellers with superior judgment ability, their expectations correlate much more with objective value, and they find value both above and below the historical average. Their profits are rarely negative, and their profits are more consistent, simply because they only rarely encounter truly incompetent counterparts, and even less often trade with them. More often they are matched with counterparts, whose expectations are sufficiently refined to prevent extraordinary profits.
This line of argument explains why the general negative relationship between mean and variance of profit is predicted, but it does not identify the opposing force, which may become sufficiently strong to dominate and consequently change the overall relationship between mean and variance of profits. To gain an understanding of this force, we need to examine the nature of profit distributions across agents with different judgment abilities.

Figure 3 illustrates the profit distributions for three types of firms\(^3\), namely a firm with poor judgment ability \((c = 1)\), one with typical judgment ability \((c = 500)\) and one with superior judgment ability \((c = 1000)\). The firms exist in a setting where expectations are correlated. Each column in the figure contains information about one particular firm, and judgment ability improves as we move from left to right. Rows contain information about distinct settings of demand and supply, with \(\beta_S\) and \(\beta_B\) being 0, 0.5 and 1.0 for respective rows, starting with the first.

It is apparent from Figure 3 that profit distributions become more peaked as demand and supply become steeper. The situation where demand and supply is inelastic corresponds to a situation where there is no propensity to trade more than a single resource, irrespective of perceived value. In that situation, variance in profit is caused exclusively by differences between objective values and negotiated prices. As demand and supply become increasingly elastic, however, variance is compounded by firms trading greater quantities upon perception of greater value. With reference to expenditure, this implies that price is multiplied by increasing quantities as perceived value increases, which ultimately creates peaked distributions with extensive tails.

\(^3\) These are actually distributions of buyer profits, but the distributions for sellers are no different, hence the reference made to ‘firms’.
Figure 3: The distribution of profits for low \((c = 1)\), median \((c = 500)\) and high \((c = 1000)\) capability firms, under increasingly elastic demand and supply conditions, when expectations are correlated.
While demand and supply thus influence the kurtosis of profit distributions, they even more clearly have an effect on the degree of asymmetry, given relative endowments of cognitive resources between buyers and sellers. To see this, consider the following.

For incompetent firms, errors of evaluation are common. Moreover, in those situations where they do correctly identify value, the value perceived is small on average, because they typically face more qualified counterparts who rarely error greatly. On the other hand, on those numerous occasions where errors of judgment are made, the value perceived is often quite substantial. In comparison, errors made by firms with abilities on par with typical counterparts, have largely the same effect on profits as correct evaluations, while for highly capable firms, the situation tends to mirror the incapable firm, except that when $c = k$, no errors are made at all.

The pattern described above has systematic effects on the profit distribution’s degree of symmetry across different capabilities, but only when combined with demand and supply that is sufficiently elastic. For those firms having abilities of judgment that are low compared with their typical counterpart, profit distributions are skewed to the left, while those firms with superior capabilities, the profit distribution is skewed to the right. Finally, the profit distribution is quite symmetric for firms whose judgment ability is quite typical within the population of possible counterparts. Given the findings made by Henkel, these predictions are particularly interesting.

Table 1: Relationships between Higher Moments of Profits Distributions across Firms.

<table>
<thead>
<tr>
<th>β</th>
<th>Lowest (c = 1)</th>
<th>Middle (c = 500)</th>
<th>Highest (c = 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Mean</td>
<td>-8.2</td>
<td>-73.1</td>
<td>-132.2</td>
</tr>
<tr>
<td>Variance</td>
<td>565</td>
<td>26,885</td>
<td>94,828</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.1</td>
<td>-2.0</td>
<td>-2.4</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>0.8</td>
<td>7.4</td>
<td>12.0</td>
</tr>
</tbody>
</table>
Besides providing information about skewness and kurtosis, Table 1 also confirms that rising mean profits may be associated with greater variance when the slopes of demand and supply are sufficiently steep. But why do we observe this phenomenon when expectations among agents are correlated, and not when agents utilize proximinal cues randomly?

A buyer (seller) matched with an equally capable seller (buyer) will have the same expectation about value as the trading partner and will subsequently face terms exactly mirroring the perceived reservation price, and no transaction will therefore take place. A buyer (seller) matched with a seller (buyer) endowed with slightly different ability will have an expectation regarding value, which deviates from the seller (buyer), but only slightly. Here a transaction will occur, but it will only involve small resource quantities, even when demand and supply is very elastic. We may expand this picture farther by considering greater differences in abilities still, and consider that quantities traded will be correspondingly higher.

If we reflect on this situation probabilistically, and consider populations of firms with different judgment capabilities, then it becomes apparent that firms endowed with atypical capabilities will more often encounter propositions representing high subjective value. Meanwhile, the typical firm is often matched with likeminded counterparts and propositions that, apparently to them, do not represent much value. The average transaction size of the former should subsequently be relatively large, while for the latter, it should be relatively small, and this is precisely what Figure 4 indicates.

In a nutshell, with expectations being correlated, the effect of elastic demand and supply is greatly curtailed for typical firms. In comparison, increasingly elastic demand and supply has increasing impact for atypical firms at either end of the scale, with both types of firms increasing their average transaction size. The effect essentially ‘pins-down’ variance of profit for the
median firm, because it faces difficulty perceiving value, while variance for more atypical firms increases. For substantially elastic demand and supply, the negative relation between mean and variance of profit will therefore become positive.

*Figure 4: Isolating the effects of correlated expectations when demand and supply is elastic with respect to perception of value.*
4.2. *Looking closer at the effect of elasticity in the presence of correlated expectations.*

As the literature review revealed, an important empirical observation often claimed to indicate the validity of prospect theory is the relatively steeper slope of negative correlations, compared with the positive, whenever both correlations exist. This pattern is consistent with loss aversion, which although being a phenomenon displayed by individuals, is nevertheless argued (Fiegenbaum, 1990; Chou, Chou, and Ko, 2009) to drive patterns at higher levels of aggregation.

Meanwhile, another important empirical observation (Fiegenbaum and Thomas, 1988; Chang and Thomas, 1989; Gooding, Goel, and Wiseman, 1996) is also claimed to indicate the correctness of prospect theory, namely curvilinearity between mean and variance of performance.

In this section we demonstrate that both patterns – differentiated steepness and curvilinearity – can be explained by the interaction of correlated expectations and increasing elasticity of demand and supply. Moreover, we demonstrate the relationship to be cubic, rather than quadratic. This finding is important in light of Gooding, Goel, and Wiseman’s (1996:343) admittance that cubic relationships, while unreported, were significant in several industries.

Our demonstration is straightforward. Within the setting we have been investigating so far, we examine the situation where expectations are correlated, and proceed to vary $\beta$ through the following locations: 0.05, 0.25, 0.50, 1.00, and 10.0. For each pattern thus observed, we report statistics indicating how consistently data follows the reported third order polynomial. The results are shown in the following five figures.
Figure 5: The effect of varying $\beta$ on the relationship between mean and variance of performance at the firm level, when expectations are correlated ($\beta = 0.05$).

<table>
<thead>
<tr>
<th>Model Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
</tr>
<tr>
<td>0.995</td>
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</table>

<table>
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<tr>
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<tbody>
<tr>
<td>Sum of Squares</td>
</tr>
<tr>
<td>Regression</td>
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<td>Residual</td>
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<tr>
<td>Total</td>
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<table>
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<tr>
<th>Coefficients</th>
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<tbody>
<tr>
<td>B</td>
</tr>
<tr>
<td>Mean Profit</td>
</tr>
<tr>
<td>Mean Profit ** 2</td>
</tr>
<tr>
<td>Mean Profit ** 3</td>
</tr>
<tr>
<td>(Constant)</td>
</tr>
</tbody>
</table>
Figure 6: The effect of varying $\beta$ on the relationship between mean and variance of performance at the firm level, when expectations are correlated ($\beta = 0.25$).
Figure 7: The effect of varying $\beta$ on the relationship between mean and variance of performance at the firm level, when expectations are correlated ($\beta = 0.50$).
Figure 8: The effect of varying $\beta$ on the relationship between mean and variance of performance at the firm level, when expectations are correlated ($\beta = 1.00$).

<table>
<thead>
<tr>
<th>Model Summary</th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>R</td>
<td>R Square</td>
<td>Adjusted R Square</td>
<td>Std. Error of the Estimate</td>
</tr>
<tr>
<td></td>
<td>.989</td>
<td>.978</td>
<td>.978</td>
<td>2760.045</td>
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</table>

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>Sum of Squares</th>
<th>d</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
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<td>3</td>
<td>1.149E11</td>
<td>15078.834</td>
<td>.000</td>
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<tr>
<td>Residual</td>
<td>7.587E9</td>
<td>996</td>
<td>7617847.421</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3.522E11</td>
<td>999</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
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<tr>
<td>Mean Profit</td>
<td>-14.287</td>
<td>-.078</td>
<td>-6.777</td>
<td>.000</td>
</tr>
<tr>
<td>Mean Profit ** 2</td>
<td>1.450</td>
<td>.735</td>
<td>157.924</td>
<td>.000</td>
</tr>
<tr>
<td>Mean Profit ** 3</td>
<td>-0.005</td>
<td>-.595</td>
<td>-51.376</td>
<td>.000</td>
</tr>
<tr>
<td>(Constant)</td>
<td>56842.234</td>
<td>434.469</td>
<td></td>
<td>.000</td>
</tr>
</tbody>
</table>
Figure 9: The effect of varying $\beta$ on the relationship between mean and variance of performance at the firm level, when expectations are correlated ($\beta = 10.00$).
4.3. *On the effect of relative strength between buyers and sellers.*

We finish our investigation by examining the effect of relative strength between buyers and sellers in terms of their information processing capabilities. So far we have only examined the situation where buyers and sellers are evenly matched. The effect, as we have seen, were either a strictly downward sloping relationship between performance and variance of performance, or, depending on elasticity of demand and correlated expectations, a curvilinear relationship with one turning point at the level of breakeven for the firm, and another at very high performance.

While these predictions resemble a wide range of empirical observations, there are at least two important empirical observations that so far have not been predicted. The first of these observations (Gooding, Goel, and Wiseman, 1996) is an apparent variability in the position of the first turning point across industries and within the same industry across time, with such turning points therefore not necessarily being positioned at the point of breakeven.

The second of these empirical observations (Conrad and Plotkin, 1968; Fisher and Hall, 1969; Hurdle, 1974; Amit and Livnat, 1988; Aaker and Jacobsen, 1987) is the existence of strictly positive relationships between mean performance and variance of performance, which although made less frequently, is consistent with standard finance theory. We begin by demonstrating how this second pattern may emerge, and then proceed to demonstrate conditions generating first.

In general, a strictly positive correlation between mean performance and variance of performance is predicted to occur across a population of firms, when no firm within this population is inferior to the typical firm with whom it transacts. Similarly, negative correlation is predicted across a population of firms, when none are superior to typical trading partners. This is shown in Figure 10 and Figure 11.
Figure 10 is based on a situation where all sellers are endowed with information processing capabilities greater than any buyer. More precisely, the distributions of resources are as follows: $c_{\text{Sellers}} \sim U(501, 1000)$, $c_{\text{Buyers}} \sim U(1, 500)$. From visual inspection alone, it is clear that no turning point exists across the population of buyers or seller. However, these strong conditions, while sufficient, are not necessary.

The situation in Figure 11 is slightly different. While the typical seller ($c = 750$) is superior to the typical buyer ($c = 500$), some sellers are inferior to some buyers, whom they may encounter. Nevertheless, the correlation between mean performance and variance of performance across the populations of sellers is still strictly positive. This is because not a single seller is inferior to the typical buyer. Meanwhile, while the typical buyer is inferior to the typical seller, 25% of all buyers are superior to the typical seller, and for these firms the correlation between mean performance and variance of performance is positive.

Let us return for a moment to Figure 10. Notice that a negative correlation exists at the aggregate level of the firm. This is an artifact of the chosen method of aggregation. The possibility that firms may be superior in both their role of buyer and seller does not exists in the way aggregate to the firm level, but it would be relatively simple to demonstrate this possibility by modeling the vertical relationship in three layers, and examining the performance of the middle.

Our method of aggregation, however, is sufficient to demonstrate turning points that are variable, do not necessarily align with breakeven profits, and are not necessarily equal to the profits of the typical firm in the population. Inspection of the bottom panel of Figure 11 reveals that a turning point is located at a mean profit of ca. 50. Moreover, this level of performance is achieved by fewer than half of all firms. In other words, the point is greater than the median.
Figure 10: Relative strength and the pattern of correlation.

- **SELLERS**
  - Distribution of c:
    - 1
    - 500
    - 1000

- **BUYERS**
  - Distribution of c:
    - 1
    - 500
    - 1000

- **FIRM**
  - Distribution of c:
    - 1
    - 500
    - 1000
Figure 11: Relative strength and the pattern of correlation.
Figure 12: Relative strength and the pattern of correlation.
So, what under what conditions are turning points positioned at the breakeven profit at the level of entire firms? As indicated, the answer depends on how the performance at the consolidated level is derived from all firm activities. On the basis of our initial examination, an educated guess might be that such is the case when the judgment ability of the typical firm, exactly matches the average ability of all those entities with whom it trades to earn consolidated profits. To examine this conjecture more closely, we examined the final setting shown in Figure 12, which is characterized by populations of buyers and sellers that both utilize a high number of cues, but are equally matched on average. As can be seen, the turning point does indeed occur at breakeven, which is aligned with median performance.

5. **Implications**

We have suggested that empirical evidence on firm performance is not created deliberately by the preferences of any individual, whose will emerges unscathed through the organization, through market interactions, and into financial statements. Nor is it caused by deliberate decisions about risk, given organization aspiration levels. Rather, the risks involved are unmanageable by any firm, and certainly by any individual. The risks involved are risks of competition between more or less capable opponents, who often see the same opportunities in the market, rightly or wrongly, and who are characterized by ‘an inveterate belief in their own luck, which is especially strong when the basis of uncertainty is the quality of own judgment’ (Knight, 1921:33).

Contrary to prospect theory and behavioral theory, the turning point observed in the relationship between mean profit and the variance of profit is a manifestation of correlated expectations among firms with similar information processing capabilities, caused by what
Brunswik (1943) called the principle of perceptual compromise, with such correlation being particularly strong at the turning point, because firms positioned there resemble those with whom they typically trade in terms of processing abilities.

In general, breakeven is achieved by the seller with information processing capabilities equal to the median buyer, and with sufficiently elastic demand and supply, this point will split the population of sellers, with sellers further below this point facing increasingly large variation in profit, and sellers further above the point earning profits that likewise vary increasingly. The point of breakeven, however, will not necessarily occur at the point occupied by the median seller. In fact, it never will unless the typical seller and the typical buyer have identical information processing capabilities. If the typical buyer is superior to the typical seller, then the median seller will suffer a loss on average, while the typical buyer will enjoy profits that are positive. In this way, turning points, in so far as they even exist, may occur at extreme positions. These predictions thereby reconcile the empirical observations made by Gooding, Goel, and Wiseman about variable turning point.

Our framework also reconciles Bowman’s original observation of strictly positive correlations, with those made prior to his, by Plotkin amongst other. If every firm within an industry is superior to those firms, with whom they transact in terms of information processing capabilities, then the correlation between mean profit and variance of profit for these superior firms will be entirely positive, stretching upward to the right from a point somewhere above breakeven. Were these firms, on the other hand, all inferior, then relationship will be entirely negative, stretching up to the left from a point somewhere below breakeven.

As for the relative steepness of positive and negative correlations, when these are present simultaneously, which we have seen is not always the case, then observed patterns are indeed
consistent with the loss aversion story, but needless to say, loss aversions are not their cause. Instead the relative steepness of negative correlation may be explained in the following way.

The variance of profits increases at every level of mean profit when demand and supply changes from inelastic to elastic and expectations are uncorrelated. However, in this situation, when expectations change from uncorrelated to correlated, two opposing forces are at work. Elastic demand and supply permit firms to ‘back up’ their judgments (Knight, 1921) upon the discovery of perceived greater positive margins, which tends to increase the variance of profit at every point across the spectrum of mean profits. However, correlated expectations dampen this effect because in the presence of such correlations, firms tend to value resources similarly, and tend to have similar ideas about what price will eliminate positive margin. This ultimately leads to smaller commitments on average. The effect is much more pronounced for firms whose information processing capability matches their typical competitor. For atypical firms at either end of the mean profit spectrum the effect is hardly experienced. The overall effect is therefore one of ‘pinning down’ the variance of the more typical firms, while the variance of extreme firms increases relatively unhindered. The emergent pattern looks as if it is caused by risk aversion, when in fact it is caused by correlated expectations in the presence of elastic demand and supply.

The resulting shape of correlation patterns, which prospect theory predicts is quadratic, but which evidence suggests is often cubic, is indeed predicted to be cubic in this paper, and while this cannot be reconciled from the perspective of prospect theory, it occurs for good reason within the presented framework. Quite simply, the second turning point, which is an implication of the cubic relationship, occurs when the variance generating effects of inelastic demand and supply, in the presence of correlated expectations, are insufficient to counterbalance the opposing
effect of the underlying negative correlation, which is particularly strong for regions of high performance.

Finally, and importantly, the applied framework makes the aforementioned predictions while generating performance distributions that not only explain empirical observations about these mean and variance relationships, but also explain relationships between the mean, skewness, and kurtosis of performance distributions across firms.

Table 2 summarizes our findings, indicating key empirical observations and associated explanations, as proposed in this paper, and proposed by competing theories.

6. Conclusion

Bowman’s observation of a negative relationship between the mean and variance of firm performance within industries was called paradoxical, and initiated a flurry of explanations for why such a relationship might occur. Bowman himself alluded to the importance of price setting efficiency, conjecturing that good managers are those who achieve higher return at lower risk through negotiations with external parties.

As this paper has demonstrated, Bowman’s intuition was valid. We demonstrated that price setting negotiations among buyers and sellers with relative judgment inequality, correlated expectations, and dispositions to invest more heavily upon discovery of greater perceived margins, can generate performance distributions of firms with moments that are related in ways reminiscent of empirical observations.
Table 2: Summary of key empirical observations, and predictions made by competing theories.

<table>
<thead>
<tr>
<th>Moment</th>
<th>Empirical Observation</th>
<th>Researcher</th>
<th>Prospect Theory</th>
<th>Behavioral Theory</th>
<th>Adaptive Risk Preferences</th>
<th>Cognitive Constraint Cue Learning*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>Entirely positive correlation between mean performance and variance of performance.</td>
<td>Conrad and Plotkin, 1968; Fisher and Hall, 1969; Hurdle, 1974; Amit and Levnat, 1988; Aaker and Jacobsen, 1987.</td>
<td>N/A</td>
<td>Deliberate choice by risk averse firms.</td>
<td>Expected value of variance is an increasing function of experienced performance (with few firms experiencing negative performance).</td>
<td>All firms within industry have better judgment ability than their typical trading partner.</td>
</tr>
<tr>
<td>1, 2</td>
<td>Entirely negative correlation between mean performance and variance of performance.</td>
<td>Bowman, 1980; Bowman, 1984; Singh, 1986; Bromiley, 1991; Fiegenbaum and Thomas, 1990; Collins and Ruefi, 1992.</td>
<td>N/A</td>
<td>Deliberate choice by risk seeking firms.</td>
<td>Expected value of variance is a decreasing function of experienced performance (with few firms experiencing positive performance).</td>
<td>All firms within industry have worse judgment ability than their typical trading partner.</td>
</tr>
<tr>
<td>1, 2</td>
<td>Both positive and negative correlation between mean performance and variance of performance.</td>
<td>Fiegenbaum and Thomas, 1988; Chang and Thomas, 1989; Fiegenbaum, 1990; Jegers, 1991; Sinha, 1994; Gooding, Goel, and Wiseman, 1996; Denrell, 2008; Chou, Chou, and Ko, 2009;</td>
<td>Positive correlation: Deliberate choice by risk averse individuals. Negative correlation: Deliberate choice by risk seeking individuals.</td>
<td>Positive correlation: Deliberate choice by risk averse firms. Negative correlation: Deliberate choice by risk seeking firms.</td>
<td>Positive correlation: Expected value of variance is an increasing function of experienced performance Negative correlation: Expected value of variance is a decreasing function of experienced performance</td>
<td>Some firms within industry are better and some firms are worse, than their typical trading partner in terms of judgment ability.</td>
</tr>
<tr>
<td>1, 2</td>
<td>Steeper slope of negative correlation compared with positive correlation.</td>
<td>Fiegenbaum and Thomas, 1988; Jegers, 1991; Sinha, 1994; Gooding, Goel, and Wiseman, 1996; Denrell, 2008; Chou, Chou, and Ko, 2009;</td>
<td>Loss aversion</td>
<td>N/A</td>
<td>N/A</td>
<td>Correlated expectations ‘pins down’ investment level of firms whose judgment ability matches the typical trading partner.</td>
</tr>
<tr>
<td>1, 2</td>
<td>Variable position of (first) turning point in correlation between mean performance and variance of performance.</td>
<td>Gooding, Goel, and Wiseman, 1996;</td>
<td>N/A</td>
<td>Aspiration levels are firms specific, and changing.</td>
<td>Changing mean of experienced performance (endogenous).</td>
<td>Judgment ability of firms within industry, relative their typical trading partner, determines position of turning point.</td>
</tr>
</tbody>
</table>

* Assuming high demand and supply elasticity, and correlated expectations, unless otherwise stated.
Table 2 (continued): Summary of key empirical observations, and predictions made by competing theories.

<table>
<thead>
<tr>
<th>Moment</th>
<th>Empirical Observation</th>
<th>Researcher</th>
<th>Prospect Theory</th>
<th>Behavioral Theory</th>
<th>Adaptive Risk Preferences</th>
<th>Cognitive Constraint Cue Learning*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>Quadratic relationship between mean performance and variance of performance.</td>
<td>Chang and Thomas, 1989; Gooding, Goel, and Wiseman, 1996;</td>
<td>Loss aversion</td>
<td>N/A</td>
<td>N/A</td>
<td>High elasticity of demand and supply (cubic model still has greater significance)</td>
</tr>
<tr>
<td>1, 2</td>
<td>Cubic relationship between mean performance and variance of performance, with second turning point positioned at very high performance.</td>
<td>Gooding, Goel, and Wiseman, 1996;</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Medium elasticity of demand and supply, this being sufficient to create first turning point, but insufficient to completely counter the underlying negative correlation, which is most pronounced at high levels of mean performance.</td>
</tr>
<tr>
<td>1, 2, 3</td>
<td>Firms below median performance tend to have negatively skewed performance distributions.</td>
<td>Henkel, 2009; Marinelli, 2011;</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Prices negotiated upon poor judgments deviate more from true value than prices negotiated upon good judgments. When combined with increasing demand and supply elasticity, asymmetry intensifies.</td>
</tr>
<tr>
<td>1, 2, 3</td>
<td>Firms above median performance tend to have positively skewed performance distributions.</td>
<td>Marinelli, 2011;</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Prices negotiated upon good judgments deviate more from true value than prices negotiated upon bad judgments. When combined with increasing demand and supply elasticity, asymmetry intensifies.</td>
</tr>
<tr>
<td>4</td>
<td>Performance distributions tend to have high kurtosis.</td>
<td>Marinelli, 2011;</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Higher levels of demand and supply elasticity create greater kurtosis.</td>
</tr>
</tbody>
</table>

* Assuming high demand and supply elasticity, and correlated expectations, unless otherwise stated.
7. References


Bromiley, P. (1991b), ‘Paradox or at least variance found: a comment on mean-variance approaches to risk-return relationships in strategy,’ Management Science, 37, 1206–1215.


