From Behavioural to Emotional Corporate Finance: A New Research Direction.

Author: Richard Fairchild, School of Management, University of Bath, UK.

September 15th 2009

Word Count: 7774

Abstract

Behavioural finance and behavioural corporate finance analyses the effects of psychological biases, heuristics, and emotions on investors’ and managers’ decision-making and performance. Taffler and Tuckett (2005) have introduced a major paradigm shift by introducing a new field of research, namely Emotional Finance. This ground-breaking approach employs Freud’s theory of phantastic objects to analyse the effect of unconscious, infantile, emotions on investors’ decisions. In this paper, we extend their work by proposing a new development, namely, emotional corporate finance. We argue that, just as investors may view investments as phantastic objects, managers may view their projects similarly. We develop a formal approach that considers the effects of managerial phantasy on the investment appraisal decision, project performance, and managerial entrapment in a losing project.

Our main results are as follows: a) Managerial project-phantasy may induce a manager to mistakenly invest in value-reducing projects. b) Phantasy may lead to volatility of managerial emotions, and hence volatility of project performance. c) Phantasy may lead to project entrapment, but may result in project abandonment if the manager’s project-phantasy turns to project hatred. We conclude by considering whether managerial phantasy could explain management’s entrapment in the Concorde project.

1. Introduction.

Traditionally, financial economists have based their work on the standard assumption that agents are fully rational, self-interested, maximisers of expected utility (the homo economicus view). However, researchers are increasingly recognising that human actors are imperfect, and that our actions and decisions are subject to errors and psychological biases. As a result, a new body of research, behavioural finance (BF), and behavioural corporate finance (BCF), has emerged as a challenge to the traditional paradigm. BF examines how the psychological biases and emotions of investors may affect decision-making and outcomes in financial markets. BCF extends the analysis to consider the effect of managerial biases and emotions on corporations’ financial decisions.

Behavioural finance and behavioural corporate finance focus on the effects of cognitive biases, heuristics, and conscious emotions. In their seminal and ground-
breaking work, Taffler and Tuckett (TT 2005) introduce a major paradigm shift by introducing a new field of research, namely *Emotional Finance*. This develops the research in behavioural finance by analyzing the effect of *unconscious*, infantile, emotions on investors’ decisions. Particularly, TT employ Freud’s theory of phantastic objects to explain investor behaviour around stock market bubbles and crashes.

Our understanding of the effects of psychological biases on financial decision-making has been enhanced by the extension of behavioural finance to behavioural corporate finance. In a similar way, we argue that the next stage of development is to extend TT’s emotional finance to Emotional Corporate Finance. In this paper, we take the first small step to embarking on this research agenda by formalising TT’s conceptual framework, and applying it to one corporate finance decision: namely, managerial investment appraisal. We consider two models. Firstly, we consider the effect of managerial phantasy on the decision to invest in a new project, and the subsequent efforts that management exerts in running the project. Secondly, we consider the effect of phantasy on management’s decision to abandon a poorly performing project (that is, we consider phantasy and project-entrapment).

Before presenting our models, we briefly review the literature on behavioural finance and behavioural corporate finance before turning to the literature on emotional finance.

1.1 Behavioural Finance/Corporate Finance

The initial work in behavioural finance arose as a reaction to empirically observed financial market anomalies that were inconsistent with the traditional view. Ricciardi and Simon (2000) note that behavioural finance is an integrated approach that combines traditional finance, psychology and sociology in an attempt to explain these anomalies.

Much of the analysis in behavioural finance focused on the effect of investor biases on the behaviour of financial markets, taking managerial rationality as given. A relatively new approach considers behavioural corporate finance, which analyses the effects of psychological biases on corporate finance decisions (such as investment appraisal, capital structure, and dividend policy).

Shefrin (2007) identifies 3 categories of psychological phenomenon; biases, heuristics and framing effects. According to Shefrin (2007), a bias is a predisposition towards an error. A heuristic is a mental shortcut or rule of thumb which facilitates decision-making. Framing refers to the way in which “a person’s decisions are influenced by the manner in which the setting for the decision is described.”

Shefrin places some psychological phenomena into these 3 categories as follows. In the category of biases, he includes overconfidence and excessive optimism.

---

1 In this paper, we merely present an outline of the rapidly-growing literature in BF and BCF. For excellent in-depth reviews of BF, see Barberis and Thaler (2002). For reviews of BCF, see Baker et al (2004), Shefrin (1999), Shefrin (2007), and Fairchild (2007).
confirmation bias, and illusion of control. In the ‘heuristics’ category, he includes representativeness, availability, anchoring, and affect (or, interestingly for our analysis, emotion). In the ‘framing effects’ category, he includes loss aversion and prospect theory.

Behavioural finance and behavioural corporate finance has overwhelmingly focused on the effects of investor and managerial overconfidence on financial decision-making. In the field of behavioural finance, researchers have suggested that investor overconfidence may lead to over-trading of shares, with resulting excessive losses (Barber and Odean 2001). Furthermore, investor overconfidence has been used to explain over- and under-reaction to good or bad financial news (eg Barberis et al 1998: Daniel et al 1998), which then provides a possible explanation for stock market bubbles and crashes.

Scholars of behavioural corporate finance have extended the work in BF by suggesting that the same biases that affect investor and financial markets may also affect corporate managers’ financial decisions, such as investment appraisal, capital structure, and dividends. Psychological research (eg; Weinstein 1980, March and Shapira 1987) supports the view that people are over-optimistic or overconfident. Psychologists have demonstrated that agents tend to be more optimistic about outcomes a) that they believe that they can control and b) to which they are highly committed. Financial economists suggest that corporate managers exhibit both of these characteristics, and hence may be particularly susceptible to overconfidence.

There is increasing theoretical and empirical evidence that overconfidence affects investment appraisal decisions. For example, Malmendier and Tate (2002) argue that overconfident managers overestimate the quality of their projects, and hence over-invest. Gervais et al (GHO 2003) employ a real-options framework to consider the combined effects of managerial risk-aversion and overconfidence on the decision to invest immediately in a project or delay investment. Risk-aversion may induce a manager to delay investment sub-optimally, reducing shareholder value. In GHO’s analysis, managerial overconfidence may offset risk aversion, since overconfident managers may hesitate less before making investment decisions.

Kahnemann and Lovallo (1993) argue that managerial optimism may lead to managers making “bold forecasts” regarding prospective projects, while at times making timid choices due to risk aversion. Heaton (2002) argues that overconfidence leads to managers overestimating the net present value of new investment projects. Therefore, they will mistakenly invest in negative NPV projects that they believe to be positive NPV, hence reducing shareholder value.

In summary, there is much evidence that managerial overconfidence affects the investment appraisal decision regarding new project investment. In our subsequent

---

2 In this paper, our focus is on developing an emotional corporate finance approach to the investment appraisal decision, and hence we restrict our literature review of BCF to that decision. Here we do not review the BCF research into capital structure decisions (for a comprehensive review of BCF as applied to investment appraisal and capital structure, please see Shefrin 1999, Baker et al 2004, and Fairchild 2007).
analysis of *emotional* corporate finance, we argue that there are parallels between managerial overconfidence and ‘phantasy’.

### 1.2 The effect of emotions in economics and finance.

Hermalin and Isen (1999) note that, although psychologists have been analysing the relationship between affect (mood, emotions or feelings) and decision-making for some time, “economic modelling of decision-making and game-playing has, however, essentially ignored the role of affect.” According to Hermalin and Isen (1999), some researchers analyse the irrationality of emotions (for example, Lewin 1996; Rabin 1998; Elster, 1998). In contrast, Hermalin and Isen (1999) present a model of positive emotions with the following ingredients; a) agents are completely rational, b) an agent’s utility consists of a payoff resulting from his action (such as an effort level) plus utility from his emotional state, c) the current emotional state plus the player’s current action affects his future emotional state deterministically, and d) the rational agent chooses his action (and hence the time-path of emotions) to maximise the sum of his future discounted payoffs.

In terms of finance, Dowling and Lucey (2005) consider the effects of investor mood on stock market behaviour and valuation. Ackert and Church (2006) analyse the effect of firm image on investors’ affective reactions and investment behaviour. Kida et al (2001), and Moreno et al (2002), examine the affect of managerial emotions in a firm’s capital budgeting (investment appraisal) process. They demonstrate that managers are more likely to reject investments that give rise to negative affective reactions, even if they were value-creating. Interestingly, in contrast, our emotional corporate finance framework demonstrates that managerial phantasy may lead to managers accepting projects that are value-destroying.

### 1.3 Emotional Finance

In their seminal and ground-breaking work, Taffler and Tuckett (TT 2005), and Eshraghi and Taffler (2009), introduce a major paradigm shift by introducing a new field of research, namely *Emotional Finance*. This develops the research in behavioural finance by analysing the effect of unconscious, infantile, emotions on investors’ decisions. Particularly, TT base their analysis on Freud’s theory of the phantastic object (1911, 1916), which is developed further by Klein (1975).

According to Taffler and Tuckett (2005), psychoanalytical theory defines a phantastic object as “a mental representation of something (or someone) which in an imagined scene fulfils the protagonist’s deepest desires to have exactly what she wants, when she wants it.” Furthermore, TT argue that “individuals are more susceptible to the phantastic object when a particular sense of reality blocks their thinking… People make decisions in one of two basic oscillating states of mind, namely the depressive

---

3 Although Hermalin and Isen (1999) focus on a deterministic time-path of emotions, a section of their paper examines stochastic emotions, subject to shocks. In the final “future research” section of our paper, we discuss the possible application of this analysis to our model.
(D) state and the paranoid-schizoid (PS) state.” Basically, in the D state, we see things as they really are, both good and bad. In the PS state of mind, we deal with psychic pain by mentally splitting the good from the bad.

Furthermore, according to the theory of the phantastic object, individuals transform an object into a phantasy; that is, they subconsciously assign a magical, exceptionally exciting, and highly desirable image to an object. Later, when reality sets in (the D state), conscious emotions of anger and blame dominate, combined with a hatred of reality.

In emotional finance theory, TT argue that financial market phenomena such as stock market bubbles and crashes may be analysed in terms of the subconscious emotions associated with phantastic objects. In section 1.2, we noted that scholars have been analyzing the effect of emotions on financial decision-making for some time. However, in emotional finance theory, TT argue that financial market phenomena such as stock market bubbles and crashes may be analysed in terms of the subconscious emotions and desires associated with phantastic objects. Taffler and Tuckett (2005) apply this theory to the internet bubble of the late 1990’s. Eshraghi and Taffler (2009) analyse the rapid growth, and equally rapid decline, of the hedge fund industry in terms of emotional finance.

Eshraghi and Taffler argue that investors may have viewed hedge funds as phantastic objects. They state, “Once hedge funds turn into phantastic objects in the minds of investors, they and their managers are suddenly deemed infallible and hence, immensely valuable….. When reality finally intrudes, investors fell cheated and the once dominant feeling of desire for the phantastic object changes to anger and blame.”

1.4: The next step: Emotional Corporate Finance

In this paper, we develop the paradigm by considering emotional corporate finance. In doing so, we draw parallels with the development of behavioural corporate finance. As previously noted, scholars of BCF built on behavioural finance by recognising that the psychological biases that beset investors (affecting the behaviour of financial markets) may also affect managerial financial decision-making (and hence corporate performance). These researchers focused on one particular bias; investor and managerial overconfidence.

Similarly, we believe that emotional finance (Taffler and Tuckett 2005) provides a conceptual framework that should be formalised and extended to consideration of managerial behaviour (which we term ‘emotional corporate finance’). Furthermore, there are parallels between investor/managerial overconfidence, as analysed in BF/BCF, and investor/managerial phantasy, as analysed in emotional finance and emotional corporate finance. In the appendix, we present a schematic that demonstrates how our analysis develops the existing research.
Hence, in this paper, we make two major contributions. First, we introduce emotional corporate finance, as a development of emotional finance. Second, we develop a formal model to assist our understanding of the issues involved.

The rest of this paper is organised as follows. In section 2, we present our first model, examining the effects of managerial phantasy surrounding a new project on the investment appraisal decision and project performance. In section 3, we present a numerical example. In section 4, we consider our second model, which examines the effect of project phantasy on project-entrapment in a failing project. Section 5 concludes.

2. Model 1: Phantasy, investment appraisal, and project performance

We analyse a self-interested corporate manager who is considering a new investment opportunity, requiring initial investment \( I > 0 \). The manager first decides whether to take the project (the investment appraisal decision), and, if the project is taken, the manager then exerts effort in developing the project towards a successful outcome (hence, moral hazard exists in the form of potential effort-shirking). All market-participants (including the manager) are risk-neutral, and the risk-free rate (discount rate) is zero.

We develop TT’s emotional finance theory as follows. The manager initially (subconsciously) views the project as a ‘phantastic’ object, with characteristics over-and-above its financial performance (such as excitement and euphoria). He continues to do so unless the project has a failure at some point in its life, in which case the manager’s euphoria is destroyed, and he switches to hatred of the project.

Our work has parallels with TT’s emotional finance theory. First, the project is similar to a financial investment for investors. The manager’s initial euphoria affects his investment appraisal decision (similarly, in TT’s conceptual analysis, it affects the investor’s decision to invest in internet stocks or hedge funds). However, by considering emotional corporate finance, we extend TT’s work by demonstrating that the manager’s euphoria can affect the performance of the project, since it affects the manager’s effort level (in TT’s analysis, investors’ euphoria affects their investment decision, but, by way of contrast to our analysis of managerial phantasy, investors cannot affect the performance of their investments). A second development is that we present a formal model of ECF.

The detailed timeline is as follows.

At date 0, the firm is owned by the manager. An investment opportunity (a project) arises, requiring initial investment funds \( I > 0 \). The manager decides whether to invest in the project (the investment appraisal decision). If he decides to make the

---

4 Indeed, Dow (2008) argues that, currently, emotional finance lacks a formal, deterministic model that could help to explain the nature and timing of events that cause the switch between euphoric phantasy and the onset of panic. Although our current model does not do this, we believe that it provides a basis for development in this direction.
investment, then we assume that (for simplicity of analysis) the manager raises the required investment funds by issuing a proportion $1 - \alpha \in (0,1)$ of the firm’s equity to outsiders. Therefore, the manager retains an equity stake $\alpha \in (0,1)$ in the business. The amount of funds raised, minus the required investment is the ‘excess transfer’ which goes directly to the manager.

We model the effects of phantasy as follows. The manager (subconsciously) views the project as a “phantastic” object, with phantasy parameter $\theta \geq 0$. Furthermore, at date 0, the manager views the project as ‘infallible’. That is she believes that it succeeds for certain in both periods. The manager continues in his phantasy as long as the project continues to succeed (we discuss this further below). In order to simplify the analysis, we assume that, at this stage, the outside investors share the manager’s phantasy. Therefore, date 0 market value exceeds fundamental value.

If the manager accepts, and invests in, the project, then, at date 0.25, the market becomes rational, and understands the manager’s motivations. Furthermore, at this stage, investors switch from ‘phantasy’ to hatred, with a hatred parameter $-\Delta$. At date 0.5, the market’s hatred ‘disappears’. Hence, at date 0.5, the firm is accurately valued at the expected fundamental value. The manager ignores the market, and continues in his project-phantasy.

At date 1, the manager exerts an effort level $e_1$ for stage 1 of the project. The manager’s effort level affects the outcome of the project as follows. The project succeeds or fails with equal probability. In the case of success, the project achieves an income $R(1 + \gamma e_1)$. In the case of failure, the project achieves zero income. The manager faces a cost-of-effort $\beta e_1^2$. Note that the success or failure of the project is affected by luck (equal probabilities), while the manager’s skill and effort affects the outcome in the case of success. When considering his expected payoff, the manager inflates the success income by the phantasy parameter; that is, he considers the success outcome to be $(1 + \theta)[R(1 + \gamma e_1)]$.

At date 2, the project achieves its first stage outcome (success or failure). If it succeeds, the phantasy parameter $\theta$ carries over to the second stage of the project. If the project fails at the first stage, the parameter ‘switches’ to $\phi \leq 0$ (that is, the project becomes an object of hatred). The manager exerts a second-stage effort level $e_2$. Again, the project succeeds (achieving income $R(1 + \gamma e_2)$) or fails (achieving zero income) with equal probability.

At date 3, the project ends with payoffs to the manager and the investors (in order to make valuations sensible and comparative throughout the timeline of the model, we assume that the manager and the investors do not receive date 1 and date 2 payoffs until date 3).

We now proceed to solve the game by backward induction.
2.1 Second Period Optimisation.

First, take as given that the project has succeeded at date 1. The manager continues to assign the phantasy parameter $\theta \geq 0$ to the project. Furthermore, the manager continues to believe that the project will succeed for sure in the second period. Hence, the manager chooses his second period effort level to maximise his second-period payoff:

$$\Pi_2 = \alpha(1 + \theta)(R + \gamma e_2 R) - \beta e_2^2. \quad (1)$$

Solving $\frac{\partial \Pi_2}{\partial e} = 0$, we obtain the manager’s optimal date 2 effort level in the case of period 1 success:

$$e_2^* = \frac{(1 + \theta)\gamma R}{4\beta} \quad (2)$$

Substituting (2) into (1), the manager’s second-period expected payoff (following date 1 success) becomes

$$\Pi_2^S = \alpha(1 + \theta)R + \frac{\alpha^2(1 + \theta)^2 \gamma^2 R^2}{4\beta}. \quad (3)$$

Next, consider the case where the project has failed at date 1. Now, the manager faces reality. His phantasy parameter switches from the positive $\theta$ to the negative ‘project-hatred’ parameter, $-\phi$. Furthermore, he now understands that the project may succeed or fail with equal probability. Therefore, the manager chooses his second period effort level to maximise his second-period payoff:

$$\Pi_2 = \frac{1}{2} \alpha(1 - \phi)(R + \gamma e_2 R) - \beta e_2^2. \quad (4)$$

Solving $\frac{\partial \Pi_2}{\partial e} = 0$, we obtain the manager’s optimal date 2 effort level in the case of period 1 failure:

$$e_2^F = \frac{(1 - \phi)\gamma R}{4\beta} \quad (5)$$

Comparing (2) and (5), we note that $e_2^* > e_2^F$; that is, the manager exerts higher date 2 effort following date 1 success than following date 1 failure. Therefore, there is a ‘volatility’ of managerial effort due to volatility (or fragility) of his emotions.
Substituting (5) into (4), the manager’s second-period expected payoff (following date 1 failure) becomes

$$\Pi_2^F = \frac{1}{2} \alpha (1 - \phi) R + \frac{\alpha^2 (1 - \phi)^2 \gamma^2 R^2}{8 \beta}.$$  \hspace{1cm} (6)

2.2 First-period optimisation

We incorporate bounded rationality as follows. When deciding on his first-period effort level, the manager does not anticipate the destruction of ‘phantasy’ if the project fails. Furthermore, he does not anticipate failure. He believes the project achieves success in both periods for certain\(^5\) (and the investors share this bounded rationality).

Therefore, the manager chooses his effort level to maximise his first-period payoff:

$$\Pi_1 = \alpha (1 + \theta)(R + \gamma e_1 R) - \beta e_1^2.$$ \hspace{1cm} (7)

Therefore, his optimal first-period effort level is

$$e_1^* = \frac{\alpha (1 + \theta) \gamma R}{2 \beta}.$$ \hspace{1cm} (8)

Note that (2) = (8) while (8) > (5); that is, \(e_1^* = e_2^F^*\) and \(e_1^* > e_2^F^*\). If the project succeeds at date 1, the manager continues in his phantasy, and exerts the same effort in date 2. If the project fails in date 1, the manager switches from phantasy to hatred, and his effort level declines in date 2.

We summarise these results as follows:

**Proposition 1:** If the project succeeds at the end of date 1, the manager’s project phantasy is maintained throughout. Therefore, he exerts the same effort in date 1 and date 2. If the project fails at the end of date 1, the manager switches from project-phantasy to project-hatred, and his effort level declines from date 1 to date 2.

2.3 Date 0 Investment Decision

The manager invests in the project if his date 0 expected two-period payoff exceeds initial investment. That is, he invests iff

$$\Pi_1 + \Pi_2 = 2 \alpha (1 + \theta) R + \frac{\alpha^2 (1 + \theta)^2 \gamma^2 R^2}{2 \beta} + \Pi_I - I \geq 0$$ \hspace{1cm} (9)

\(^5\) Indeed, Taffler and Tuckett (2005) state that phantasy leads to actors eliminating consideration of risk and uncertainty.
where
\[ \Pi_j = (1 - \alpha)(1 + \theta)(V_1 + V_2). \tag{10} \]

The last two terms of (9) \( (\Pi_j - I) \) reflect the investors’ excess transfer to the manager.

Since \( V_1 + V_2 = 2(R + \frac{\alpha(1 + \theta)\gamma^2 R^2}{2\beta}) \), then the E invests in the project iff
\[ \Pi_1 + \Pi_2 = 2(1 + \theta)R + (2\alpha - \alpha^2) \frac{(1 + \theta)^2 \gamma^2 R^2}{2\beta} - I \geq 0 \tag{11} \]

2.4: Time-series of firm values

At date 0, the stock market shares the manager’s phantasy (that is, like the manager, investors assign the phantasy parameter \( \theta \) to the project, and believe that the project will succeed in both periods for sure). Therefore, the date 0 firm value is
\[ V_0 = 2(R + \frac{\alpha(1 + \theta)\gamma^2 R^2}{2\beta}) \tag{12} \]

Due to phantasy, we demonstrate below that the firm is overvalued (market value exceeds the true fundamental value at date 0).

At date 0.25, investors face reality, including the hatred parameter \(-\Delta\). At date 0.5, investors are fully rational. They no longer attach the phantasy parameter to the project, and they now understand that the project may succeed or fail with equal probability in each period (note the manager continues the project-phantasy).

Therefore, the date 0.25 firm value is
\[ V_{0.25} = R + \left[ \frac{3\alpha(1 + \theta)}{8\beta} + \frac{\alpha(1 - \phi)}{16\beta} \right] \gamma^2 R^2 - \Delta < V_0, \tag{13} \]

And the date 0.5 firm value is
\[ V_{0.5} = R + \left[ \frac{3\alpha(1 + \theta)}{8\beta} + \frac{\alpha(1 - \phi)}{16\beta} \right] \gamma^2 R^2 < V_0. \tag{14} \]

\( V_{0.5} \) is the fundamental value of the firm at date 0.5, and is less than the date 0 value, as reality ‘kicks in’.

Now, we may state the second key result of our analysis.
Proposition 2:

If $V_{0.5} < 1$, but equation (11) holds, the manager makes the value-reducing decision to invest in the project.

Following date 1 success, date 1 firm value is

$$V_1(S) = \frac{3}{2}(R + \frac{\alpha(1+\theta)}{2\beta} \gamma^2 R^2).$$

Following date 1 failure, date 1 firm value is

$$V_1(F) = \frac{1}{2}(R + \frac{\alpha(1-\phi)}{4\beta} \gamma^2 R^2).$$

Finally, we consider project values at the end of the life of the project. There are 4 such values, depending on the patterns of success and failure in each of the two periods. The values are as follows;

$$V_2(S, S) = 2(R + \frac{\alpha(1+\theta)}{2\beta} \gamma^2 R^2).$$

$$V_2(S, F) = R + \frac{\alpha(1+\theta)}{2\beta} \gamma^2 R^2.$$

$$V_2(F, S) = R + \frac{\alpha(1-\phi)}{4\beta} \gamma^2 R^2.$$

$$V_2(F, F) = 0.$$

With the exception of the project’s date 0 market value (which is overvalued due to phantasy), and date 0.25 market value (which is undervalued due to investors over-reacting with hatred), the time-series of firm values are internally consistent. That is, the date 0.5 fundamental value equals the expectation of the date 1 values following date 1 success or failure,$V_{0.5} = 0.5[V_1(S) + V_1(F)].$

Similarly, the date 1 value following date 1 success equals the expectation of the date 2 values; $V_1(S) = 0.5[V_2(S, S) + V_2(S, F)]$, while the date 1 value following date 1 failure equals the expectation of the date 2 values; $V_1(F) = 0.5[V_2(F, S) + V_2(F, F)]$.

In section 4, we present a numerical analysis of these results in order to demonstrate the effect of phantasy on the time series of firm values. Before we do so, we consider
the emotionless fully rational case, in order to provide a comparison with our phantasy case.

2.5 The emotionless, fully rational case.

We now compare the previous analysis with the case where investors and managers are fully rational and emotionless (the homo economicus case). In particular, the phantasy and hatred parameters are all equal to zero ($\theta = \phi = \Delta = 0$), and the manager and the investors understand that success or failure can occur with equal probability in each period (recall that, in the previous analysis, the manager initially believed that the project would succeed for certain).

In this case, in both periods the manager chooses his optimal effort level to maximise his per-period payoff

$$\Pi = \frac{1}{2}\alpha (R + \gamma eR) - \beta e^2.$$  

Therefore, each period, his optimal effort level is

$$e^* = \frac{\alpha \gamma R}{4\beta}.$$  \hspace{2cm} (21)

Comparing (21) with (2), (5) and (8), we state the following results:

**Proposition 3:**

a) In the emotionless, fully rational case, the manager exerts identical effort levels in date 1 and date 2.

b) The manager exerts higher date 1 effort level in the phantasy case than in the emotionless, fully-rational case.

c) If the project succeeds at the end of date 1, the manager’s phantasy is maintained, and he exerts the same effort level in date 2 (see proposition 1). Therefore, this date 2 effort level is higher than in the fully rational, emotionless case.

d) If the project fails at the end of date 1, the manager’s phantasy switches to project-hatred, and he exerts lower effort in date 2 (see proposition 1). Furthermore, the date 2 effort level under phantasy/hatred is lower than in the fully rational, emotionless case.

Proposition 3 demonstrates that managerial effort is more ‘volatile’ in the phantasy case than in the fully rational, emotionless case, due to the volatility of the manager’s emotions. We proceed to demonstrate how this leads to higher volatility of project values in the phantasy case, compared to the emotionless, fully-rational case.

The value of the firm at date 0 is
\[ V_0 = R + \gamma eR = R + \frac{\alpha \gamma^2 R^2}{4\beta} = V_{0.25} = V_{0.5}. \tag{22} \]

Note that, in contrast to the emotional case, the value of the firm at date 0 equals that at date 0.25 and date 0.5. This is because in this case, the firm is accurately valued (that is, market value equals fundamental value) from date 0, due to the lack of phantasy. Furthermore, consider lack of emotion in the previous case \((\theta = \phi = \Delta = 0)\). In this case, (12), (13), and (14) all exceed (22). That is, even when the investors fully understand the structure of the game, they value the firm higher than in the fully rational case, because they understand that the boundedly rational manager overestimates the probability of success, and works harder than the fully rational manager.

The value of the firm at date 1 and 2 is as follows:

\[ V_1(S) = \frac{3}{2}(R + \frac{\alpha \gamma^2 R^2}{4\beta}). \tag{23} \]

\[ V_1(F) = \frac{1}{2}(R + \frac{\alpha \gamma^2 R^2}{4\beta}). \tag{24} \]

\[ V_2(S,S) = 2(R + \frac{\alpha \gamma^2 R^2}{4\beta}). \tag{25} \]

\[ V_2(S,F) = V_2(F,S) = (R + \frac{\alpha \gamma^2 R^2}{4\beta}). \tag{26} \]

\[ V_2(F,F) = 0. \tag{27} \]

We note that (15) > (23): that is, following date 1 success, the value of the firm in the phantasy case is higher than in the current, fully-rational case, for two reasons: the manager continues to enjoy project-phantasy, and continues to believe that the project will succeed for certain. Therefore, as noted in proposition 3, following date 1 success, the manager works harder in the phantasy case than in the fully rational, emotionless case. Thus, in the case where the project succeeds at date 1, firm value is actually enhanced by managerial phantasy and emotions. Effectually, project-phantasy is desirable while the project is still ‘winning’.

In contrast, (24) > (16). In the case that the project fails at date 1, firm value is lower in the emotional case, due to the manager switching from phantasy to hatred, and reducing his effort level.

Next, note that (17) > (25). In the case where the project succeeds in both periods, firm value is higher under project phantasy than in the emotionless case.

Furthermore, (18) > (26) > (19). If the project succeeds in the first period and fails in the second period, then firm value is higher under phantasy If the project fails in the
first and second periods, firm value is lower under phantasy. Further note that, in the fully rational case, firm value is identical, whether the project succeeds then fails, or fails then succeeds. This is not true in the phantasy case; the order of success and failure affects firm value.

Drawing this discussion together, we provide our main result.

**Proposition 4:**

Firm value is more volatile in the phantasy case, compared to the fully rational, emotionless case, due to the volatility of managerial emotions. Following date 1 project success, firm value is higher in the phantasy case than in the rational case, due to managerial ‘euphoria’. Following date 1 project failure, firm value is lower in the phantasy case than in the rational case, due to managerial ‘hatred’ of the project.

For clarity, we demonstrate these results numerically and graphically in the next section.

3. **Numerical example/graph**

We consider a numerical example with the following parameter values:

\[ R = 100, \quad \beta = 50, \quad \alpha = 1/2, \quad \gamma = 1, \quad \text{and initial investment is } I = 180. \]

Furthermore, the phantasy parameters are \( \theta = 1/2, \quad \phi = 3/4, \quad \Delta = 100. \) In the fully rational, emotionless case, \( \theta = \phi = \Delta = 0. \)

First, consider the phantasy case. Substituting the parameter values into equations (12) – (19), we obtain the following project values over time:

\[ V_0 = 350, \quad V_{0.25} = 57.8, \quad V_{0.5} = 157.8 < V_0, \quad V_1(S) = 262.5, \quad V_1(F) = 53.12. \]
\[ V_2(S, S) = 350. \quad V_2(S, F) = 175. \quad V_2(F, S) = 106.25. \quad V_2(F, F) = 0. \]

We may confirm that \( V_{0.5} = 0.5[V_1(S) + V_1(F)]. \quad V_1(S) = 0.5[V_2(S, S) + V_2(S, F)], \) and \( V_1(F) = 0.5[V_2(F, S) + V_2(F, F)]. \)

We present these results graphically, as follows:
Note that the solid line represents a deterministic time path for the project value, while the dashed lines represent a stochastic path, with each branch occurring with equal probability.

This diagram demonstrates the following. Initially (at date 0), the project is overvalued (350), both due to the manager’s and the investors’ project phantasy. Since this value exceeds the required initial investment, the manager believes that the project has positive NPV (is value-adding), and therefore invests in the project. At date 0.25, the market faces reality, and the market switches from phantasy to project-hatred. Therefore the market over-reacts with its downward re-valuation of the project. At date 0.5, the market now values the project accurately, such that the value rises to equal fundamental value. At this stage, the manager still has project phantasy, and this is incorporated in the date 0.5 fundamental value. Therefore, the project actually has a negative NPV. Therefore, based on date 0.5 valuation, the manager should not have taken the project.

At date 1, the firm value either rises to 262.5, in which case the manager retains his project-phantasy, or falls to 53.12, in which case the manager switches to project hatred. Finally at date 2, the project enjoys its second period of success or failure.

Next, consider the fully rational case, with parameter values as before, except $\theta = \phi = \Delta = 0$.

Substituting these parameter values into (22) to (27), we obtain the following:

$$V_0 = V_{0.25} = V_{0.5} = 125.$$  

$$V_1(S) = 187.5. \quad V_1(F) = 62.5. \quad V_2(S, S) = 250. \quad V_2(S, F) = V_2(F, S) = 125. \quad V_2(F, F) = 0.$$
We may confirm that \( V_{0.5} = 0.5[V_1(S) + V_1(F)] \), \( V_1(S) = 0.5[V_2(S, S) + V_2(S, F)] \), and \( V_1(F) = 0.5[V_2(F, S) + V_2(F, F)] \).

We superimpose these values onto the diagram for the previous, phantasy, case, as follows:

![Graph showing project value and initial investment over time]

Note that the light lines represent the fully rational, emotionless, case. As discussed previously, we observe that a) initial (date 0) firm value is lower in the rational case than the phantasy case, b) date 0.25 firm value is higher in the rational case than the phantasy case, as the emotional investors over-react with hatred, c) date 0.5 firm value is higher again in the emotional case, as emotional investors hatred is eliminated, and the firm value bounces back up. d) From date 0.5 to date 2, managerial project-phantasy is value-enhancing while the project is succeeding, e) but managerial phantasy is value-reducing when the project starts failing.

Finally, we observe (taking d and e together) that managerial phantasy results in greater volatility of firm value compared to the rational, emotionless, case, since firm values are higher under success in the phantasy case than in the rational case, and lower under failure in the phantasy case than in than the rational case.

In summary, the model, and the numerical example, demonstrates the following. Initially, a project may be overvalued, due to manager’s and investors’ phantasy. When reality ‘kicks in’, the market may over-react negatively, due to investors’ switching from phantasy to hatred. Later on, as the hatred works its way out of the system, the project value may bounce back up to fundamental value.

This fundamental value may incorporate manager’s phantasy, which encourages him to work hard, creating value. This is the case while the project is succeeding.
However, when the project begins to fail, the manager may ‘turn against’ the project, switching from phantasy to hatred, thereby reducing his effort level.

Hence, phantasy can have negative consequences, in that it inflates project values, and may cause the manager to invest in ultimately value-reducing projects. However, phantasy has an upside, in that it increases managerial commitment and effort in a project. While the project is performing well, phantasy may actually enhance value. However, when the project’s fortunes take a down-turn, the switch from phantasy to hatred may be very damaging to project value.

As noted in the introduction to this paper, behavioural finance arose as a reaction to observed financial market anomalies, such as excessive volatility. BF has attempted to explain this anomaly by appealing to psychological biases, such as investor overconfidence. Our contribution is to show, in an emotional corporate finance framework, that excessive volatility may also be caused by volatility of managerial emotions (project-phantasy switching to project-hatred), affecting volatility of company performance.

4. Model 2: Phantasy, real option to abandon, and project entrapment.

The previous model examined the effects of managerial and investor phantasy on the initial stages of a project (the investment appraisal decision, followed by project performance). In this section, we consider the effects of phantasy on the decision to abandon a badly-performing project.

The real options approach recognises that firms are not always committed to a project once they have invested in it, but have the option to abandon it if it is performing badly. Specifically, managers should periodically re-appraise the project, and, if the present value of future cashflows is less than the abandonment value, it should be abandoned.

However, Statman and Caldwell (SC 1987) have noted that a common behavioural problem is that of project entrapment, where a manager continues to invest into a project that should be abandoned. SC explain this phenomenon in terms of prospect theory, loss aversion, framing and regret aversion. Furthermore, they argue that project entrapment is more severe when the manager making the abandonment decision was involved in the initial investment appraisal decision.

In this paper, we combine insights from behavioural corporate finance and our new paradigm of emotional corporate finance to provide a richer analysis of project entrapment. The idea that we consider is the following. The behavioural factor of regret may be reinforced by project phantasy to induce the manager to refuse to abandon the project. However, in a project down-turn, regret aversion and project hatred may work in opposite directions, with the former inducing project entrapment, and the latter inducing project abandonment. The manager’s decision to abandon the project may then depend on which factor (phantasy/hatred or regret aversion) dominates.
We analyse this formally as follows. Consider a two-period project. At date 0, the firm begins to work on the project. At date 1, the firm receives good or bad news about the project’s prospects. At this stage, the manager decides whether to allow the project to continue, or to liquidate it at liquidation value $L > 0$. If he liquidates the project, he faces a behavioural regret cost: $r$.

If the manager allows the project to continue, then, following date 1 good news, it generates an income of $R_H$ or $R_M < R_H$ with equal probability. If the project is allowed to continue following date 1 bad news, it generates a date 2 income of $R_M$ or $R_L < R_M$ with equal probability (where subscripts $H, M, L$ refer to high income, medium income and low income respectively).

We assume the following:

\[
\frac{R_H + R_M}{2} > L > \frac{R_M + R_L}{2}. \tag{A.1}
\]

According to assumption A.1, the efficient decision is to continue the project following good news, and abandon the project following bad news.

However, the manager also takes his phantasy parameter and regret into account when making his decision. We assume that the manager acts to maximise total firm value. In order to analyse the manager’s decision, we assume the following:

\[
(1 + \theta)\frac{R_H + R_M}{2} > (1 + \theta)\frac{R_M + R_L}{2} > L - r > (1 - \phi)\frac{R_M + R_L}{2}. \tag{A.2}
\]

We consider two cases:

a) the manager continues to have project-phantasy (that is, he continues to assign the parameter $\theta > 0$ to the project at date 2, whether the project succeeds or fails).

b) the manager switches to project hatred if the project fails at date 1 (that is, if the project fails at date 1, he switches to the negative, hatred parameter $\phi < 0$, at date 2).

Firstly, note that, given (A.2), the manager makes the efficient decision to continue the project following date 1 success in both cases. The efficient decision to continue is merely re-inforced by the manager’s project-phantasy and regret-aversion.

Now consider date 1 project failure. In case a), the manager continues the project phantasy, and becomes entrapped in the project. That is, he makes the inefficient decision to allow the project to continue. He becomes entrapped due to two-re-inforcing factors: project-phantasy and regret-aversion. In case b), the manager makes the correct, efficient decision to abandon the project following date 1 project failure.
In this case, failure induces the manager to switch to project hatred, and this effect outweighs his regret aversion, such that he prefers to abandon the project. Researchers have employed a behavioural corporate finance framework to suggest that project entrapment may result from the cognitive emotional bias of regret aversion. We suggest that emotional corporate finance provides another dimension by incorporating project phantasy/hatred into the abandonment decision. We have demonstrated that phantasy and regret may be re-inforcing factors in a manager’s refusal to abandon a failing project. In contrast, if project failure induces a manager to switch to project-hatred, this may induce him to abandon the project, providing this subconscious emotion exceeds the conscious bias of regret-aversion.

An interesting policy question then becomes, following project failure, when will managers continue in their project phantasy? When will managers switch to project hatred? What are the triggers? We consider this in our next section, which analyses the Concorde case study.

4.1 Case Study: The Concorde, phantasy and project-entrapment.

Behavioural corporate finance analyses the psychological biases affecting a manager’s refusal to abandon a losing project. Specifically, BCF focuses on conscious biases and cognitive emotions, such as regret aversion, as an explanation for project entrapment.

In the previous analysis, in our emotional corporate finance framework, we have argued that subconscious emotions, and project-phantasy, may complicate the issue, either by re-inforcing managerial entrapment in a project, or, in terms of project-hatred, outweighing regret to induce a manager to abandon the project. Further, we have discussed how our understanding of project entrapment/abandonment may be enhanced by an understanding of the conditions under which managers will switch from project-phantasy to hatred.

In order to consider these issues, we now briefly analyse the case of the Concorde, the supersonic aircraft produced as a collaborative effort between the British and French nations. According to the web article, “The Concorde Saga,” the Concorde was a “technical marvel… The only aircraft offering commercial supersonic travel to passengers.”

Furthermore, “Concorde represented the dream of travelling faster than the speed of sound…. It was launched with the expectation of revolutionising air travel.”

Hence, the project may have been viewed as a phantasy by company management. However, following major problems, including the Air France crash, the customer airlines (British Airways and Air France) decided to abandon their Concorde services in 2003. Furthermore, Airbus decided not to support Concorde operations after 2003 (see the website for full details).

However, the decision to abandon Concorde was not taken lightly. According to the web story “the sunk-cost fallacy”, “when one makes a hopeless investment, one sometimes reasons: I can’t stop now, otherwise what I’ve invested so far will be lost.”
Furthermore, “to continue to invest in a hopeless project is irrational”.

Interestingly, the web report notes that the sunk-cost fallacy is sometimes referred to as “the Concorde Fallacy.”

“Despite the fact that the Concorde is beautiful and as safe as any other jet transport, it was very costly to produce and suffered some major marketing problems. There weren’t many orders for the plane. Even though it was apparent there was no way this machine would make anybody any money, France and England kept investing deeper and deeper on the grounds that they had already invested a lot of money.”

The web story proceeds to point out that the ‘trigger’ for the abandonment of the project was the Air France crash on July 25th, 2000.


Beginning with the observation that “only bean-counters would put a price on human ingenuity,” Matthews notes that, following the Air France crash:

“One of the few bits of cheering news last week was the safe return to operation of the most beautiful machine ever built. … the aircraft has always been more than just a ludicrously expensive flying vehicle that goes fast. It is a priceless symbol of engineering prowess and national pride.”

Furthermore, he notes that “critics of the aircraft bemoaned the refusal of British and French ministers to abandon the project- which cost more than £6 billion at current prices- despite its obvious lack of commercial viability.”

However, the author concludes that “the Concorde fallacy is based on a flawed premiss because it ignores the fact that, if the plug had been pulled on the project, the result would have been a few billion quid extra for Treasury bean-counters to fritter away. Instead, we ended with a priceless demonstration of human ingenuity- which, to me, seems like a bit of a bargain.”

In terms of our framework, we note the following. Concorde can be seen as a ‘phantastic’ project. Furthermore, the refusal to abandon it had both behavioural and emotional foundations. First, it is argued that the French and British governments did not want to stop the project as they had already invested millions in it (sunk cost fallacy, together with possible regret aversion). However, an equally important factor in the refusal to abandon appears to be the phantasy surrounding the project.

The ‘trigger’ for the abandonment of the project may have been the Air France crash. In our framework, this could have been the point at which phantasy turned to reality, and then to hatred.
5. Conclusions and Future Research.

In this paper, we have gone some way to formalising Taffler and Tuckett’s (2005) theory of emotional finance. Furthermore, whereas TT focus on emotional finance as it affects investors and financial markets, we have extended the paradigm to emotional corporate finance, recognising that corporate managers may view projects as phantastic objects.

Our analysis provides a basis for future research. Firstly, we have taken investors’ and managers’ phantasy parameters as exogenously given. It is important for future researchers to develop a theoretical framework which endogenises the formation of subconscious emotions, phantasies, and hatred of financial investments (in the case of investors) and projects (in the case of managers). Hermalin and Isen’s (1999) formal model of emotion-formation may prove fruitful.

Second, in our model, investors’ and managers’ phantasies occur independently (for example, we have assumed that investors’ face reality before the manager does). A richer model will consider the interaction of managers’ and investors’ phantasy.

Third, we must consider the interaction between conscious and sub-conscious biases. A useful approach would be to consider the relationship between phantasy and overconfidence. Such an analysis would strengthen the relationship between behavioural corporate finance and emotional corporate finance.

In addition to developing a theoretical analysis of emotional corporate finance, a challenge for future researchers will be to test this approach empirically. We could extend the BCF approach, which employs various empirical techniques (quantitative, qualitative, experimental). When using a quantitative approach, the problem is to find a measure of unobservable managerial behavioural characteristics, such as managerial overconfidence. Malmendier and Tate, 2002, 2005 examine the relationship between capital structure and managerial overconfidence. They use two proxies for overconfidence. Firstly, they examine a managerial action (the early or delayed exercise of stock options) as a potential indicator of overconfidence. Secondly, they use an indirect measure (press statement about the manager and his behaviour) in an attempt to measure overconfidence. Future researchers in ECF may attempt to use similar measures for managerial phantasy.

Emotional corporate finance represents an exciting development, building on Taffler and Tuckett’s (2005) work in emotional finance, and provides a challenging agenda for future theoretical and empirical research.

---

6 Hermalin and Isen (1999) argue that stochastic emotions may become chaotic. This may be incorporated into Cohen’s (1997) conceptual framework, where she discusses how chaos theory may be used to predict stock market bubbles and crashes.
References:


*Concorde cases*


Appendix

Historical development of behavioural/emotional finance, and our contribution, emotional corporate finance.