International Review of Business Research Papers
Vol. 7. No. 5. September 2011. Pp. 16-34

Off-Shoring, Managerial Anchoring, and Firm Value: A Two Period Model

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Firm level off-shoring decisions have assumed greater importance in today's brutally competitive environment. If managers rely more on their own estimates (managerial anchoring) than on realized estimates when making off-shoring decisions, their decisions can adversely impact firm value. We develop one and two period models where we simulate and examine the impact of managerial anchoring on firm value. Firms can incur substantial costs if manager's exhibit such behavior. Solutions to combat managerial anchoring include a team approach to decision making. Firms also need to consider managerial anchoring possibilities when signing or renewing off-shoring contracts.

JEL Codes: G340, G390

1. Introduction

The issue of off-shoring of U.S. jobs, especially to developing countries, has drawn considerable attention over the last decade. These concerns center on job losses in the manufacturing and service sectors in the United States and elsewhere, and possible costs associated with data security/loss as a consequence of off-shoring. Most academic and newspaper articles present detailed analysis of the costs and the benefits of outsourcing, and especially foreign outsourcing[1].

On a different but parallel front, behavior finance literature informs us that managers can exhibit signs of irrationality when making decisions that affect firm value or behavior that fulfills their self interest over the interest of the owners. In a brutally competitive

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globalized economy, superior financial performance is valued and rewarded by investors. Since corporate financial performance is also linked to the personal reputation of managers, their eventual compensations and future employment opportunities, mangers may make decisions that benefit them but are detrimental to the owners of the firm.[2] Furthermore, managers with superior (inferior) prior track records may be more optimistic (pessimistic) in predicting future cash flows. Pressures to produce results for the firm may increase risk taking behavior for corporate managers, and increase the possibility of bad decisions based on pessimistic predictions.

From an off-shoring decision theoretic perspective, these prediction errors can have considerable impact on firm value. In the past, off-shoring decisions may have been considered to have only a minor impact on overall corporate value. Off-shoring of non-core activities was undertaken to reduce costs, and was not considered important to overall corporate strategy. In recent times, however, and as pointed out by Madison & Padmanabhan 2005) and others, outsourcing and off-shoring activities have now become an integral component of the corporate strategic equation. This is also evidenced by the fact that global off-shoring contracts were valued at $ 12.1 Billion in 2010 (Overby 2010).[3] Consequently, managing the off-shoring process efficiently has become critically important for firms competing in a globalized environment. If managers are overly optimistic (pessimistic), they may accept (reject) negative (positive) net present value off-shoring projects, with detrimental consequences for firm value.

In this paper we build a theoretical model that involves an analysis of the costs and benefit of off-shoring under uncertainty. Specifically, we develop a simple one period valuation model that incorporates the impact of managerial anchoring on firm value – we investigate whether anchoring affects firm value associated with off-shoring in a positive or negative manner. This analysis is extended to a two period model to show how positive or negative anchoring in period one influences firm value as a consequence of off-shoring in the second period. Next, since firms are concerned with loss of technology and other sensitive information associated with off-shoring contracts, we explore the impact of the potential loss of technology on firm value in the context of managerial anchoring. Specifically, we investigate the impact of a high (low) level of possible loss of technology on firm value when managerial anchoring is prevalent. Finally, we incorporate the impact of "off-shoring cash flow" uncertainties on firm value in the context of managerial anchoring. If cash inflows at the end of period 1 are

expected to be high (low), we determine whether these expectations, in the context of managerial anchoring influence firm value.

To summarize, we attempt to provide some simulation based answers to the following questions: a) What is the impact of manager anchoring (as it relates to off-shoring) on firm value? b) What is the impact of high (low) costs associated with loss of technology and data security on firm value when anchoring is present? c) What is the impact of cash flow uncertainties on off-shoring related firm value in the context of managerial anchoring? Despite the growing importance of off-shoring, these questions have yet to be raised in the literature. We expect that managerial anchoring will increase firm level costs, and our simulation results will confirm this belief.

The paper is organized as follows. In the next section, we present a brief review of the literature related to outsourcing/off-shoring and managerial anchoring that serves as a rationale for the paper. Next, the basic elements of the model proposed in this paper are presented, followed by a discussion of model simulation results associated with the three different types of situations discussed earlier. Policy implications of our findings and concluding comments are presented in the last section.

2. Literature Review

The benefits and costs of outsourcing/off-shoring are well documented (Madison & Padmanabhan 2006). Job losses can occur due to falling demand, and as a result of *managerial decisions designed to lower firm costs*. These cost savings may be because the vendor[4] has a comparative advantage with respect to the outsourced/off-shored activity and will result in a cost savings to the client firm (Levina & Ross 2003).[5] Similarly, the risks of outsourcing and off-shoring have also been examined extensively (for example, Atkinson 2004, Drezner 2004, Clott, 2004, and Wonseok, Gallivan & Kim 2006). McIvor 2000, Dimaggio & Powell 1983, and Hall & Liedtka 2005 specifically link outsourcing and off-shoring risks to managerial myopia. They collectively argue that over-reliance on stock options for managerial compensation motivates managers to make investment decisions with high risk/return characteristics, and that include outsourcing and off-shoring decisions. Manager stock options may change the risk aversion appetite, i.e. change utility function, or induce unethical behavior by the manager. Here, we examine the scenario where managers do not change their utility functions, but continue to behavior ethically and adopt shareholder value maximizing

behavior as a paradigm. However, we assume that managers may be influenced by emotional and psychological factors, and as a result, can make erroneous managerial decisions. These types of behaviors can be classified as "availability bias effect" (Tversky & Kahneman, 1973) and/or utility inversion of the prospect theory (Kahneman & Tversky 1979). When availability biases exist, managers pay more attention to recent (as opposed to more distant) information. According to prospect theory, the loser (winner) tends to become more optimistic (pessimistic) about future profits. These effects collectively explain the so called managerial anchoring phenomenon, and there is ample supporting evidence that these factors affect managerial decision making (see for instance, Epley & Gilovich 2005, Russo & Schoemaker 1992, Kaustia, Alho & Puttonen 2008, Popescu & Wu 2007, Bromiley 1987). The basic premise of these papers is that decision makers may suffer from psychological and other behaviorally induced biases that may influence the manner in which they use available objective information when making decisions. They may, for example, rely more on their own subjective estimates than on objectively realized values, and this phenomena is referred to as managerial anchoring. In the current context, managers making outsourcing and off-shoring decisions may rely more on their own forecasts and ignore realized outcomes. Since outsourcing and off-shoring decisions are becoming more important in this economy, managerial errors based on subjective forecasts have the potential to affect firm value negatively. Hence the need for a model as proposed in this paper.

3. The Methodology and Model: Maximizing Shareholders' Value with Off-shoring

Initially, we develop a simple one period model, where firm management (in this case, a manager) makes an off-shoring vendor selection decision.[6 7] The initial cash flows associated with off-shoring are assumed to be C_0, and are assumed computed as a percentage of total revenues of the firm for the year.[8] We capture the present values of the expected cash flows generated from the off-shoring contract in period 1 and period 2 respectively as C_u (high cash flow) and C_d (low cash flow), both for period 1. Similarly, C_{uu} (high cash flows in periods 1 and 2), C_{dd}, C_{ud}, and C_{du} capture the other permutations related to cash flows in periods 1 and 2.

Using the discounted free cash flow (FCF) approach to calculate outcomes, the manager making decisions related to an off-shoring contract must carefully decide on

off-shoring activities only if they contribute positively to shareholder value.[9] As a first step, and following our assumptions, we capture the free cash flow of the firm as follows:

> *Free cash flow = EBIT(1-tax rate) +Depreciation – Capital Expenditure – Increase in Net Working Capital, Where: EBIT = Revenue – Cost of Goods Sold – Selling, General and Administration Expenses*
> These variables have the usual connotations. [10] [11]

3.1 Case 1: A Single Period Model

The cash inflow at time 0 is C_0 and $C_0>0$. At time 1, we assume that free cash flow has only two possibilities, C_u and C_d where $C_u>C_0>C_d$, and $C_u = \alpha C_0$, $C_d = \frac{C_0}{\alpha}$, $\alpha > 1$. α captures the ratio of cash flows at time 1 to the cash flow at time 0.[12] We further assume that the actual probability that free cash flow will increase at time 1 is p ($C_u > C_0$). In addition, we assume that L represents the present value of the costs associated with possible loss of technology, managerial skill and data security as a consequence of off-shoring activities (the probability associated with this risk is also assumed to be (1-p)).[13] L is proportional to the initial cash flow C_0, and is captured as $L = \gamma C_0$. γ can be viewed as the coefficient of loss of technology. A larger |γ| represents a higher risk of outsourcing induced technology, managerial skill and data security loss. For this part of the analysis, we keep α and L constant.

If the manager exhibits perfect foresight, the off-shoring project will be selected when the expected cash flows are positive, i.e., when C_0+ p C_u + (1-p)C_d + (1-p)L> 0. We label this probability as the break even probability, p_{be} :

$$p_{be} = \frac{-C_0 - C_d - L}{C_u - C_d - L}.$$

As an example, if we assume that C_0 = 10%, C_u = 11%, C_d = 9.09%, and L = -40% of sales, the project should be accepted if the true probability of the upper cash flows occurring is greater than p_{be} = (-10%-9.09% +40%)/(11%-9.09%+40%) =0.499. Hence, if the true probability of success is greater than 49.9%, the project should be accepted. In other words, if p > p_{be}, then the project should be accepted.

3.2 Case 2: Varying γ, the Coefficient of Loss of Technology

In this simple one period case, we now examine the relationship between the break even probability and the coefficient of loss in technology. To achieve this, we first note that since L = $\gamma C_0, p_{be}$ the break even probability can also be written as

$$p_{be} = \frac{-C_0 - C_d - \gamma C_0}{C_u - C_d - \gamma C_0}$$

We now take first derivates of the breakeven probability (established earlier) with respect to γ as follows:

$$\frac{\partial \mathrm{p_{be}}}{\partial \gamma} = \frac{-\mathrm{C_0}(C_u - C_d - \gamma C_0) - C_0(-C_0 - C_d - \gamma C_0)}{(C_u - C_d - \gamma C_0)^2}$$
$$= \frac{-\mathrm{C_0} C_u + \mathrm{C_0} C_d + \gamma C_0^2 + C_0^2 + C_0 C_d + \gamma C_0^2}{(C_u - C_d - \gamma C_0)^2}$$
$$= \frac{-\mathrm{C_0} C_u + 2\mathrm{C_0} C_d + (2\gamma + 1) C_0^2}{(C_u - C_d - \gamma C_0)^2} < 0$$

Clearly, the breakeven probability increases as |γ| increases. As costs associated with loss of technology increases, the breakeven probability also increases, ceteris paribus, as expected. For example, when |γ| increases from 4 to 5, p_{be} increases from 0.499 to 0.595.

4. Managerial Anchoring Effects and Outsourcing Decisions

We consider the case where L is assumed constant (case 1). We now introduce the possibility that managers may err in estimating the probability of success. We assume that the manager's expected probability that free cash flow will increase is p_e. If $p_e < p_{be}$, and $p > p_{be}$, the manager underestimates the true probability of success of the off-shoring contract, and rejects the positive NPV contract. On the other hand, if $p_e > p_{be}$, but $p < p_{be}$, then manager is excessively optimistic, and accepts the negative NPV project. From this simple example, it is clear that the manager's subjective probability estimates can result in off-shoring decision errors.

4.1 Case 3: Two-Period Model, Managerial Anchoring and Firm Value

In this section, a two period model is utilized to analyze the impact of the option to extend existing off-shoring contracts, examined under conditions of excessively optimistic/pessimistic expectations by managers. We extend the basic framework (assuming that L is fixed) to a two period model where the experiences of the first period can be used to revise cost/probability estimates for the second period. In this instance, managers may decide to forego re-contracting in the second period, or extend the contract for another period.

We assume that the company has an option to extend the off-shoring contract at time 1. If free cash flow is C_u at time 1, free cash flow could be either C_{uu} or C_{du} at time 2. If at time 1 free cash flow is C_d, at time 2 free cash flow could be either C_{du} or C_{dd}, $C_{uu} = \alpha C_u$, $C_{ud} = \frac{C_u}{\alpha} = C_{du} = \alpha C_d$, $C_{dd} = \frac{C_d}{\alpha}$, where $C_{uu}>C_u>C_{ud}=C_{du}>C_d>C_{dd}$.[14] The actual probability that free cash flow will increase at time 1 and time 2 is p. The actual probability that free cash flow will decrease at time 1 and time 2 is 1-p. Manager's (subjective) expected probability that free cash flow will increase is p_e.[15] At time 2, losses of technology, managerial skill and data security are also expected to remain at L. The actual probability of this risk is (1-p). When the present value of the expected cash flows are positive, i.e when $C_u + pC_{uu} + (1-p)C_{ud} + (1-p)L > 0$ or $C_d + pC_{du} + (1-p)C_{dd} + (1-p)L > 0$, manager will choose to off-shore the activity at time 1. If the cash flow is C_u at time 1 the manger has the option to extend the off-shoring contract. If the manager estimates this probability correctly, the off-shoring project will be selected when the expected cash flow is positive, i.e., when $C_u + pC_{uu} + (1-p)C_{ud} + (1-p)L > 0$. This breakeven probability for the second period is similar to what was computed for period 1:

$$p_{be} = \frac{-C_u - C_{ud} - L}{C_{uu} - C_{ud} - L}$$

If we assume that C_0 = 10% of sales, C_u = 11%, C_d = 9.09%, C_{uu} = 12.1%, $C_{ud} = C_{du}$ = 10%, C_{dd} = 8.264%, and L = -40%, the project should be accepted if the true probability of the upper cash flows occurring is greater than:

P_{be} = (-11% -10% +40%)/(12.1%-10%+40%) = 0.45.

If we now relax the assumption that L is constant, we can investigate the impact of γ on the revised probabilities. First, with changing data security loss costs,

$$p_{be} = \frac{-C_u - C_{ud} - \gamma C_0}{C_{uu} - C_{ud} - \gamma C_0}$$

$$\frac{\partial \mathrm{p_{be}}}{\partial \gamma} = \frac{-\mathrm{C_0}(C_{uu} - C_{ud} - \gamma C_0) - C_0(-C_u - C_{ud} - \gamma C_0)}{(C_{uu} - C_{ud} - \gamma C_0)^2}$$

$$= \frac{-\mathrm{C_0} C_{uu} + \mathrm{C_0} C_{ud} + \gamma C_0^2 + C_0 C_u + C_0 C_{ud} + \gamma C_0^2}{(C_{uu} - C_{ud} - \gamma C_0)^2}$$

$$= \frac{-\mathrm{C_0} C_{uu} + \mathrm{C_0} C_{ud} + 2\mathrm{C_0} C_{ud} + 2\gamma C_0^2}{(C_u - C_d - \gamma C_0)^2} < 0$$

Under this scenario, the breakeven probability p_{be} increases when |γ| increases. For example, when |γ| increases from 4 to 5, p_{be} increases from 0.45 to 0.557. Clearly, higher costs associated with technology/data security loss results in an increased breakeven probability in periods 1 and 2.

For period 2, if the true probability of success is greater than 45%, the project should be accepted. In other words, if $p > p_{be}$, then the project should be accepted. If the cash flow is C_d at time 1, extending the off-shoring contract for one more period may have a negative impact on the value for the company. The manager has an option not to extend the off-shoring contract. In addition, if the cash flow is C_u at time 1, the breakeven probability of 45% in period 2 is less than the breakeven probability of 49.9% in period 1. Clearly, the range where the manager's underestimation in period 2 (< 45%, rather than <49.9%) will cause an error, has decreased. If manager provides an overly pessimistic p_e estimate in period 2, then there is a greater chance that a good project will be rejected. However, if manager is overly optimistic, there is a smaller chance of accepting a bad project. Of course, if two successive periods of bad cash flows result, firms can opt to cancel the off-shoring contract at the end of period 2. This is the value of experience that kicks in during the second period.

5. Impact of Managerial Anchoring on Firm Value: Revision of Subjective Estimates

We now explore the impact of managerial anchoring in a more formal manner. We now assume that the manager's expected probability $p_{e,t}$ at any time t (t>1) is a function of

the same period breakeven probability $p_{be,t}$ and the previous one period expected probability $p_{e,t-1}$. Let $PV_{e,t}$ represent the manager's expected value at time t. $PV_{e,t}$ is an independent random variable with a systematic component $\eta_{e,t}$ and a random component $\varepsilon_{i,t}$ such that[16]

$$PV_{e,t} = \eta_{e,t} + \varepsilon_{i,t} = p_{e,t} C_u + (1-p_{e,t}) C_d + \varepsilon_{i,t}$$

where : $p_{e,t} = \beta\, p_{be,t} + (1-\beta)\, p_{e,t-1}$, $p_{be,t-1} = \frac{-C_0 - C_d - L}{C_u - C_d - L}$, and $\varepsilon_{i,t} = L\,(1-p_{e,t})$.

For example, $\beta = 0.5$, $p_{be,t-1} = 0.499$, $p_{e,t-1} = 0.509$, then $p_{e,t} = 0.5039$. We assume that the manager maximizes the expected value $PV_{e,t}$. and every manager does not change his/her β over time. For each time t, new information on the breakeven probability, $p_{be,t}$ is generated. Managers will combine this new information with their own subjective probability estimates to update their beliefs for the next period. When β is small, the manager will rely more on his/her own beliefs, and less on the information reflected in the breakeven probability to update estimates. In other words, β captures the essence of the managerial anchoring impact on decision making. The anchoring effect is bigger when β is smaller.

Table 1 presents the range of simulation probability estimates as they relate to β and its impact on the probability of errors on the off-shoring decision for costs and outcomes tracked over 2 periods.

Table 1: Impact of Manager's Anchoring Effect On Off-shoring Decisions: Simulation Run Outcomes

β	p_{eu}	p_{ed}	p_{eu}-p_{beu} (Optimistic Forecasting Errors)	p_{ed}-p_{bed} (Pessimistic Forecasting Errors)
0	0.509	0.509	0.058	-0.034
0.1	0.502	0.511	0.051	-0.031
0.2	0.496	0.514	0.044	-0.029
0.3	0.490	0.517	0.038	-0.026
0.4	0.483	0.520	0.032	-0.023
0.5	0.478	0.523	0.026	-0.019
0.6	0.472	0.527	0.021	-0.016
0.7	0.466	0.530	0.015	-0.012
0.8	0.461	0.534	0.010	-0.008
0.9	0.456	0.538	0.005	-0.004
1	0.451	0.543	0.000	0.000

Legend: 1) β represents the coefficient of anchoring and measures the extent to which the manager relies on current information to make off-shoring decisions.

2) p_{eu} and p_{ed} represent the manager's subjective probability estimate of the actual breakeven probabilities P_{beu} and P_{bed} when at time 1 free cash flow are C_u and C_d respectively.

β represents the coefficient of anchoring – the higher the β the lower the reliance by managers of their own subjective estimates based on their previous experiences. There is no anchoring effect when β is 1; it comes into play when β is different from 1 ($0 \leq \beta \leq 1$). From columns 1 and 4 of Table 1, it is clear that for high cash flow estimates, as β increases the error probability captured by (p_{eu}-p_{beu}) decreases. In other words, the manager subjective estimate (p_{eu}) when cash flows are high (C_u) gets closer to the actual breakeven probability (p_{beu}) as β increases. Similar results are observed when free cash flow levels are low (C_d): the manager's subjective estimate (p_{ed}) gets closer to the actual breakeven probability (p_{bed}) as β increases.[17]

From Table 1, it is clear that there are instances where manager's anchoring can be linked to incorrect off-shoring decisions. As β decreases, managers rely more on their own subjective estimates, and less on the information conveyed in the current breakeven probability estimates. Hence, their probability of error (the interval over which an incorrect decision can be made) increases. The manager's propensity to assume

unnecessary risk increases inversely with β. This means that the risk of an incorrect off-shoring decision also increases inversely with β.

6. Impact of Manager Anchoring When γ is Varied

The preceding analysis assumed that costs associated with possible loss of data security was held constant. In the next section, we vary γ – the coefficient that measures the loss of technology and data security in terms of the initial costs. These costs can become particularly relevant and important for off-shoring decisions. Results of these simulation runs are presented in Table 2.

The first section of Table 2 shows the impact of varying γ but keeping α constant. In particular, when α is assigned a value 1.1[18], we examine the relationship between β and γ when managers make optimistic forecasts in the first section of Table 1. Similarly, the second section of Table 2 presents results associated with pessimistic forecasts by managers.

Based on results presented in Table 2, for each level of γ, the anchoring results are similar to those reported in Table 1: holding α and γ constant, β is negatively related to manager forecast errors, ($p_{eu} - p_{beu}$). Holding α constant at 1.1, and γ = -3, we note that as β increases, manager's subjective estimate when cash flows are predicted to be low (C_u) comes closer to the actual breakeven probability. Similarly, section 2 documents similar results when cash flow predictions are high (C_d), holding α and γ at the same levels as before. These results are similar to what was reported in Table 1.

A more interesting result is the link between manager's estimate errors[19] and |γ|, *holding α and β constant*. It can be observed from section 1 of Table 2 that |γ| is negatively related to manager estimation errors when cash flow estimates are low, but positively related to estimation errors when cash flow estimates are high For example, when |γ| increases from 3 to 3.5, breakeven probability p_{be} increases from 0.342 to 0.431. If α = 1.1 and γ = -4, when β increases from 0.5 to 0.6, $p_{eu} - p_{beu}$ decreases from 0.026 to 0.021, $p_{ed} - p_{bed}$ increases from -0.019 to -0.016. If α = 1.1 and β = 0.3, when |γ| increases from 3.5 to 5, $p_{eu} - p_{beu}$ decreases from 0.042 to 0.032, and $p_{ed} - p_{bed}$ increases from -0.03 to -0.02.

Table 2: Impact of Manager's Anchoring Effect On Off-shoring Decisions Under Changing γ (loss of Technology Coefficient)

A	1.1						
Γ	**-3**	**-3.5**	**-4**	**-4.5**	**-5**	**-5.5**	**-6**
p_{be}	0.342	0.431	0.499	0.552	0.595	0.631	0.661
B	$p_{eu} - p_{beu}$ **(Optimistic Forecasting Errors)**						
0	0.072	0.064	0.058	0.053	0.049	0.046	0.043
0.1	0.063	0.056	0.051	0.047	0.043	0.040	0.038
0.2	0.056	0.049	0.044	0.041	0.037	0.035	0.033
0.3	0.048	0.042	0.038	0.035	0.032	0.030	0.028
0.4	0.041	0.036	0.032	0.029	0.027	0.025	0.023
0.5	0.033	0.029	0.026	0.024	0.022	0.020	0.019
0.6	0.026	0.023	0.021	0.019	0.017	0.016	0.015
0.7	0.019	0.017	0.015	0.014	0.013	0.012	0.011
0.8	0.013	0.011	0.010	0.009	0.008	0.008	0.007
0.9	0.006	0.005	0.005	0.004	0.004	0.004	0.003
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
β	$p_{ed} - p_{bed}$ **(Pessimistic Forecasting Errors)**						
0	-0.047	-0.039	-0.034	-0.029	-0.026	-0.023	-0.020
0.1	-0.043	-0.036	-0.031	-0.027	-0.024	-0.021	-0.019
0.2	-0.039	-0.033	-0.029	-0.025	-0.022	-0.020	-0.018
0.3	-0.035	-0.030	-0.026	-0.023	-0.020	-0.018	-0.016
0.4	-0.030	-0.026	-0.023	-0.020	-0.018	-0.016	-0.014
0.5	-0.026	-0.022	-0.019	-0.017	-0.015	-0.014	-0.012
0.6	-0.021	-0.018	-0.016	-0.014	-0.013	-0.011	-0.010
0.7	-0.016	-0.014	-0.012	-0.011	-0.010	-0.009	-0.008
0.8	-0.011	-0.009	-0.008	-0.007	-0.007	-0.006	-0.006
0.9	-0.006	-0.005	-0.004	-0.004	-0.003	-0.003	-0.003
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Legend: All variables have been described in Table 1.. α represents the ratio of costs in period 1 (period 2) relative to period 0 (period 1). γ represents the costs of data loss as a function of the initial costs associated with outsourcing.

Hence, one of the most interesting results presented in Table 2 is that the forecasting errors *decrease* as the costs associated with loss of data security increases. In other words, as the firm considers outsourcing tasks that have higher costs of technology

transfer; managerial anchoring effects become less important. As the data loss costs increase, the costs associated with prediction errors become smaller in comparison, and firm value is more affected by costs associated with the data loss, and not by managerial anchoring.

7. Manager's Anchoring and Off-shoring Decisions When Cash Flows Increase

In the analysis so far, it was assumed that α (the ratio of cash flow expected in period 1 to the initial cash flow) was held constant. What happens when we *increase* this cash flow estimate coefficient?[20] In Table 3, we duplicate the simulation runs of Table 2, except that we change α to be 1.2. In Table 4, we use α = 1.5. Results are presented below.

Table 3: Impact of Manager's Anchoring Effect On Off-shoring Decisions Under Changing γ: α = 1.2

α	**1.2**						
γ	**-3**	**-3.5**	**-4**	**-4.5**	**-5**	**-5.5**	**-6**
p_{be}	0.347	0.431	0.496	0.548	0.590	0.625	0.654
β	Section 1: $p_{eu} - p_{beu}$ (Pessimistic Forecasting Errors)						
0	0.124	0.111	0.101	0.092	0.085	0.079	0.074
0.1	0.111	0.099	0.090	0.082	0.076	0.071	0.066
0.2	0.098	0.087	0.079	0.072	0.067	0.062	0.058
0.3	0.085	0.076	0.068	0.063	0.058	0.054	0.050
0.4	0.072	0.064	0.058	0.053	0.049	0.045	0.042
0.5	0.059	0.053	0.048	0.044	0.040	0.037	0.035
0.6	0.047	0.042	0.038	0.035	0.032	0.029	0.027
0.7	0.035	0.031	0.028	0.026	0.024	0.022	0.020
0.8	0.023	0.021	0.019	0.017	0.015	0.014	0.013
0.9	0.011	0.010	0.009	0.008	0.008	0.007	0.007
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
β	Section 2: $p_{ed} - p_{bed}$ (Optimistic Forecasting Errors)						
0	-0.089	-0.077	-0.068	-0.061	-0.054	-0.049	-0.045
0.1	-0.081	-0.070	-0.062	-0.055	-0.050	-0.045	-0.041
0.2	-0.073	-0.063	-0.056	-0.050	-0.045	-0.041	-0.037
0.3	-0.064	-0.056	-0.050	-0.044	-0.040	-0.037	-0.033
0.4	-0.056	-0.049	-0.043	-0.039	-0.035	-0.032	-0.029
0.5	-0.047	-0.041	-0.037	-0.033	-0.030	-0.027	-0.025
0.6	-0.038	-0.033	-0.030	-0.027	-0.024	-0.022	-0.020
0.7	-0.029	-0.025	-0.023	-0.020	-0.018	-0.017	-0.016
0.8	-0.019	-0.017	-0.015	-0.014	-0.012	-0.011	-0.011
0.9	-0.010	-0.009	-0.008	-0.007	-0.006	-0.006	-0.005
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 4: Impact of Manager's Anchoring Effect On Off-shoring Decisions Under Changing γ: α = 1.5

α	1.5						
γ	**-3**	**-3.5**	**-4**	**-4.5**	**-5**	**-5.5**	**-6**
p_{be}	0.348	0.423	0.483	0.531	0.571	0.605	0.634
β	$p_{eu} - p_{beu}$ (Pessimistic Forecasting Errors)						
0	0.240	0.223	0.207	0.193	0.181	0.171	0.161
0.1	0.215	0.199	0.185	0.173	0.162	0.153	0.144
0.2	0.191	0.176	0.164	0.153	0.144	0.135	0.128
0.3	0.166	0.154	0.143	0.133	0.125	0.117	0.111
0.4	0.142	0.131	0.122	0.114	0.106	0.100	0.094
0.5	0.118	0.109	0.101	0.094	0.088	0.083	0.078
0.6	0.094	0.087	0.080	0.075	0.070	0.066	0.062
0.7	0.070	0.065	0.060	0.056	0.052	0.049	0.046
0.8	0.046	0.043	0.040	0.037	0.035	0.033	0.031
0.9	0.023	0.021	0.020	0.018	0.017	0.016	0.015
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
β	$p_{ed} - p_{bed}$ (Optimistic Forecasting Errors)						
0	-0.173	-0.156	-0.141	-0.129	-0.119	-0.110	-0.102
0.1	-0.157	-0.141	-0.128	-0.117	-0.108	-0.099	-0.092
0.2	-0.140	-0.126	-0.115	-0.105	-0.096	-0.089	-0.083
0.3	-0.123	-0.111	-0.101	-0.092	-0.085	-0.079	-0.073
0.4	-0.106	-0.096	-0.087	-0.080	-0.074	-0.068	-0.063
0.5	-0.089	-0.080	-0.073	-0.067	-0.062	-0.057	-0.053
0.6	-0.072	-0.065	-0.059	-0.054	-0.050	-0.046	-0.043
0.7	-0.054	-0.049	-0.045	-0.041	-0.038	-0.035	-0.033
0.8	-0.036	-0.033	-0.030	-0.027	-0.025	-0.024	-0.022
0.9	-0.018	-0.016	-0.015	-0.014	-0.013	-0.012	-0.011
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000

These results are intuitive, and are similar to those reported in Table 2. However, since we are exploring the impact of changing α, we compare these results presented in Tables 3 (α = 1.2) and 4 (α= 1.5) with those presented in Table 2 (α = 1.1). We examine the impact of changing α on β and γ.

Clearly, an examination of the simulation results presented in Tables 2-4 indicate that the manager prediction errors increase with changes in α. In other words, as α

increases, the probability of prediction errors made by the manager also increases. This result is independent of the level of γ or β. The question is: why? The answer lies in the manner in which we constructed α- an α of 1.1 implies that C_u (the upper cash flow) was 10% more than C_0 (the initial cash flow). However, an α of 1.1 also implies that C_d (the lower cash flow) *was 90.9% (= 1/1.10)* of C_0. *As α increases, the upper and lower cash flows diverge – creating a greater dispersion of expected cash flows.* In other words, we can postulate that higher α's proxy *higher volatility of cash flows.* Hence, manager's prediction errors become stronger when there is a greater volatility of cash flows (proxied by higher α coefficients), and this is an intuitive result.

8. Summary and Conclusions

We can generate many policy implications from the simulation results generated in this paper. First, it is clear that firms can incur substantial costs if managers' exhibit anchoring behavior and these costs are ignored by the firm. With increased global competition, firms can ill afford to accept these losses. A solution is to allow a team of managers (and not rely on one manager) to make off-shoring decisions. Even if one manager exhibits managerial anchoring, the team approach will mitigate any adverse impact on firm value. A team approach is also recommended when there is a greater volatility associated with future cash flows, since managers are prone to make larger prediction errors associated with cash flow volatility (as shown in Tables 2 – 4). Second, another interesting result is that the impact of managerial anchoring decreases if other costs associated with off-shoring increase their impact on firm value. Clearly, this is not the correct way to decrease the negative impact of anchoring, but it does suggest that other costs *that do not require manager input* may reduce the impact of anchoring. Finally, firms entering into off-shoring contracts (or extending an existing off-shoring contract) have obvious strategic and cost implications that extend beyond direct costs. Limitations include the restrictive assumptions made during the modeling process. Obviously, our conclusions may not be valid if these assumptions are incorrect. Further research may include the elimination of all or some of these restrictive assumptions.

Endnotes

[1] Foreign outsourcing is also referred to as off-shoring. In this paper, we will use both terms interchangeably. For a detailed review of this literature, refer to Madison and Padmanabhan (2005), and Madison, San Miguel and Padmanabhan (2006).

[2] Costs associated with such conflicts are referred to as 'agency costs'. Since the pioneering works of Jensen and Meckling (1976), there have been numerous papers addressing this issue.

[3] However, outsourcing activity in 2010 declined slightly from 2009 levels.

[4] Vendor refers to the firm receiving the outsourcing contract, and client refers to the firm outsourcing the contract.

[5] For more on the benefits of outsourcing, please see Prahalad and Hamel (1990), Madison and Padmanabhan (2005) and Tompkins (2005).

[6] It is assumed that the firm has not had any prior experience with outsourcing.

[7] We also assume that managers do not change their utility functions during the decision period, nor do they exhibit unethical behavior. They are assumed to maximize expected shareholder value at the end of period 1.

[8] In addition, and without loss of generality, we assume these costs as a percentage of total revenues of the firm for the year. Similarly, all costs referenced in this paper are assumed to be expressed as a percentage of revenues of the firm.

[9] Terminologies used here have the usual accounting definitions.

[10] We further assume that there is no asymmetric information between the company and the outsourcing supplier, discount rate is 0%, taxes rate is 0% and there are zero risks of bankruptcy. At time 0, company frees up some units and starts to outsource activities that were conducted in house.

[11] Based on our treatment of α, higher levels of α imply higher *volatility* of cash flows. The implications of this aspect will be explored in a later section.

[12] Based on our treatment of α, higher levels of α also imply higher *volatility* of cash flows. The implications of this aspect will be explored in a later section.

[13] Clearly, since data loss/security related issues are more important in off-shoring activities than in outsourcing (domestic) activities. Hence the model considered in this paper is more relevant for off-shoring activities.

[14] For sake of tractability, we assume that α remains constant from period 1 to period 2.

[15] We assume for now that the manager's subjective probability continues to remain at p_e for both periods 1 and 2. We assume that this probability also extends to his/her estimates for the loss of technology.

[16] We assume that L is constant for this part of the analysis.

[17] In this case, the errors are 'negative'.

[18] This means that cash flows in period 1 are expected to increase or decrease by 10% over costs at the beginning of the period.

[19] Either $(p_{eu} - p_{beu})$ when cash flows are low, or $(p_{ed} - p_{bed})$ when cash flows are high.

[20] Decreasing this coefficient to a level such that $\alpha < 1$ is relatively uninteresting since it would imply that cash flows in period 1 are less than the initial cash flows, and hence that outsourcing relationship should be terminated.

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