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Failure of Stock Prices to Discipline Managers in a Rational Expectations Economy

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1. *Introduction*

In this paper we show that even a strongly efficient stock market is, by itself, insufficient to discipline managers who may hold incorrect beliefs about investors' behavior and their decision rules. Instead of disciplining the managers, the stock market may generate prices that reinforce these incorrect beliefs. When this happens, the disciplining of managers must be accomplished through other mechanisms, such as through markets for managerial labor, mergers and takeovers, the financial press, and education. These alternative mechanisms may produce slower disciplinary reactions than the stock market.

Several important classes of accounting phenomena seem consistent with a failure of the stock market to discipline managers promptly. We present in detail how the apparent failure of managers to make cash-flow-maximizing *LIFO–FIFO* choices in a timely fashion is consistent with this theory. Our approach is also applicable to other financial reporting conundrums in which adverse managerial and stock market reactions were predicted in response to *Financial Accounting Standard No. 2* (accounting for research and development outlays), *Standard No.*

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8 (foreign exchange translation), and *Standard No. 19* (accounting for oil and gas exploration costs), each of which changed firms' accounting incomes but not their cash flows.

Classical Arrow-Debreu models, as well as the rational expectations models, assume that firms are run by managers who seek to maximize the "market value" of the firm. Since the main purpose of such models is to examine the Pareto efficiency of wealth allocations by the stock market under the presumed behavior of management, this assumption has been useful in bypassing the extremely difficult problems of managerial compensation contracts and motivation. Formal examination of these contracts in the agency theory literature (e.g., Mirrlees [1976] and Holmstrom [1979]) has concluded that in the presence of moral hazard, appropriate incentives are provided to managers if their compensation is a direct function of appropriately defined and measured net income. Most of the empirical studies of the relationship between accounting events and stock price behavior have taken the Pareto optimality of market-value-maximizing managerial behavior as a maintained hypothesis. The literature on managerial compensation plans[1] generally advocates profit-sharing as one primary incentive device to motivate managers to maximize the market value of the firm. Accordingly, it has now become almost an article of faith that management compensation plans which are highly aligned with the market value of the firm also result in a high alignment of goals of the managers and the shareholders.

The main purpose of our paper is to show that such faith might be misplaced. We demonstrate that a *generic*, and not just pathological, class of economies can exist in which managerial compensation, perfectly aligned with the market value of stock, will not always motivate managers to undertake decisions that maximize this market value. We argue that the contracts that ensure market value maximization by managers would have to include non-stock-market variables and other disciplinary mechanisms. These alternative mechanisms are triggered when the stock price reactions fail to enforce discipline. However, we expect the speed of such discipline to be slower than the practically instantaneous reaction of stock prices.

An essential assumption of our model is that investor decision rules that generate market prices are *not common knowledge*[2] among managers. Managers make conjectures about investor decisions rules when they make their own decisions and form expectations about stock prices conditional on such decisions. When the managers fail to differentiate the observed stock prices from their ex ante expectations of such prices, their beliefs in their conjectures about the investor decision rules are

[1] See Antle and Smith [1986, p. 1, n. 2] for references.

[2] A piece of information is defined to be common knowledge to all players of a game if (*i*) all players know the information, (*ii*) all players know that all players know the information, and (*iii*) all players know that all players know that..., and so on ad infinitum. See Aumann [1976].

strengthened by such fulfilled expectations. Such reinforcement of beliefs by observed market prices derived from an efficient market can occur irrespective of whether managers' conjectures are correct or incorrect.[3] When managers have incorrect conjectures about investor behavior, their "bad" behavior may persist as long as it takes the slower alternative disciplinary mechanisms to take effect, or they make a mistake which results in an unanticipated market reaction.

It is not our purpose here to derive a demand schedule for accounting information. Nor is it our purpose to derive optimal compensation contracts. Our purpose is to show that in a generic class of economies, managerial compensation based purely on market value of the firm is suboptimal even though the stock market is in equilibrium.

The setting and underlying intuition of the model is explained in section 2. In section 3, we develop the first part of a numerical example to illustrate the inability of an efficient stock market necessarily to correct managerial beliefs. In section 4, we develop the second part of the numerical example to show that the phenomenon is generic and not pathological. Section 5 discusses the role of alternative disciplinary mechanisms. Section 6 presents potential extensions and some concluding remarks.

2. *The Setting*

Assume that: (*a*) The model economy is populated by a number of firms, not necessarily identical, whose shares are held and traded among a large number of shareholders in a well-functioning stock market. (*b*) Managers are compensated only in cash on the basis of the stock price of the firms they manage. No other variable enters the compensation function. (*c*) Managers as well as shareholders are risk neutral. They are also rational in the sense that each maximizes his or her own expected cash flows. The expectation of each individual is taken with respect to his or her beliefs which may be inhomogeneous (see Fishburn [1970]). (*d*) The stock market is perfectly competitive and, therefore, values the shares of stock at the future cash flows expected by market agents. (*e*) It is *not common knowledge* in the economy that expected cash flow maximization is the decision rule used by economic agents in the economy.

The last assumption needs elaboration. Essentially, it implies that although both investors and managers use the cash flow criterion in making their own decisions, they do not necessarily believe that the other party (i.e., managers and investors respectively) uses the cash flow criterion. Specifically, we assume that while some managers model investors' valuation decisions as being based on reported cash flows, other managers mistakenly (for reasons elaborated later) model investors'

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[3] See Arrow [1986] for an almost identical assertion in a more general context.

valuation decisions to be based on reported accounting income. We shall refer to the managers of the first type who believe that the investors use the cash model as C-managers; managers of the second type who believe that the investors use accounting income will be referred to as I-managers. Put another way, while we assume that everyone is rational (i.e., cash flow maximizing) in making decisions relative to one's own beliefs, we do not assume that everyone necessarily believes that all other parties use decision criteria identical to one's own. A similar relaxation of the common knowledge assumption is used by Kreps and Wilson [1982] and others to develop the concept of reputation and to resolve the chain store paradox.[4]

In the usual capital market settings, a manager's error in modeling investor behavior is promptly corrected by that market in the following way: errant managers' mistaken expectations about the stock price are repudiated by the share price; they are penalized for their mistakes in the form of reduced compensation and, thus, are induced either to alter their behavior until it is correct or to look for greener pastures. In such capital markets, we would not expect managers' wrongly held beliefs about how investors behave to persist. Our model is an example of a fulfilled expectations equilibrium in which an informationally efficient security market may not only fail to correct promptly the wrongly held beliefs of certain managers about how investors value their stock, it may even provide positive reinforcement for these wrongly held beliefs. The capital market discipline, usually the most immediate and prompt factor in correcting wrongly held beliefs, fails in this instance. Discipline imposed by other markets, through takeover battles, hiring and firing, seminars, lectures, the financial press, etc., may yet alter the beliefs of managers about the investor decision process. However, transaction costs in labor and education markets tend to be higher and the adjustment process tends to be slower than in the capital markets.[5] Therefore, when the capital market fails as a corrective mechanism, other markets only accomplish the correction slowly.

3. *Numerical Example Part 1: The Special Case*

3.1 CASH FLOW AND ACCOUNTING INCOME

Consider a firm which faces uncertainty about which one of the three possible states of the world, ($S1$, $S2$, $S3$), might be realized. The discounted present value of net cash flows of the firm under each of the three states, and under each possible decision A and B, are given in table 1. The probability of each state is also given. Similarly, table 2 shows the

[4] Arrow [1986] claims that the "common knowedge" assumption so pervasive in modern economic theory is, perhaps, the major source of difficulties in operationalizing analytical models of economic behavior.

[5] The average premium paid to acquire control of a New York Stock Exchange firm is in the range of 20 to 30% of market value.

TABLE 1
Distribution of Cash Flows

	States			Expected Value
	$S1$	$S2$	$S3$	
Probability	0.3	0.6	0.1	
Decisions: A	2	1.5	4	1.9
B	1.9	2	1.8	1.95
Information Signal	y_1		y_2	

TABLE 2
Distribution of Accounting Income

	States			Expected Value
	$S1$	$S2$	$S3$	
Probability	0.3	0.6	0.1	
Decisions: A	1	2	1.5	1.65
B	2	1	1.8	1.38
Information Signal	y_1		y_2	

discounted present value of accounting income of the firm under the three states of the world under each decision. Data in these tables are common knowledge to the manager of the firm and to the investors as a group. However, individual investors may have access to only a noisy signal about this data. Investors also know whether the firm is run by an I- or a C-manager.

The manager receives one of the two possible information signals, y_1 (if the state is S_1 or S_2) or y_2 (if the state is S_3). The market in aggregate, though not necessarily each investor, receives the same signal as the manager does.[6] The manager also knows that the investors either receive or can surmise this information. We shall show that in spite of having access to so much information, investors are unable to discipline the I-managers through the stock price mechanism.

3.2 OPTIMAL DECISIONS

A C-manager, who correctly models the investor decisions to be based on cash flow, chooses between decisions A and B after observing the signal (y_i, $i = 1, 2$) to maximize what he thinks will be the price placed on the firm's stock by investors. (Recall that the manager has an incentive to maximize the [expected] market value of the firm.) Since the data in tables 1 and 2, as well as signal y, are common knowledge to the manager and to the body of investors as a whole, the expectations of possible stock

[6] In other words, we assume that the market attains a fully revealing rational expectations equilibrium with respect to the information (y_1 or y_2) about the realized state of the world. Thus, the market is assumed to be strongly efficient. See Verrecchia [1983] for a discussion of these concepts.

prices reckoned by this manager are as follows:

$$\text{Expected Cash Flow } (B \mid y_1) = \frac{0.3 \times 1.9 + 0.6 \times 2}{0.9} = 1.97. \quad (1)$$

$$\text{Expected Cash Flow } (A \mid y_1) = \frac{0.3 \times 2 + 0.6 \times 1.5}{0.9} = 1.67. \quad (2)$$

A C-manager chooses B upon receipt of signal y_1, expecting the investors to price the stock at 1.97. Investors, knowing that the firm uses B and using the same data, arrive at the same price of 1.97, thus fulfilling the manager's expectation and reinforcing the manager's belief in the cash model of investor behavior. In contrast, A is chosen when the manager receives signal y_2, leading to the expectation of and realization of a stock price of 4 (the expected cash flow from decision B under signal y_2 is 1.8).

Before signal y_i is observed and decisions are taken, the stock is priced at $1.97 \times 0.9 + 4 \times 0.1 = 2.17$, given that the probabilities of signal y_1 and y_2 are 0.9 and 0.1 respectively. The ex ante price of 2.17 is also equal to the price that the C-manager expects to observe under the belief that investors value stocks on the basis of cash flow. Thus, the stock market provides no reason for the C-manager to abandon the cash model of investor behavior.

If the firm is run by an I-manager, expectations of stock price under the two decision options are determined as follows:

$$\text{Expected Accounting Income } (B \mid y_1) = \frac{0.3 \times 2 + 0.6 \times 1}{0.9} = 1.33. \quad (3)$$

$$\text{Expected Accounting Income } (A \mid y_1) = \frac{0.3 \times 1 + 0.6 \times 2}{0.9} = 1.67. \quad (4)$$

The manager chooses the market value maximizing the decision of A under signal y_1 and expects to observe a price of 1.67. But investors in fact follow the cash model, and having observed y_1 and the manager's decision to choose A, they too arrive at the price of 1.67 as calculated in (2).

Though investors impute the same price to the stock as the manager expects them to impute, they do so for different reasons. The crucial observation here is that the market price itself provides no clue to the I-manager that the I-model of investor behavior is incorrect. On the contrary, the manager's belief in this model is, if anything, reinforced because the observed market price fulfills the manager's expectation. Similarly, when the manager (and the investors in aggregate) observes y_2, the manager conducts the following computations of the expected

stock price under either accounting alternative:

$$\text{Expected Accounting Income } (B \mid y_2) = 1.8. \tag{5}$$

$$\text{Expected Accounting Income } (A \mid y_2) = 1.5. \tag{6}$$

Maximizing the market value under the I-model, the I-manager chooses B under signal y_2 and expects a stock price of 1.8, which is also the price the investor imputes to the stock using the information and the cash flows as calculated in (3) above. Again, the market reinforces, instead of disciplining, the behavior of this errant manager.

Before signal y_i is observed, stock of this firm is priced at $0.9 \times 1.67 + 0.1 \times 1.8 = 1.68$ because investors know that its value will be 1.67 with probability 0.9 and 1.8 with probability 0.1. The I-manager also expects to see this stock price, and the market observation reinforces the belief that the investors use the I-model.

In the above arguments we have assumed that the investors always know whether the firm is run by an I- or a C-manager. If we do not assume this, investors will infer the identity of the manager as soon as the signal y arrives and the manager makes the decision. The crucial point, however, is that the investors in the stock market cannot use the security price mechanism at any time, before or after the arrival of the signal, to inform the I-manager that the latter's beliefs about investor behavior are wrong. On the contrary, we have shown above that an efficient stock market may actually reinforce these wrongly held beliefs. The task of disciplining the I-managers can only be accomplished through other markets.

3.3 EMPIRICAL STUDIES OF PRICE CHANGES AND MANAGERIAL DECISIONS

What results should we expect of the empirical studies of the stock market price changes associated with the manager's decision? If the investors do, in fact, always price the stock "right" (i.e., in accordance with the consideration of cash flows) shouldn't we expect decision B adoption to be associated with positive price changes? The answer would be yes *only if* all managers acted under the belief that investors use the C-model to impute price to the firm's stock. As we illustrate next with our numerical example, when some managers act under the belief that the investors use the I-model, all B decisions do not enhance the cash flows of the firm. Various stock price effects of firms run by managers who use different models of investor behavior are confounded when the average change in stock price for a sample of B decisions is calculated.

The ex post valuations of stock after signal y_i is received and the managers make the decision choices are summarized in column 3 of table 3. Investors are always assumed to know what type of manager runs each firm. Since the investors know the probabilities of receiving signals y_1 and y_2, as well as the decision rules of each manager, they value the stock

TABLE 3
Change in Stock Price

(1) Manager Type and Information Signal Received	(2) Decision Choice of Manager	(3) Ex Post Valuation of Stock	(4) Probability of Signal y	(5) Ex Ante Valuation of Firm Managed by Manager of Known Type	(6) Stock Price Change: Ex Post–Ex Ante
(I, y_1)	A	1.67	0.9	$1.67 \times 0.9 + 1.8 \times 0.1 = 1.683$	$1.67 - 1.683 = -0.013$
(I, y_2)	B	1.8	0.1		$1.8 - 1.683 = 0.117$
(C, y_1)	B	1.97	0.9	$1.97 \times 0.9 + 4.0 \times 0.1 = 2.173$	$1.97 - 2.173 = -0.203$
(C, y_2)	A	4.0	0.1		$4.0 - 2.173 = 1.827$

before receiving signal y_i at the expected values given in column 5 of table 3. Changes from ex ante to ex post valuation for each signal and each type of manager are shown in the last column of the table.

Firms' managers who choose A after receiving signal y_i could either be the ones run by an I-manager and receiving signal y_1 or those run by a C-manager and receiving signal y_2. A sample of A firms will generally be expected to include each type of firm. While the change from ex ante to ex post price for (I, y_1) firms is negative (−0.013), it is positive (1.827) for the (C, y_2) firms. Consequently, the sign of the cross-sectional average of the stock price change for a sample of A firms could be positive or negative depending on the relative proportions of each type of firm in the sample.

The same argument applies to the B firms who must either be of type (I, y_2) or (C, y_1). The ex ante to ex post change in stock price is positive for the (I, y_2) firms and negative for the (C, y_1) firms. Therefore, the average change in the stock price for a sample of B firms could be positive or negative depending on the relative proportions of firms of each type in the sample and the magnitudes of the respective stock price effects.

As an illustration, consider the ambiguity in the sign of stock price reactions to *LIFO–FIFO* decisions as documented in various empirical studies.[7] Within our framework, it may arise because I-managers do not necessarily make *LIFO–FIFO* choices which are in fact maximizing even though they believe that they are doing so.

3.4 OPPORTUNITY FOR LEARNING BY MISTAKES

We have shown above that the capital market can reinforce the beliefs of both types of managers, the C-manager who has the right model and

[7] See Sunder [1973; 1975], Abdel-khalik and McKeown [1978], Brown [1980], Ricks [1982], Biddle and Lindahl [1982], Murray [1983], Stevenson [1984], and Ricks and Biddle [1984]. Also, see Lev and Ohlson [1982] for a review.

the *I*-manager who has the wrong model of investor behavior, as long as they make decisions which are optimal relative to their information and beliefs. This can be seen clearly in the equality of expected and observed prices in the optimal rows of table 4. However, the market does provide corrective feedback when these managers act, for whatever reason, suboptimally relative to their information and beliefs. When a *C*-manager acts suboptimally, the observed price is equal to the expected price and the market provides no incentive to this manager to switch from the *C*-model of investor behavior to the *I*-model. In contrast, when an *I*-manager acts suboptimally, the market reveals the error of the *I*-model by pricing the firm's stock differently from what the manager expected (see numbers marked ↔ in table 4). The difference between expected and observed prices gives the *I*-manager a reason to doubt if the *I*-model of investor behavior is correct. This opportunity to correct oneself through stock market discipline is available to the manager only when the decision is made suboptimally relative to the manager's information and beliefs. An *I*-manager who always makes locally optimal decisions may never reach the global optimum; local errors, some randomness, and/or search behavior interestingly seem to lead to globally superior results in this case. The higher the probability of error in making the local decision (i.e., *A* or *B*), the shorter is the expected number of periods or repeat trials to reach the global optimum through the market discipline.

4. *Numerical Example Part 2: The Generic Case*

4.1 NOISY MARKETS

Since the simple example given above uses the exact equalities of expected values of stock price under the *I*-model (*A* under y_1 and *B* under y_2), we may have left the impression that our explanation applies only to some rare pathological cases, rather than being generally applicable. Also, one could argue that the *I*-managers can learn from observations of the stock price of the *C*-managed firms, thereby discovering that their firms' values would increase if they changed their beliefs. In this section, by introducing noise into the market mechanism for pricing, we show

TABLE 4
Opportunity to Learn from Suboptimal Decisions

Manager Type	Decision	Signal					
		y_1			y_2		
		Decision Chosen	Price Expected	Price Observed	Method Chosen	Price Expected	Price Observed
I-Manager	Optimal	*A*	1.67	1.67	*B*	1.8	1.8
	Supoptimal	*B*	1.33 ↔	1.97	*A*	1.5 ↔	4
C-Manager	Optimal	*B*	1.97	1.97	*A*	4	4
	Suboptimal	*A*	1.67	1.67	*B*	1.8	1.8

that managers will not necessarily learn from cross-sectional observations. Hence the parameter set over which our model of disciplinary failure of the stock market holds is not a set of measure zero.[8]

In section 3 we assumed that the observed stock price is equal to its expectation under the C-model. It is more realistic to assume that the observed price will be equal to its expected value under the C-model (given in table 1) plus some white noise. When investors have diverse information, individual incentives to acquire information can be maintained only when the price constitutes a noisy rational expectations equilibrium in which it only partially reveals the information gathered by individual investors.[9] Let σ^2 be the variance of this noise.

Each manager holds a current belief (I- or C-model) at each point in time. When signal y_i is received, managers choose A or B to maximize the expected *value of stock* under their current beliefs. When actual prices of stock are observed, managers conduct a statistical test of their current beliefs to decide if they should be abandoned in favor of the alternative. Thus, the null hypothesis for I-managers is the I-model, with the C-model being their alternative hypothesis. We postulate a Neyman-Pearson procedure in which the manager chooses a tolerance level for type I error (α level) and establishes a region of rejection for the test statistic.[10] If the test statistic falls in the rejection region, the manager abandons the null hypothesis in favor of its alternative; otherwise the null hypothesis is maintained. The matrix of transition probabilities for the two hypotheses can be computed on the basis of the cumulative distribution function of prices under each hypothesis and the region of rejections elected for the test. The transition matrix can be used to compute the steady state proportion of I- and C-managers respectively in the population if the game were to be repeated indefinitely. Our point here is not that the game must be repeated indefinitely, but that even if it were, all managers are still unlikely to be converted to the C-model in a noisy environment.

4.2 OPTIMAL DECISIONS IN NOISY MARKETS

To illustrate, consider the firm in the numerical example of section 3 and alter its income numbers in table 2 to disrupt the strict equalities of expected values used to drive our argument in that section. Let table 2 be replaced by table 5. Then expressions (3), (4), (5), and (6) can be

[8] Intuitively, for a parameter set to have measure zero, the numbers chosen in section 3 must be representative of a knife-edge situation, and slight perturbations of the numbers may produce precisely the opposite result. This section shows that by addition of noise to the systems, the knife-edge situation becomes stable and generic.

[9] See Hellwig [1980] and Verrecchia [1982].

[10] For those who feel uncomfortable with classical hypothesis testing, we could make our manager a Bayesian. The cost of change is greater modeling complexity but the basic result will remain unchanged—the stock price signal will not convert all managers into C-managers in one shot or in a finite number of repetitions.

TABLE 5
Distribution of Accounting Income

	States			Expected Value
	$S1$	$S2$	$S3$	
Probability	0.3	0.6	0.1	
Decisions: A	1.2	2	1.5	1.71
B	2	1	1.6	1.36
Information Signal	y_1		y_2	

recomputed for the revised table:

Expected Accounting Income $(B \mid y_1)$

$$= \frac{0.3 \times 2 + 0.6 \times 1}{0.9} = 1.33. \quad (3a)$$

Expected Accounting Income $(A \mid y_1)$

$$= \frac{0.3 \times 1.2 + 0.6 \times 2}{0.9} = 1.73^*. \quad (4a)$$

$$\text{Expected Accounting Income } (B \mid y_2) = 1.6^*. \quad (5a)$$

$$\text{Expected Accounting Income } (A \mid y_2) = 1.5. \quad (6a)$$

An I-manager, having observed signal y_1, chooses A because he expects to observe the price drawn from a distribution whose *mean* is 1.73. This mean exceeds the mean price of 1.33 under decision B. If the I-manager observes y_2, he will choose B by a similar reasoning.

For the C-manager, the optimal choices remain unchanged from section 3 because the cash flows from table 1 remain the same. This manager chooses B under y_1, and expects to observe a price drawn from a distribution whose mean is 1.97; under y_2, A is chosen with a mean of 4.

For the purpose of illustration, and without loss of generality, let us assume that the variance of the white noise in the price process is 0.07 and that it is normally distributed. Also assume that the manager conducts a one-tailed test of the null hypothesis, his current belief, at the 5% ($\alpha = .05$) level of significance. Table 6 shows the probabilities of rejecting and failing to reject the null hypothesis for the two null hypotheses and for the information signals assuming that each manager chooses the accounting method which is optimal relative to his information and beliefs.

Since the probabilities of rejecting the null hypothesis (H_0: I-model) are not equal to one, it is immediately obvious that, in general, even an efficient security market does not always correct wrongly held beliefs of managers.

One is tempted to argue that a few repeated observations would suffice to discipline all errant managers. Unfortunately, that is not true either.

TABLE 6

Statistical Testing of Models by Managers

Manager Type	Signal							
	y_1				y_2			
	Optimal Choice	Anticipated Distribution	Actual Distribution	Probability of Rejecting H_0 at $\alpha = 0.05$	Optimal Choice	Anticipated Distribution	Actual Distribution	Probability of Rejecting H_0 at $\alpha = 0.05$
I-Manager H_0: *I*-Model	*A*	*N* (1.73; 0.07)	*N* (1.67; 0.07)	0.01	*B*	*N* (1.6; 0.07)	*N* (1.8; 0.07)	0.887
C-Manager H_0: *C*-Model	*B*	*N* (1.97; 0.07)	*N* (1.97; 0.07)	0.05	*A*	*N* (4; 0.07)	*N* (4; 0.07)	0.05

TABLE 7
Transition Matrix for C- and I-Models

		Belief After Testing	
		I-Model	*C*-Model
Belief Before Testing:	*I*-Model	0.9023	0.0977
	C-Model	0.05	0.95

Using the probabilities of y_1 and y_2, we can derive the transition matrix of managers' beliefs in the two models, as given in table 7. Note that there is no absorbing state. Over a large number of independent repetitions, this Markov matrix converges in the limit to a stable proportion of *I*- and *C*-model managers in the marketplace.[11] For our numerical example, that proportion is 34% and 66% respectively. Specific numbers are not important. However, it is important to note that if the stock market price is the only means of disciplining the managers, there will be an equilibrium proportion of *I*-managers in the marketplace, no matter what the cash flows and income numbers are under decisions *A* and *B*. Actions in and signals from other markets are necessary to drive the beliefs of all managers to the cash model.

5. *Alternative Disciplinary Mechanisms and Speed of Adjustment*

Having shown the failure of the stock market *alone* to force market-value-maximizing accounting decisions on firms, we now consider reasons that such discipline has not (or cannot) be imposed through other mechanisms. If these alternatives are as efficient as the stock market, the latter's failure to discipline managers would hardly be noticed because these mechanisms would take up the slack. In the following paragraphs we present several arguments about why the cost of using these mechanisms is high and their disciplining speed is slow. These characteristics are consistent with the apparent long delays in the adoption of cash-flow-maximizing decisions by many firms (e.g., *LIFO* over *FIFO*).

Alternative disciplinary mechanisms may be classified into four subsets: direct communication, market for corporate control, market for managerial labor, and educational. These mechanisms are freely available without constraint. Of course, no mechanism would be used unless the benefits of using it exceeded its cost.

5.1 DIRECT COMMUNICATION

In publicly held firms, major accounting decisions (such as *LIFO/FIFO*) are made through consensus or voting among the board of direc-

[11] Repeatedly multiplying a Markov matric by itself yields stationary probabilities in the limit when the limit exists. In our problem, the limit always exists.

tors, senior management, and corporate and outside accountants. The word "manager" used in our model does not represent an individual; it represents this decision-making collective, and the labels "*I*-manager" and "*C*-manager" are applied to the consensus views of this collective. Formation and alteration of this consensus is a complex process. The security price mechanism, whose operation is not controlled by any member of this collective and whose output is common knowledge to its members, is more effective in changing the consensus than alternative mechanisms that do not usually possess such properties.

One may also ask why shareholders and managers do not "get together" and arrive at a Coasian or cooperative game solution to their mutual advantage. The events of the market for corporate control in the eighties provide a massive body of evidence that such "get-togethers" do not always occur. Modern economic research in unanimity theory and cooperative games admits such failure to arrive at Pareto superior solutions when the number of parties involved is large.

5.2 MECHANISMS FOR WRESTING CORPORATE CONTROL

It is well known that proxy fights to oust all or most of the decision-making collective, the "manager," involve huge transaction costs of organization and sometimes litigation. Organizers of the proxy fight have to present convincing evidence to other shareholders of the incompetence of the "manager." These organizers face two hurdles: the cost of such a campaign can be very large and must be borne privately by those who wage the fight,[12] and convincing evidence on managerial incompetence is hard to obtain. For example, the empirical evidence on the stock market reaction to *LIFO* adoptions is ambiguous (also see our demonstration in table 3).

Consequently, the proxy battle as a disciplinary mechanism has a high cost, a long time lag, is risky and, therefore, relatively inefficient.

Larger shareholders who are not represented on the board of directors may alert potential raiders, or join forces with them, take over a firm at a lower stock price, and realize a riskless arbitrage profit by kicking out the *I*-managers. However, the costs of a takeover fight against the management may wipe out much of what appeared to be riskless arbitrage opportunities prior to the takeover. Scherer [1980, pp. 37–38] concludes: "Seen as a whole, the available evidence provides only weak support for the hypothesis that take-overs generate an effective disciplinary mechanism against departures from profit maximization." Indeed, raiders typically offer a *higher* price for the stock than is quoted in the marketplace. Thus the question of riskless arbitrage becomes moot.

[12] T. Boone Picken's campaign to oust the management collective of Gulf Oil cost tens of millions of dollars and the prize ultimately went not to Pickens but to Chevron Corporation. This example shows that proxy battles usually have large numbers of "free-riders" who do not contribute to the cost of waging the battle but gain from the win.

Also, as Mossin [1977, p. 143] argues, takeover bids are not as easily accomplished as some neoclassical economists believe because a takeover bid is *not* a substitute for a proxy fight. He states: "Why should a stockholder be willing to sell his shares to a raider? If he believes the raider's claim that another policy exists that would result in a higher price per share, and furthermore believes that the raider will be successful in carrying out his designs, then it would be certainly very stupid to part with his shares."

5.3 MARKET FOR MANAGERIAL LABOR

There are two significant obstacles to prompt disciplining of managers through the labor market: incompleteness of the market for managerial skills, and the economic externalities among the contracts of managers and other agents in the firm.

Managers can be thought of as skill-bundles which include efficient and inefficient skills. In the absence of a complete market for such skills, shareholders make trade-offs among these skills when they hire managers; sometimes they are unwilling to kick out an I-manager who is a good salesman in favor of a C-manager who cannot sell.[13] Dismissal of managers also can be quite costly. "Golden parachutes" for senior managers frequently run into tens of millions of dollars.

Externalities among the contracts of various agents constitute a second hurdle to efficiency in the labor market. If managerial contracts were to be designed alone, it is unlikely that they would be based on *GAAP* because *GAAP* permits managers to exercise discretion in the choice of accounting methods. An individually designed optimal contract would be more effective. In practice, bond covenants, as well as compensation contracts, are frequently based on *GAAP* (see Holthausen [1981]). A publicly held corporation has hundreds of contracts outstanding at any one time, and if the accounting system were individually optimized with respect to each contract, the firm might have to produce many sets of audited financial statements to satisfy the combination of accounting methods chosen for enforcement of each contract. When we consider the cost of auditing, and the potential problems of the credibility of an auditor who certifies multiple sets of divergent financial statements for the same firm, it no longer seems surprising that the vast majority of contracts continue to rely on *GAAP*.[14]

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[13] There is much current anecdotal evidence on this. Consider, for instance, the 1987 battle between Roger Smith, CEO of General Motors, and H. Ross Perot, who was paid $700 million (twice the price his stock was worth in the market) to leave the management team. Shareholders did not oust Roger Smith.

[14] In a multiperiod contractual relationship, concern for building a good reputation may attenuate managerial temptation to play accounting games. *GAAP*-based contracts may not be as bad as they look at first.

5.4 EDUCATIONAL MECHANISMS

These mechanisms represent efforts to change the managerial beliefs without threatening to wrest corporate control from the entrenched collective. Phone calls, letters, lunch meetings, picketing the corporate headquarters, the financial press, academic literature, and educational seminars belong to this class.

To illustrate, the case for *LIFO* under increasing prices is essentially theoretical. The empirical evidence being ambiguous, it is difficult for the "phone-callers" to convince the managerial collective that the stock price reaction to a *LIFO* shift will be unequivocally positive.

If one cannot educate managers by telephone, perhaps one has a better chance of educating them in the classroom. Again, there are two problems. Intellectual means of communication frequently take a long time to disseminate information. For example, the use of discounted cash flow as a criterion for capital budgeting lagged behind classroom teaching by over a quarter of a century. Second, those few students who do learn in class about capital market research in accounting are likely to remember that changes in the stock price and net income are positively correlated. The statistical linkage between accounting methods and stock prices, being more ambiguous, is less likely to be retained.

The assumptions we have used to derive the logical possibility of slow disciplining of managers are merely clinical statements of the existing reality. If the manager were in charge of a corporate subsidiary, a simple phone call or discharge from the job would prove to be an effective disciplinary mechanism. However, in the case of top-management collectives, which run most publicly held firms, enforcing such discipline is neither simple and prompt nor costless.

6. *Concluding Remarks*

A stock market, in which all agents—managers as well as shareholders—act rationally according to their beliefs and information, can fail to perform as a rapid disciplining mechanism to change managers' incorrect beliefs about investor decision rules. When this happens, managers either revise their beliefs on the basis of information from sources other than the stock market, or their locally suboptimal accounting decisions result in market price behavior which leads them to reject their null hypothesis of current erroneous beliefs about investor behavior.

Most attempts to explain managerial decisions have *assumed* that in an efficient market, managers are induced to make cash-flow-maximizing decisions if their compensation is linked to the stock price. Accordingly, much attention has been devoted to explaining accounting policy as being driven by other kinds of contracts, including alternative compensation plans, or by trying to show, for example, that cash flow savings from *LIFO* may be small or negative for *FIFO* firms. Such explanations may be correct. We have added a new contender—even if the cash savings are

positive and the compensation scheme induces market value maximization, an efficient market still will not necessarily lead managers to make optimal accounting decisions promptly.

As with all models, ours is designed to explain and analyze a specific phenomenon, namely, the failure of certain firms to adopt cash-maximizing decisions. To focus attention on this issue, we take for granted other features of the system, e.g., agency relationship between managers and shareholders, the stock market, the accounting system, taxes, availability of multiple methods of inventory valuation, etc. It is not our purpose to explain all these features.

Several directions for further exploration and extensions of the model can be pursued. First, strategic gaming behavior could be introduced to the present model. Suppose there are two sets of I-managers and two sets of C-managers. I_1 receive signal $y_{11} = \{s_1, s_2\}$, I_2 receive $y_{12} = \{s_2, s_3\}$, and, similarly, C_1 receive y_{11} and C_2 receive y_{12}. By appropriately changing the cash flows in the example, it can be shown that I_2 may wish to behave strategically as C-managers and C_2 may wish to behave strategically as I-managers. This would confound the pricing process; if information is costly, instead of a fully revealing price function, a price correspondence per signal or a noisy rational expectations equilibrium may emerge (see Verrecchia [1983]). The actual prices may be randomly realized from these correspondences so that the prices will neither discipline the managers nor reveal all or part of the information to the investors. In this case, the entire burden of disciplining the manager would fall on the nonmarket processes. Even takeovers may prove to be risky and arbitrage will not be riskless.

A second extension would be to study the comparative statics of parametric changes in the probability of committing a policy error in a given price model. The results should generate an inversely varying discipline time: the larger the probability, the shorter the duration between the time a manager shifts from the I-model to the C-model.

A third extension would be to set up an experimental market to verify the model in the paper or the extensions suggested above. Sunder [1984] has shown, in a different context, that when information acquisition requires a fixed cost outlay, the equilibrium price behavior can become random, and therefore generate no information.

A fourth extension would be to examine the alternative market mechanisms, such as industry conventions and trade associations, that lead to an exchange of information in which an I-manager finds out that his beliefs about investors are incorrect given the superior performance of a C-manager in an almost identical firm. The frequency of contact (as in the search model of Salop and Stiglitz [1976]) would be the parameter on which comparative statics of the duration to recognize mistake can be based. This duration can be compared to data on how long firms in different industries have taken to make policy changes, for example, to shift from *FIFO* to *LIFO*.

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