

## Comment on Forward Markets, Stock Markets, and the Theory of the Firm

VOJISLAV MAKSIMOVIC, GORDON SICK, and JOSEF ZECHNER\*

### ABSTRACT

In a recent article, MacMinn [5] argues that the presence of forward markets eliminates the incentives of the firm's manager to choose production levels that maximize firm value. In this comment, we show that his results do not depend on the presence of forward markets. The critical assumptions are that the manager is endowed with money rather than stock in the firm and that there is no competitive labor market for managers. In addition, his results require time-inconsistent behavior on the part of the firm's manager.

MACMINN [5] SUGGESTS THAT THE introduction of forward markets for a firm's output commodity makes management indifferent to alternative production plans. This eliminates the incentive for management to maximize the value of the firm. In Section I, we show how MacMinn's results require that the manager's endowment consist of money rather than human wealth or equity of the firm, as well as the absence of a competitive market for managerial labor. We show that the presence of forward markets is just a special case of a technical spanning assumption, so that his results cannot be construed as evidence that the introduction of forward markets reduces social welfare. Section II shows how MacMinn's results require time-inconsistent behavior on the part of the manager. Section III discusses the features of incentive options that MacMinn uses to obtain incentive compatibility. Section IV provides some concluding remarks.

### I. Monetary Endowment, Spanning, and Managerial Indifference

MacMinn's Proposition 1 shows that the value of the firm is invariant to its position in the forward market. His Proposition 2 demonstrates that the welfare of the manager is invariant to the production decisions of the firm; that is, the manager has no incentive to maximize firm value. The reader gets the impression that the presence of forward markets is the key in Proposition 2. We argue below that the presence of forward markets is only incidental to Proposition 2.

The critical assumption, which is not clearly stated, of Proposition 2 is that the manager is endowed with money, rather than shares of the firm. By announcing a suboptimal production plan, the manager will find that the market value of the firm's shares drops. The price drop does not hurt the manager because he or she does not yet own shares. The low price merely allows the manager to buy a

\* Maksimovic and Zechner are at the University of British Columbia, and Sick is at the University of Calgary. This comment was written while Gordon Sick was visiting at UBC. The authors are grateful to an anonymous referee for helpful suggestions.

larger portion of the firm to achieve the same play in the firm's risky output commodities.

The incentive problem evaporates, however, if the manager is endowed with stock in the firm, because the manager then has incentives to maximize value by optimizing output.<sup>1</sup> Alternatively, as shown by Fama [3], a competitive market for managerial services would also resolve the incentive-compatibility problem. Thus, MacMinn's model tacitly rules out a well-functioning market for managers.

While MacMinn's results crucially depend on the absence of discipline from a managerial labor market and a monetary rather than stock endowment for the manager, his results do not particularly depend on the presence of forward markets. The presence of other markets, such as the market for shares in other firms in the same industry, will lead to the same conclusion. His proofs go through as long as there are enough securities to span the payoffs of the firm and his other assumptions essentially require this. To see this, note that, even though MacMinn allows investors to have heterogeneous beliefs and preferences, there is unanimity amongst investors about the firm's investment decisions and the Modigliani-Miller (M-M) irrelevance of capital structure holds. Generally speaking, the unanimity and M-M results require that the operating cash flows of the firm must be spanned by securities that already exist in the market and that the firm must be a price taker in securities markets.<sup>2</sup>

Under those assumptions, the manager can make a compensating adjustment in the level of shares purchased to achieve precisely the same stochastic personal wealth level regardless of the firm's production level or the existence of futures markets.<sup>3</sup> To see this in the context of MacMinn's model, consider the production decisions of firm  $h$ , which is managed by individual  $i$ . Assume, for simplicity, that the firm produces a single output commodity, so that the production level  $y_h$  is a scalar. Using the M-M theorem and MacMinn's Proposition 1, we will assume, without loss of generality, that the firm has no debt and takes no position in the forward market. To establish Proposition 2, we must show that, if the manager adjusts the firm's output level from, say,  $y_h^*$  to  $y_h^{**}$ , he or she can make a compensating adjustment in the level of shares purchased from, say,  $s_{ih}^*$  to  $s_{ih}^{**}$  without changing the stochastic personal wealth level:  $\tilde{W}_i^{**} - \tilde{W}_i^* \equiv 0$ . Using the representation of the manager's wealth that appears in MacMinn [5] on the bottom of page 1170, this change is simply the change in the product of the excess return times the amount of shares purchased,  $s_{ih}^{**}(\tilde{R}_h^{**} - r) - s_{ih}^*(\tilde{R}_h^* - r)$ , where the riskless interest rate is  $r$ , the return on the unleveraged, unhedged firm is  $\tilde{R}_h^* = (\tilde{P}y_h^* - c_h(y_h^*))/S_h^* - 1$ , and  $S_h^*$  is the value of the shares. Assuming unanimity (as does MacMinn), the valuation operator does not depend on investor  $i$ 's individual marginal utility  $Du_i$  or beliefs  $G_i$ . Then, using MacMinn's

<sup>1</sup> In fact, in MacMinn's model, there is no agent who is initially endowed with shares of the firm or whose wealth depends on firm value. Therefore, all agents are indifferent about the firm's production plan.

<sup>2</sup> See, for example, Ekern and Wilson [2] and Duffie and Shafer [1] for the importance of spanning to unanimity and Stiglitz [6] for the importance of spanning to the irrelevance of capital structure. Leland [4] shows that the unanimity result can fail if the demand for the shares of the firm is not perfectly elastic.

<sup>3</sup> At this point, we are using MacMinn's implicit assumptions that the manager is not endowed with shares in the firm and is not given an incentive-based compensation scheme, of course.

notation and normalizing marginal utilities so that  $\int DudG = 1$ ,  $S_h^* = (\int (\tilde{P}y_h^* - c_h(y_h^*))DudG)/(1 + r)$ . Thus, since the cost of production is nonstochastic, the excess return on the firm is

$$\tilde{R}_h^* - r = \frac{(1 + r)y_h^*(\tilde{P} - \int \tilde{P}DudG)}{\int (\tilde{P}y_h^* - c_h(y_h^*))DudG}.$$

If the manager readjusts his or her share ownership so that

$$s_{ih}^{**} = s_{ih}^* \frac{y_h^*}{y_h^{**}} \frac{\int (\tilde{P}y_h^{**} - c_h(y_h^{**}))DudG}{\int (\tilde{P}y_h^* - c_h(y_h^*))DudG},$$

then  $s_{ih}^{**}(\tilde{R}_h^{**} - r) \equiv s_{ih}^*(\tilde{R}_h^* - r)$  and hence  $\tilde{W}_i^* \equiv \tilde{W}_i^{**}$ . The manager can undo the change in the production decision so as to leave his or her welfare unchanged. Thus, it is not the presence of forward markets that causes managerial indifference, but the assumption that the manager is not endowed with shares of the firm, combined with the spanning and price-taking assumptions.<sup>4</sup>

## II. The Time Inconsistency of Suboptimal Production Decisions

Even if the manager is not endowed with shares, as in MacMinn [5], the possibility of trading shares makes non-value-maximizing production decisions time inconsistent. The only time-consistent (sequentially rational) strategy for the manager is to announce the value-maximizing production plan and to follow through with it. To see this, suppose the manager announces a plan that does not maximize firm value. This will drive down the stock price and allow the manager to buy stock cheaply.<sup>5</sup> Then the manager can switch to the optimal production plan and earn an arbitrage profit at the end of the production period corresponding to the productivity improvement. Note that the shareholders need not force the manager to maintain the long position in the stock since the manager will not profit without either holding out to the end of the production period or making a credible announcement of the revised production plan and then selling the shares at a profit. The market will rationally anticipate that the manager can do this and will bid up the stock price at the very first trading opportunity.<sup>6</sup>

## III. Options and Managerial Incentives

In Proposition 3, MacMinn shows that incentives to maximize value can be achieved by offering the manager a nontradable stock option. If the option is

<sup>4</sup> Generally, introducing additional markets will reduce rather than increase incentive-compatibility problems because a more complete market structure allows the manager to diversify. This enables agents to write more efficient managerial labor contracts because optimal incentive contracts impose less of a cost on the manager from suboptimal portfolio diversification. Thus, we would not expect that making markets more complete, e.g., by introducing forward markets, makes it more difficult to align the manager's and shareholders' interests.

<sup>5</sup> If the manager wants to be insulated from variations in commodity prices, he or she can take an offsetting position in the commodities or other securities that span the firm's cash flow stream.

<sup>6</sup> Note that, if the manager were allowed initially to short sell shares in the firm, it would pay to announce an optimal production plan and then revise to a less-than-optimal production plan. Such short sales are generally precluded by law.

guaranteed to expire in the money, this is in effect the same as endowing the manager with stock and a loan. Since the manager can undo the loan in financial markets, this is equivalent to endowing the manager with stock. There are two important things to observe here.

First, it is not essential that the option be nontradable. It is only essential that the manager not be able to sell the option before precommitting to the production plan of the firm. However, there will be substantial moral hazard facing anyone who buys a stock option from a manager without obtaining a precommitment that the firm will adopt an optimal production plan, so the manager will not likely be able to trade the option before announcing the production plan.

Second, compensating the manager with an option that could expire out of the money gives the manager incentives to increase the risk of the firm. Thus, the manager may have an incentive to make the firm more risky than the shareholders would want. With decreasing returns to scale in production, the level of production determines the amount of operating leverage and, hence, the risk of the firm, and, therefore, the option will generally result in incentive-compatibility problems with the shareholders.

#### IV. Conclusion

We have shown that MacMinn's argument that the presence of forward markets eliminates the incentives of managers to maximize the value of the firm is incorrect. The lack of incentives requires that a) managers are not endowed with stock, b) there does not exist a competitive market for managerial services to the firm, and c) managers are not allowed to purchase shares of the firm before announcing its production plan. The presence of forward markets is not a critical assumption in the paper. Rather it is a special case of a technical spanning condition that simplifies the analysis and makes the welfare questions well defined. Moreover, MacMinn's suggestion that compensating the manager with a guaranteed-in-the-money call option on the firm is equivalent to endowing the manager with shares in the firm. However, it is not necessary to prevent the manager from selling this option prior to expiry, as MacMinn suggests. If the option could expire out of the money, the option scheme could still result in divergent incentives between the manager and the shareholders.

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