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Intrinsic Bubbles: The Case of Stock Prices A Comment

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Abstract

Some recent empirical evidence suggests that stock prices are not properly modelled as the present discounted value of expected dividends and that empirical models incorporating nonlinear bubble components better fit the data. In this paper we show that the nonlinearity in the relationship between prices and dividends may arise from how managers choose dividend payout. In particular, we propose a model of managed dividends which can explain observed long-term trends in stock prices. This model of managed dividends is shown to be observationally equivalent to the popular intrinsic bubbles model.

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Deviations in stock prices from those predicted by the simple present value model based on constant discount rates, ordinary cash dividends, and rational expectations appear to be substantial and persistent over time. However, until a recent paper in this *Review* by Kenneth A. Froot and Maurice Obstfeld (1991a), no other parsimonious model of stock price has found empirical support. Froot and Obstfeld model stock price using a rational >intrinsic= bubble which depends exclusively on economic fundamentals, i.e., aggregate dividends, and not on the extraneous or extrinsic factors which often underlie bubble terms. Intrinsic bubbles are appealing because they are able to generate persistent deviations from present-value prices, but the deviations are driven exclusively by changes in fundamental value. Despite this appeal, the intrinsic bubbles model has not ended the search for alternatives to the simple present-value model. These bubbles are arbitrary and problematic in that their existence depends on rather stringent assumptions about investor behavior and the dynamic inefficiency of the economy. Froot and Obstfeld assert that "(e)ven if one is reluctant to accept the bubble interpretation, the apparent nonlinearity of the price:dividend relation requires attention" (1991a, p. 1208).

Our purpose is to propose another interpretation of their results. However, there is an important theoretical distinction between their alternative hypotheses and the model of dividend regulation we outline. The model we offer is not suggestive of short-run speculative profit opportunities nor does it imply that Athe market is literally stuck for all time on a path along which price:dividend ratios eventually explode@ (Froot and Obstfeld, 1991a, p. 1190). To explain the apparent nonlinear relationship between stock prices and dividends, we appeal to observed managerial behavior.

There is no generally accepted theory of optimal dividend policy. In fact, the pioneering work of Merton H. Miller and Franco Modigliani (1961) shows that dividend policy is irrelevant in the absence of taxes and transactions costs. John Lintner's (1956) classic study, which suggests that dividends are a distributed lag on earnings, provided a foundation for our understanding of how firms choose dividends. Empirical studies by Eugene F. Fama and Harvey Babiak (1968), R. Richardson Pettit (1972), Ross Watts (1973), Marsh and Merton (1987), and Bong-Soo Lee (1996) provide empirical support for Lintner=s model though models of economic behavior that predict dividend smoothing by managers have only recently been proposed by Vincent A. Warther (1994) and Drew Fudenberg and Jean Tirole (1995). Yet, Robert J. Shiller (1984) points out that

that is able to explain the relationship between prices and dividends. Although our model may not seem to appropriately describe dividend policy at the firm-specific level, it is a reasonable representation for an aggregate index of firms. See Marsh and Merton (1987) for motivation of studies on aggregate-dividend behavior.

In our model price is a function of fundamentals alone; however, fundamental values are unobservable. Instead, we observe a managed dividend series. We show that the observable effect of dividend control on the price-dividend relation is identical to the effect of intrinsic bubbles. Thus, the nonlinear relation between prices and dividends may be attributable to how managers choose to manage dividends which, in effect, makes Froot and Obstfeld's intangible bubble tangible. This result improves our understanding of the relationship between prices and dividends.

The note is structured as follows. In section I, we posit a simple discounted present value model of stock price. Section II provides concluding remarks.

I. Dividend Control in a Present-Value Model

process given in equation (1) is Markov and the probability distribution of D_t increments depends only on its current level and the parameters.

The intrinsic value of the firm's shares under the present-value model is obtained by

$$P_t = E[\int_0^{infinity} D_{t+s} e^{-ks} ds]$$

discounting the expected future dividend stream, i.e.,

where P_t is the time t stock price, E is the expectations operator, and k is the discount rate. With a constant growth rate in dividends (μ) and in the absence of dividend regulation by management,

$$P_t = \frac{D_t}{k - m}$$

equation (2) has the familiar simple solution

where $k > \mu$. In the case of dividend regulation or control, a problem arises when evaluating the present value relation in equation (2) because the true dividend or fundamental $\{D_t\}$ is unobservable. Instead, we observe the managed dividend process $\{d_t\}$.[2]

The dividend management process we envision is one in which actual cash dividends

supported, the dividend is reduced to a level that is consistent with the permanently lower earnings capacity. Similarly, if future earnings capacity is deemed sufficient to support a permanently higher dividend, the dividend is increased above the current level. Earnings in excess of total dividends paid are retained in the firm at a given reinvestment rate.

As is well known, most firms exhibit a bias against lowering cash dividends which suggests that managers place a lower bound on the level of cash dividends. This bound represents a barrier below which management is reluctant to reduce dividends, even when earnings capacity is consistent with a lower payout level. The firm may resort to liquidating assets in order to maintain the level of dividend payment. However, if the level of dividend payment cannot be supported by earnings, management may choose to shift the lower barrier downward to accommodate the change in fundamentals. Ordinarily, this lower barrier serves as a reflecting barrier for the dividend process.

On the up side, evidence regarding a firm=s actual cash payments suggests that management has the flexibility to increase dividends if earnings capacity supports the increase. However, beyond some level, dividend increases must be justified by strong evidence of a permanent increase in the firm=s earnings capacity. The upper bound for the dividend process can

cash dividends has lower, l, and upper, u, reflecting barriers. In this specification, $\{d_t\}$ is a regulated geometric Brownian motion process with dynamics given by equation (1) in the absence of regulation. As a result of dividend management, when the dividend process $\{D_t\}$ reaches the upper barrier (u) or the lower barrier (l), the observed dividend process $\{d_t\}$ is reflected back towards the interior of the band $[l, u]$. Thus, the dynamics of dividends suggested by this model are quite different from those suggested by Lintner.

Following Samuel Bentolila and Giuseppe Bertola (1990, page 386), the managed dividend

$$d_t = D_t U_t / L_t$$

stream $\{d_t\}$ can be related to the true dividend process $\{D_t\}$ as follows

where $\{L_t\}$ is a lower regulator defined as the unique, nondecreasing, continuous process which increases only when d_t equals l keeping $d_t \$ l$ and $\{U_t\}$ is an upper regulator defined as the unique, nondecreasing, continuous process which increases only when d_t equals u keeping $d_t \# u$ (see also J. Michael Harrison, 1985, page 20). In our model, the barriers, u and l, are exogenously specified.

The stock price can be expressed as a function of managed cash dividends following

where A and B are constants determined by boundary conditions and ß1 and ß2 are the positive and

$$Q \equiv 1/2\, s^{2}\, b(b-1) + (k-m)b - k = 0,$$

negative roots to the quadratic equation

and the other variables are as previously defined. Our formulation rests on the simplifying assumption that incremental retained earnings resulting from the dividend management process earn exactly the capitalization rate, k. In this case, a stockholder is indifferent between receiving the incremental earnings (which may be negative) and the capitalized cash flow in some future period. On this indifference see Myron J. Gordon (1962, Chapter 5). As the reader can verify, equation (5) is equivalent to the general solution provided by Froot and Obstfeld (1991a, footnote 8, page 1192) for their intrinsic bubbles model. Although our general solution includes two nonlinear terms, Froot and Obstfeld exclude the second nonlinear term in their estimation because the estimate of the second term was imprecise and its inclusion did not contribute to explaining movements in stock price. In our empirical examination of the model we also find that estimates vary widely, though the coefficients of both nonlinear terms are significantly different from zero in some sample periods (Ackert and William C. Hunter, 1996).

type of model may be more realistic, the analysis of such models is extremely complex.

II. Concluding Remarks

Froot and Obstfeld proposed a model of stock price that includes intrinsic bubbles and showed that the intrinsic bubbles model is superior to a simple constant growth rate model in predicting changes in actual stock prices. Their model is better able to track changes in actual stock prices because of the inclusion of a nonlinear bubble. However, as Froot and Obstfeld recognize, the rational bubbles specification is not the only one that can explain stock price movements. In this extension of their analysis, we show that the nonlinearity in the relationship between prices and dividends may arise from how managers choose dividend payout. In particular, we propose a model of managed dividends which can explain observed long-term trends in stock prices. In contrast to Froot and Obstfeld, the long-term trends implied by the model we develop do not depend on bubbles, but instead result from observed management behavior. As Froot and Obstfeld=s intrinsic bubbles model and the dividend control model described herein are observationally equivalent, the same gains in predicting actual stock prices that arise in the bubbles model can be derived from the model of dividend control.

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Notes

1. See Froot and Obstfeld (1991a), footnote 4, in particular, where they discuss models of fads and bubbles that are consistent with their results. John Driffill and Martin Sola (1998) show that a stock price formulation based on a dividend switching model better explains stock prices than a bubble model. Our model can be viewed as another interpretation and is compatible with Froot and Obstfeld=s conceptualization.

2. The observed, ordinary cash dividend is not the only cash flow received by shareholders. The finance literature has long recognized that firms distribute cash flows to shareholders through other methods (Miller and Modigliani, 1961). The importance of other cash payments to shareholders, in addition to ordinary cash dividends, is well documented (see, for example, John B. Shoven, 1987; Laurie Simon Bagwell and Shoven, 1989; Lucy F. Ackert and Brian F. Smith, 1993). The difference between the fundamental and ordinary cash dividend may reflect other cash distributions such as share repurchases and takeover distributions, among others.

3. The solution given in (5) requires that Paul R. Krugman=s (1991) Asmooth pasting@ conditions