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The influence of the Modigliani-Miller (1958) propositions on capital structure and the Miller-Modigliani (1961) theses on dividend policy permeates almost all aspects of financial economics to this day. The implications of their methodological innovations for later work on option pricing, on the constrained optimality of stock markets, and in public finance and macroeconomics have been noted elsewhere in this symposium. In this commentary, I shall focus on the influence of Miller's and Modigliani's contributions on a couple of key areas in corporation finance, and review research progress by later contributors.

My choice of these topics has been motivated by two distinct criteria: their central importance in understanding corporate financial policy and equity valuation, and their preeminence in later contributions by Miller (1977) and Modigliani (1982) in their presidential lectures to the American Finance Association, as well as in Miller (1987) and Modigliani and Cohn (1979), for example. Broadly speaking, these two themes can be summarized as: (A) integrated tax- and information-related considerations in capital structure and dividend policy choices; and (B) the impact of inflation and nominally denominated debt contracts on the valuation of corporate equity.

Debt and Dividend Policy Choices

The key methodological contributions of the MM (1958, 1961, 1966) papers were, in my opinion, those of: (a) introduction of the risk-class (set of payoff patterns mutually replicable through trading) notion; (b) consideration of investor arbitrage

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(homemade leverage) in pricing securities; (c) initiation of integrated after-tax analyses of dividend and debt supply policies of firms; (d) consideration of empirical evidence and introduction of "respectable" econometric methods in corporate finance; and (e) planting seeds for the development of economic modeling of unexplained phenomena, such as the "informational content" of dividends for stock prices. In this section, I shall focus in particular on topics (c) and (d), and developments along the lines of topic (e). Extensions of the MM methodology on (a) and (b), to considerations of alternative equilibria and the endogeneity of risk classes of equities in infinite-horizon economies, will be germane to the discussion of the impact of inflation and leverage on equity valuation in the next section.

From MM (1963) we knew that, based on the differential tax deductibility of interest costs at the corporate level, the addition of D dollars in market value of debt should add a tax-shield value ($T_c \times D$) to firm value, where T_c is the corporate tax rate, if the following assumptions hold. First, the debt is a perpetuity; second, interest is effectively tax-deductible (earnings are nonnegative) whenever it is paid; third, there are no other costs of debt, and no information about earnings prospects is communicated by the use of debt. In Miller (1977), this calculation was modified to reflect the tax advantage of equity at the personal level, owing to lower and postponable taxation of capital gains (see the equation in his current article). This analysis (and Stiglitz, 1973) raised the possibility that choices of corporate leverage could be determinate (by investors' demands) only at the aggregate level, with indifference for valuation at the level of the firm.

Miller's work also focused on the tax consequences of that other major financial policy variable, the payment of dividends. In an often-cited article, Miller and Scholes (1978) suggested that the (pre-1986) personal tax disadvantage of dividends relative to capital gains could be obviated by investors' portfolio strategies. Specifically, taxable investors would borrow to generate interest deductions equal to their dividend income, and invest the borrowing proceeds in tax-exempt means of accumulation such as cash-value life insurance (subject to legal limitations to pursuing such schemes; see also Stiglitz, 1973). Together, Miller's papers advanced the notion of firm-level *indifference* to debt and dividend policies for valuation, as a candidate solution for market equilibrium.

Empirical evidence has, by and large, gone against the above parsimonious view of corporate financial policy. Studies of the marginal bondholder tax rate across tax-exempt (municipal) and taxable bonds, exemplified by the recent paper of Buser and Hess (1986), suggest the following. The tax rate T_{PB} of the marginal bondholder indifferent between taxable and tax-exempt bonds is on average significantly below the corporate tax rate T_C. The differential between these two rates, and the resulting positive marginal tax-shield value of corporate debt (as measured by the equation in Miller's article) suggest a major role for other offsetting costs of debt in determining optimal leverage choices. (See Stiglitz (1985), as well as Kim (1988), for models of such costs.) These costs include (a) loss or postponement of interest tax shields due to future bankruptcy, (b) the present value of prospective bankruptcy-related costs, and (c) the "agency costs" of managerial behavior—such as under-investment and overly

risky strategy choices—that can occur when levered equity holders have limited liability.[1] These costs, and thus the required offsetting tax shield of debt, are likely to be higher when corporate earnings are depressed, with some temporal persistence, since that increases the risk of default at a given level of debt. The empirical evidence of Buser and Hess on the cyclical behavior of T_{PB} indirectly confirms this prediction of theories that model interior choices of debt-equity ratios, choices that arise from the tradeoff between the net positive tax-shield value versus other "deadweight" costs of debt.

Evidence on the impact of dividend policy on equity valuation is also, on balance, against the Miller-Scholes (1978) solution. However, it is fair to admit that there is some controversy over the interpretation of this evidence (for example, Litzenberger and Ramaswamy, 1980, vs. Miller and Scholes, 1982). Much of this controversy has to do with the interpretation of the observed impact that dividend yields have on the risk-adjusted returns on equities. It has been known for a long time that unanticipated (relative to trend) announcements of dividend increases are associated with contemporaneous increases in stock prices, a linkage often termed the informational content of dividends (Miller, 1987). The essence of the difference between Miller-Scholes and Litzenberger-Ramaswamy has to do with determining the "right" proxies for anticipated dividend yields, so that higher risk-adjusted average returns on high-dividend stocks can be interpreted as a tax-induced effect that equates returns net of personal taxes.

Based on studies of stocks on the New York Stock Exchange (NYSE), Litzenberger and Ramaswamy (1980) and others (for example, Keim, 1985, in non-January months) conclude that an extra percentage of dividend yield causes investors to demand roughly a 0.2 percent increase in total pre-tax equity returns. Miller and Scholes (1982), using different lagged dividend yield measures, arrive at a much smaller number close to zero. However, there is a further wrinkle. Since investors in different personal tax brackets (e.g., pension funds versus individual investors), should hold different portfolios of high- and low-dividend stocks, the impact of dividends on required returns should be different in separate yield categories. Both Litzenberger-Ramaswamy and Miller-Scholes, using very different dividend-yield measures, find this to be the case. As Modigliani (1982) notes, this similarity alone creates some presumption in favor of the contention that the higher required returns on high-dividend stocks are due to tax effects. On balance, the evidence suggests that, prior to the 1986 Tax Reform Act, firms would have reduced the required return on their equities by reducing their dividend payout.

For large changes in dividend policy though, other valuation tradeoffs can come into being. The seminal analysis of MM (1961) assumed that lower dividends (greater retention) would be matched by lower new equity issue, holding the levels of investment and debt constant. For many firms outside the regulated utilities industries

[1]The work of Stiglitz and his coauthors (see Stiglitz, 1985, for a summary), on these incentive effects of capital structure, provides important qualifications to the MM (1958) leverage indifference proposition. The use of income bonds, with interest paid given sufficient income, or collateralized junior debt (Bhattacharya, 1988), can ameliorate some of these agency costs of debt arising from limited liability.

—which can pass through their cost of capital to the rate base—new equity issues are few and far between, and the relevant tradeoff holding investment constant might be that of greater retention leading to a lower level of debt issue. If, as some find plausible (Modigliani, 1982), the *net* positive tax shield per unit of debt was around 20 percent, and this was comparable to the marginal tax disadvantage of a dollar of dividends for valuation, then this debt-dividend tax tradeoff might have been a matter of indifference. Further work on this issue is warranted, although the 1986 Tax Reform Act has drastically reduced the personal tax advantage of capital gains relative to ordinary (dividend or interest) income, and thus also increased the tax shield value of corporate debt.

What about the analytical assumption, recommended by MM (1961), that investment be held constant when analyzing dividend policy choices? Several recent studies of the dividend payout "puzzle" (Auerbach, 1984; DeAngelo, 1987), assume that real investments are made by firms with retained earnings which would *not* be made with new equity issues, until the point at which the alternative of paying taxable dividends to equity dominates. However, the feasibility of firms using retained earnings to purchase marketed securities voluntarily held by households, together with the low taxation of intercorporate dividends, casts doubt on this phenomenon as being the major determinant of corporate investment and dividend payout policies.

An alternative set of models, grounded in *asymmetric information* between corporate insiders and outsiders (future shareholders), seeks to simultaneously explain both the payout and informational content aspects of dividends.[2] One set of examples, including Bhattacharya (1979), John and Williams (1985), and Miller and Rock (1985), focuses on circumstances in which: (a) current earnings of firms are asymmetrically known by insiders who serve current shareholders' interests; (b) shareholders who need to sell, currently or in the future, care about the firm's valuation for their overall returns; and (c) dividends paid have deadweight costs such as personal taxes, corporate transaction costs of refinancing cash flow shortfalls, or costs of under-investment. In these circumstances, it can be shown that firms may use dividends as a costly *signal* of the Spence (1973) type, to differentiate each other and communicate higher (anticipated) earnings to the stock market with higher dividends. Given knowledge of the intertemporal stochastic process of economic earnings, the market then arrives at informationally accurate current valuations of firms that are increasing in the level of dividend payout. The reason dividends work as a signal is that the expected marginal cost of *some* component of the deadweight cost of dividends is negatively related to (expected) earnings, so that only firms with higher earnings prospects are induced to pay higher dividends in a separating equilibrium.[3]

[2]Almost any conceivable resolution of the dividend payout puzzle has to assume that a systematic policy of repurchasing equity would result in taxation of the payout as dividend income for shareholders, particularly if other financing is raised simultaneously to fund investments.

[3]In Bhattacharya (1979), this component is the expected value of the potential costs of financing shortfalls of earnings relative to dividend commitments. These costs are allowed to be arbitrarily small relative to the personal tax cost of dividends, which is unrelated to earnings.

These costly signaling models make predictions about dividend policy that are in line with empirical evidence (Eades, 1982). First, unanticipated increases in dividends should be followed by stock price increases. Second, higher differential personal taxation of dividends, relative to capital gains, should lead to lower dividend payouts because of the increased deadweight cost of the dividend signal. Third, in the cross-section, higher-risk firms should pay lower dividends relative to average earnings because their likelihood of costly cash flow shortfalls is higher. The second comparative static is often *not* true in models in which dividends are paid solely as "residuals" to meet the current consumption needs of investors.[4] Other empirical features of corporate dividend behavior (systematically analyzed in Lintner, 1956), such as their sluggish or discrete adjustments to changes in earnings, are predicted by signaling models in which endogenous investment, chosen following the dividend signal in line with shareholders' interests, plays a major role; see Kumar (1987).

These signaling models require us to modify several conventional notions about the firm's decision criterion and, possibly, the separation of different categories of financing and investment decisions. Foremost among these is the fact that maximization of current market value is no longer an adequate criterion for decision-making at the firm level. The assumed motive for dividend-signaling is the desire of different shareholders to liquidate their holdings at a mix of different times. Thus, assuming a stationary mix of shareholder horizons, some collective weighted average of current and future valuations (and after-tax dividends received) is relevant to decision-making, as Bhattacharya (1979) noted and Miller-Rock (1985) emphasized. Miller and Rock also let the level of investment be determined as a residual by the dividend signal, in contrast to the stance of MM (1961). The resulting signaling cost of underinvestment retains validity in the post-1986 tax regime.

Another salient feature of most costly signaling models of dividends is their assumption that current earnings *cannot* be communicated to outsiders through accounting disclosure. A more reasonable assumption would be that, despite some managerial discretion regarding accounting rules, some coarse indicators of true economic earnings (and, with repetition, their temporal stochastic process) do emerge through the accounting process, and these serve to discipline insiders' incentives to overstate their firm's prospects to raise its value. In Bhattacharya (1980) I considered a "contingent contracting" mechanism in which divergences between dividends or earnings forecasts and realized later earnings lead to revisions of firm values in the equity market. The expectation of this revision process, in turn, leads insiders to pick dividend levels (or earnings forecasts) as signals in line with their "true" earnings prospects, leading to informed valuation.

This model, as noted in the paper, had a major lacuna. Except for special cases (like a random walk in cash flows), there was no guarantee that for all realized future

[4]It is easily checked that in the model of DeAngelo (1987), which is a general equilibrium extension of Auerbach (1984), increased personal taxation of dividend income would lead to an increase in before-tax dividends, if consumption in each period is a normal good.

earnings the revised market value would properly reflect the discounted value of further-in-the-future earnings prospects, given the informative self-selection in dividend classes brought about by the value revision prospect. Recent work, by Constantinides and Grundy (1986) among others, has tried to resolve this problem by introducing leveraged securities—such as options, risky debt, and convertibles—as contracting instruments between current shareholders and the market. In the process, a role for capital structure and variable investment choices in the signaling process has emerged.[5] Constantinides and Grundy show that the set of financial contracts that is needed for separating signaling equilibria may be smaller if, out-of-equilibrium, the possibility of non-optimal investment and stock repurchase is admitted.

As the above discussion illustrates, we have come a long way in understanding the various tradeoffs associated with debt and dividend policy choices, in an integrated fashion. What is needed now is a synthesis and judgments regarding the range of relevance of different theories, in explaining corporate financial policy and valuation in cross-sectionally and temporally different circumstances (see Scholes and Wolfson, 1988, and Stiglitz, 1985, for attempts). In what follows, we shift our focus to a different set of issues related to the MM (1958) leverage indifference propositions pertaining to the impact of inflation and nominal debt contracts on equity valuation.

Inflation, Leverage, and Stock Market Efficiency

A major empirical puzzle in corporate finance has been the reaction of stock prices and returns to anticipated inflation and unanticipated innovations therein. As Pindyck (1984) notes, the price-level adjusted real decline of the value-weighted New York Stock Exchange index between 1965–81 was nearly 68 percent. Since then, prior to the declines in the summer of 1987 and the dramatic events of October, the index rose to almost three times its value in 1981. These contrasting periods of time have also coincided with sharp (by postwar U.S. standards) accelerations and decelerations in the inflation rate in the economy. Many people would consider such variations in stock prices to be excessive relative to variations in economic fundamentals over these periods, barring major structural changes in the real economy.

Other evidence on the contemporaneous impact of inflation on stock and bond market returns is equally puzzling. Fama (1981) has noted that stock returns are negatively related to measures of both currently anticipated inflation, and differences between the actual inflation rate and its anticipated value. These relationships have been confirmed in a vast number of studies, using measures of anticipated inflation based on moving averages of past rates, or those embedded in nominal Treasury bill rates. In bond markets, the yields or average returns of long-term bonds free of default risk barely kept up with anticipated inflation during periods of high inflation. As a

[5]See also Ross (1977), Stiglitz (1985), Myers (1984), and Asquith and Mullins (1986), for arguments and evidence regarding the importance of different types of asymmetric information and insiders' incentives for the choice of capital structure and the valuation of equity issues.

result, the after-tax returns to bondholders who are taxed on their nominal interest income decreased with inflation, which lowered the real values of their nominal credit contracts.

Various theories have been advanced to account for the reaction of stock prices in the 1970s to inflation, which should have *no* impact on real stock prices in a world where "money is only a veil" for transaction purposes. Modigliani and Cohn (1979) examined some of the more conventional explanations, and then suggested a very unconventional one based on irrationality on the part of a subset of investors. They identified essentially three conventional explanations. First, the current dollar values of nominal corporate depreciation tax shields are lowered and taxes on nominal capital gains are increased by inflation, in an unindexed tax system based on historical cost and valuation bases. Second, and in contrast, the real after-tax cost of corporate debt is lowered by high inflation, since the full nominal interest is deductible and this seems to rise at most by the amount of anticipated inflation. Third, it is possible that inflationary times are associated with higher riskiness of real activity (like the oil "supply shocks" of the 1970s), which increases the discount rates applied to equity payoffs.

Modigliani and Cohn (1979) have documented that the tax-related first and second effects above largely canceled out each other in the 1970s, producing a stable ratio of corporate taxes as a proportion of total capital valued at replacement cost. Furthermore, using accounting-based measures of operating earnings and their variability as a proportion of replacement value of capital stock, they (and Pindyck, 1984) could not find evidence of sufficient declines in average profitability or increase in the risk thereof to explain the dramatic stock price declines in the 1970s and early 1980s. This motivated the Modigliani-Cohn alternative explanation, based on *misperceptions* of the impact of inflation and corporate leverage on economic earnings on the part of (some) investors and analysts. The essence of their thesis can be summarized through the following example.

Suppose that a firm has perpetual riskless operating income of \$100 per year, of which \$50 is paid as 10 percent interest on \$500 of debt, leaving \$50 in pre-tax earnings and \$25 in after-tax earnings, given the corporate tax rate $T_C = .5$. Assume that, as in a Miller (1977) scenario of zero net tax-shield of debt, the required return on riskless payoffs to equity is 5 percent, because equity earnings are reinvested to generate largely untaxed (and postponable) capital gains. Thus, these after-tax earnings sustain an equity value of \$500 (\$25/.05). Now assume that the (anticipated) inflation rate goes up from 0 to 5 percent, and that the nominal interest rate on the firm's debt goes up to only 15 percent from 10 percent. For convenience, assume that the firm's nominal operating income now increases over time at the rate of inflation, so that in the first period the after-tax nominal accounting profit to equity is .5 (100 − 75) = \$12.5, in the second period .5 (105 − 75) = \$15, in the third period .5 (110.25 − 75) = \$17.625 etc., where \$75 is the new level of annual interest payments in the absence of any additional borrowing by the firm.

What should the value of the firm's equity be now? If investors apply the old *real* required return of 5 percent on equity to the first-period earnings of \$12.5, they get a

value of only \$250. If the required nominal return on equity is now 10 percent and this is applied to the growing nominal earnings stream starting at \$12.5, with a nominal growth rate that is 20 percent in the first period but progressively lower thereafter, we get yet a different answer. The first "answer"—which exemplifies the sort of error Modigliani-Cohn accuse (some) analysts of making—is especially puzzling, since a reduction in the firm's inflation-adjusted after-tax cost of borrowing from .5 (10 percent) = 5 percent to (.5 (15 percent) − 5 percent) = 2.5 percent has had the effect of *lowering* equity value!

An economically correct valuation procedure has to recognize that the firm can refinance 5 percent of its debt each period—because the real value of its debt obligation declines at that rate—and thus keep the ratio between debt interest and nominal operating income constant over time. As a result, the ratio of *net* (of refinancing) payout to creditors before taxes to operating income is also kept equal to its old pre-inflationary level. Indeed, given the lowering of the real after-tax cost of debt relative to the required real return on equity, the firm should increase its leverage even more, up to the point where other deadweight costs of debt cancel its new-found tax advantage for valuation. Even the first step, however, gives the result that equity's economic earning in the first year is (12.5 + 25) = \$37.5, growing at a nominal rate of 5 percent, so that applying either a real (5 percent) or nominal (10 percent) required return on equity leads to equity value of \$750. This *increase* in rational equity valuation by \$250 (750 − 500), reflects the perpetual lowering of the after-tax net payout to creditors by \$12.5 (25 − (37.5 − 25)) per period in today's dollars, discounted at 5 percent.

What economic phenomenon can prevent classic MM (1958) homemade investor arbitrage, vis-a-vis an unlevered firm in the same risk class valued at \$500, from restoring the above rational valuation of \$750? There are two major alternatives. First, if inflation is expected to accelerate, and this worsens the current under-valuation at \$250 by 7.5 percent per period in constant dollars, an equity investor would get a net return of only 5 percent (37.5/250 − 7.5) percent on his \$250 investment in the equity of the levered firm. Second, if the inflationary scenario is associated with (higher) riskiness of equity returns, then our investor's increased average return of 37.5/250 = 12.5 percent on equity could be required to compensate him for bearing the added risk. The first scenario corresponds, loosely speaking, to that of a "rational speculative bubble." The second scenario might arise from either genuine increases in real asset (cash flow) risk, which would also lower the value of unlevered firms, or risk induced by the presence of "irrational noise traders" whose forecasts regarding *future* stock prices of the levered firm are triggered by a variable such as inflation. We briefly clarify these alternatives before proceeding further.

A rational speculative bubble corresponds to a situation where the price P_t for a dividend stream $\{d_{t+1}, d_{t+2} \ldots\}$, equals the appropriate risk-adjusted discounted value of expected future dividends plus a bubble $\tilde{b}_t$, with the feature: $E(\tilde{b}_{t+1}) = (1 + R)b_t$, where R is the required expected rate of return. In the absence of infinitely-lived utility-maximizing investors, such bubbles can sometimes survive in equilibrium, for example if R is less than the growth-rate of population in an

overlapping-generations economy. Notice that the bubble $\tilde{b}_t$ need not be deterministic, and its collapse ($b_t = 0$) may be correlated with other economic variables such as inflation. However, a negative rational bubble ($b_t < 0$) congruent with the Modigliani-Cohn thesis, is inconsistent with market equilibrium since stock prices would then become negative with non-zero probability in finite time, if R is strictly positive and the firm's dividend growth-rate is less than R.

In contrast to a rational speculative bubble, noise trader effects on stock prices may be brought about by a subset of *irrational* agents acting on the basis of whimsical forecasts of future stock prices. The random variability of their resulting trades and the price variability induced thereby may prevent risk-averse rational agents (statistical forecasters) with finite horizons from fully reversing the influence of such trades on prices, as Shiller (1984) pointed out. If the degree of optimism or pessimism on the part of these noise traders is correlated with some uncertain economic variable such as inflation, and this variable inherently has some intertemporal persistence (serial correlation), then the under- or over-valuation produced by their presence may persist over time (Campbell and Kyle, 1986).[6] In the presence of such noise trader effects, the market returns on the equities of a levered and an unlevered firm whose operating cash flows are perfectly correlated, would no longer lie in the same MM (1958) risk class.

Empirically, models using *market* measures of risk have shown some success in explaining the relations between stock prices and anticipated inflation observed in the 1970s. Pindyck (1984) finds that an exponentially weighted moving average of NYSE stock rate of return variances nearly doubled between 1965 and 1981. Based on this, and a portfolio choice model of rational stock market equilibrium with homogeneous investor beliefs, he concludes that the real price decline of 68 percent between 1965 and 1981 could be a combination of around 18 percent owing to average corporate profitability decline, and around 50 percent owing to the doubling of risk, which assumes an empirically plausible relative risk-aversion coefficient for investors of between 3 and 5. Using studies of stock market returns, Chan, Chen, and Hsieh (1985) find that use of a forward-looking proxy measure of riskiness such as the difference between the yields of low-grade (BAA and under) and government bonds or bills, virtually eliminates any impact of *anticipated* inflation on stock returns. In interpreting this result, they suggest that this yield difference is proxying for the default risk-premium on corporate bonds, which increases when firm values are (proportionately) more volatile over time.

A closer look at the evidence, however, raises doubts about both these above rational valuation explanations. Poterba and Summers (1986) find that changes in stock return variances attenuate much more rapidly over time than implied by Pindyck's (1984) model, and hence their highest estimates of the elasticity of stock price response to current volatility changes are around $-.225$, in contrast to Pindyck's calculation of nearly -1. Campbell (1987) and Shanken (1987) have established that,

[6]Given sufficiently irrational average optimism about future asset prices, these noise traders may even make higher average returns by taking larger positions in risky assets (DeLong et al., 1987).

in response to changes in the Treasury bill rate (which moves closely with expected inflation), the conditional expected returns and variances (or market betas) of stocks move in *opposite* directions. This makes it difficult to rationalize the observed negative correlation between stock returns and the Treasury bill rate (and expected inflation) in terms of associated changes in the riskiness of stock returns. The cross-sectional evidence of Modigliani and Cohn (1980), on valuation decreases in the 1970s across firms differing in their systematic market (beta) risk, also runs counter to the Pindyck explanation, which would have predicted greater value declines for riskier (higher beta) firms.

Recent evidence, due to DeBondt and Thaler (1987) among others, provides some indirect support for the Shiller (1984) thesis on the impact of noise traders on stock market prices. DeBondt and Thaler find that stock returns display significant negative serial correlation over long horizons, such as 5 years, in that portfolios of past "losers" significantly outperform those of past "winners." These reversals do not seem to be easily explainable by variations in riskiness of these portfolio returns,[7] and they appear to be accompanied by contemporaneous reversals in the rank order of these firms' earnings. These findings led DeBondt and Thaler (1987) to suggest that some parts of the stock market *overreact* to current earnings, and do not recognize the mean reversion implicit in their intertemporal evolution in arriving at valuation.

Further empirical evidence is to me interpretable as being supportive of a story of irrational valuation related to changes in anticipated inflation. Shanken (1987) finds that the positive impact of a higher Treasury bill rate on market return betas or variances of stock returns declines with the market size of the firms in a rather dramatic fashion, whereas the negative impact of the T-bill rate on future expected returns of stocks is almost uniform across firm size categories. Of course, it is precisely smaller firms that are likely to be less well analyzed, or subject to difficulties such as credit rationing (Stiglitz, 1985) in refinancing the inflationary component of their nominal interest payments.[8] Chan, Chen, and Hsieh (1985), using a multifactor model of risk-return tradeoffs in the capital market, are able to largely "explain" the impact of firm size, and expected inflation, on expected returns of stocks. However, they find that an explanatory yield differential (BAA- government) risk factor has a significant January seasonal, as does the raw impact of the firm size variable on stock returns, again suggesting that this variable is not serving solely as a rational measure of default risk on bonds.[9]

[7]Bhattacharya (1978) displays a model in which rational valuation with mean-reverting cash flows results in stock return risks (market betas) moving *positively* with stock value, in contrast to the impact of leverage on equity return risk, and in opposition to the risk effect needed to explain the DeBondt-Thaler findings in an efficient market context.

[8]The patterns observed by Shanken are consistent with valuation decreases, produced by increases in interest rates and expected inflation, that are proportionately much greater for smaller firms. In contrast, the negative impact of higher T-bill rates on required future expected return on equities, which is likely to be influenced by substitution away from monetary assets, shows little variation with firm size.

[9]In their study, smaller firms' returns are far more highly correlated with changes in this yield differential risk-factor, especially in January. It is conceivable that greater interest-rate-related valuation changes of small firms (fn. 8) plays a role in this phenomenon.

The accumulation of evidence above presents, in my view, a murky picture vis-à-vis the prevalence of rational (informationally efficient) valuation in the stock market. While earlier time-series empirical studies claiming the presence of excessive volatility (Leroy and Porter, 1981; Shiller, 1981) or inflation-related irrationality (Modigliani and Cohn, 1979) in stock prices were flawed methodologically,[10] more recent evidence on equity valuation is harder to rationalize in terms of the evolution of fundamental technological and preference parameters. As one who as observed the U.S. stock market over the last 15 years, and tried to teach the rational valuation concepts in Modigliani and Cohn (1979) to M.B.A. students, I am inclined to be sympathetic to the likelihood of some truth in their hypothesis of (leverage-related) irrationality in equity under valuation in the inflationary 1970s, and the related rebound over 1982–87.

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[10]Criticisms of the excessive volatility tests of Leroy-Porter and Shiller have focused in large part on the inadmissibility of their variance estimators for non-stationary time series (Kleidon, 1986). The regression tests of Modigliani-Cohn, based on the Price-Earnings ratios of NYSE stocks as the dependent variable, have been accused of bias due to omitted variables such as appropriate measures of the riskiness of equity returns. The methodology of Campbell and Shiller (1987) offers some hope of resolving and unifying our understanding of these puzzles.

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