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THE STOCK MARKET AND THE CORPORATE SECTOR

A profit-based approach

Anwar Shaikh

I first got to know Geoff Harcourt's work through his wonderful review essay on the Cambridge Capital Controversy (Harcourt 1969). I had entered graduate school in economics at Columbia University in the Fall of 1967, and helped occupy the buildings in the student strike of 1968, and was generally disrespectful of the neoclassical theory I was being taught. Geoff's essay had an immediate and powerful impact on my thinking. It introduced me to the works of Joan Robinson, Sraffa, Pasinetti, Garegnani, Bhaduri and many others. It showed me that classical and Marxian economics could be rigorous alternatives to neoclassical theory. Its critique of the notion of an aggregate production function led directly to my first seminar paper, which also became my first publication shortly thereafter, entitled 'The Humbug production function'. Its discussion led me directly back to Sraffa's little book, and through it to the classical economists and to Marx. These ideas continue to ground my work to this very day. All in all, Geoff's article became such an important part of my intellectual arsenal that the very sight of this dog-eared and tattered copy frightened my beleaguered professors (most of whom, however, successfully resisted the temptation to read it).

One of the powerful themes to which Geoff's work introduced me is the classical notion of a perpetual oscillation of market rates of profit around one another – i.e. the notion of a turbulent tendency for rates of profit to equalize across spheres of capital investment. In the article which I contribute to this Festschrift, I show that the (incremental) rate of return in the US stock market is indeed equalized, in a surprisingly direct manner, with the corresponding return in the corporate sector, and that it is this fact which explains the gyrations of the US stock market.

INTRODUCTION

This paper shows that the level and volatility of the stock market rate of return can be explained directly by fundamentals – measured by the incremental rate

of profit in the corporate sector. It is argued that the two rates are linked by the mobility of capital across sectors.

In a competitive economy, the mobility of capital tends to equalize (risk-adjusted) rates of return across investments and sectors. Various branches of economic theory, such the theory of the firm, the law of one price, the theory of finance, and even the present-value principle, depend directly on this mechanism (Dybvig and Ross 1992: 43; Mueller 1986: 8; Diermeier *et al.* 1984: 74).

The fact that capital can move across various applications implies that the evaluation of any given investment must always be relative to the alternatives forgone in making it. This opportunity cost underlies the notion of a reference ('required') rate of return, to which the actual return on any given investment must be compared at any moment of time, and with which it is equalized over time (Ibbotson Associates 1994: 129–30).

Under certain *additional* assumptions (such as constant or slowly changing required rates of return), one can derive the standard discounted present value (PV), and the dividend-discount (discounted cash flow or DCF) models of asset pricing. But these standard models do not perform well empirically. Our own approach is therefore somewhat different. We begin from the common premise that competitive risk-adjusted rates of return tend to become equalized across sectors. But instead of making the additional assumptions needed to arrive at DCF models of stock prices, we directly compare the annual stock market rate of return to the current rate of return on investment in the real sector. To this end, we develop an appropriate measure of the real sector rate of return on investment, and show that its movements are closely mirrored in those of the stock market rate of return. By implication, the so-called risk premia of the sectors are quite similar. This allows us to demonstrate that the stock market is directly driven by fundamentals, i.e. by the profits of the firms issuing stock. It also allows us to critically assess the standard DCF models.

MODERN FINANCE THEORY

Much of modern finance theory is built around the hypothesis that the mobility of capital equalizes risk-adjusted rates of return (Dybvig and Ross 1992: 48; Cohen *et al.* 1987: 131–48). This includes Markowitz's return-risk trade-off, the approximate equality of risk-adjusted returns in the capital-asset pricing (CAPM) and arbitrage pricing theory (APT) models, and the stochastic equality between expected and actual returns in efficient market theory.¹

The present-value principle is also based on this same assumption. When applied to the stock market, this leads directly to the ubiquitous dividend-discount model, in which the price of a stock is said to be equal (in equilibrium) to the discounted present value of the expected stream of

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dividends. Let r_{s_t} be the rate of return on a stock held over period t (i.e. from the beginning of period t to the beginning of period $t + 1$), p_{s_t} be the price of the stock, d_t be the dividend paid by the stock, and r_t be some relevant required rate of return. Then equality of rates of return implies:

$$r_{s_t} = r_t, \text{ where by definition } r_{s_t} \equiv \frac{\Delta p_{s_{t+1}} + d_{t+1}}{p_{s_t}}. \quad (1)$$

Equation (1) can be rewritten in terms of the current opening stock price:

$$p_{s_t} = \frac{d_{t+1}}{1 + r_t} + \frac{p_{s_{t+1}}}{1 + r_t}. \quad (2)$$

We can write a similar equation for $p_{s_{t+1}}$ and substitute it into the right-hand side of equation (2), and then do the same thing for the remainder term involving $p_{s_{t+2}}$, and so on. This yields:

$$\begin{aligned} p_{s_t} &= \frac{d_{t+1}}{(1 + r_t)} + \frac{d_{t+2}}{(1 + r_t)(1 + r_{t+1})} + \frac{p_{s_{t+2}}}{(1 + r_t)(1 + r_{t+1})} \\ &= \frac{d_{t+1}}{(1 + r_t)} + \frac{d_{t+2}}{(1 + r_t)(1 + r_{t+1})} + \frac{d_{t+3}}{(1 + r_t)(1 + r_{t+1})(1 + r_{t+2})} \\ &\quad + \frac{p_{s_{t+3}}}{(1 + r_t)(1 + r_{t+1})(1 + r_{t+2})} \end{aligned} \quad (3)$$

If we assume that the remainder term approaches zero as we continue expanding the preceding expression, we are left with a familiar-looking result in which the current stock price is expressed as the discounted present value of (expected) future dividends, where the discount rates are *time-varying* current and (expected) future required rates of return. But as Campbell notes, this restatement of the arbitrage process 'is tractable only if the expected [required] returns are constant, which is one reason why the academic literature has focused for so long on this unlikely special case' (Campbell 1991: 158). Imposing the strong restriction that $r_t = r$ for all t then gives us the familiar dividend-discount model of stock prices (equation 4 below). If in addition dividends are assumed to grow at some constant rate g over time, with $0 \leq g < r$ ($g = 0$ being the case of a constant dividend), we get the Gordon model in equation 5 below (Le Roy 1992: 172–4).

$$p_{st} = \sum_{k=1}^{\infty} \frac{d_{t+k}}{(1+r)^k}$$

(dividend-discount model with a constant rate of discount) (4)

$$p_{st} = \frac{d_{t+1}}{(r-g)}, \text{ for } r > g$$

(Gordon model, constant discount and dividend growth rates) (5)

THE REQUIRED RATE OF RETURN FOR THE AGGREGATE STOCK MARKET

Equations 3-5 are merely alternative ways of expressing the assumption that over time the stock market rates of return will be kept in line with some (as yet unspecified) required rate of return. For this to be meaningful, we also need a theory of the required rate itself.

Most discussions of the required rate of return begin from the assumption of perfect competition and perfect capital markets. In this case, the required rate is assumed to be 'the' rate of interest, since in long-run equilibrium every asset and every industry is assumed to earn a rate of return exactly equal to the interest rate. When risk (as opposed to true uncertainty) is introduced into the story, the concept of the required rate is expanded to encompass an economy-wide riskless interest rate and an asset- or industry-specific risk premium. This of course necessitates an independent means of assessing specific risk and the hypothesized risk premium associated with it, so as to construct the required rate.²

Empirical models of the aggregate stock market generally assume constant dividend growth rates and constant (or slowly varying) required rate of return, although estimates of these particular rates vary substantially.³ But while the resulting models are theoretically tractable, their empirical performance is quite poor (Shiller 1989: 88). As Shiller has so graphically demonstrated, actual stock prices are strikingly different from those implied by standard dividend discount models (*ibid.*: 78-82).

The problem stems from the very assumptions that make the models tractable: i.e., the hypothesized constancy of discount and dividend growth rates over time. Figure 1 (data sources and methods are described below in the Data Appendix) displays the actual annual rate of return in the aggregate stock market (r_{st}), and its long-term average ($r_{st,avg}$), which can be taken to be an estimate of the corresponding required rate of return.⁴ Figure 2 depicts a similar pattern of the actual dividend growth rate. In neither case is it particularly useful to assume constant expected values for these variables.

The persistent empirical problems of standard stock market models have

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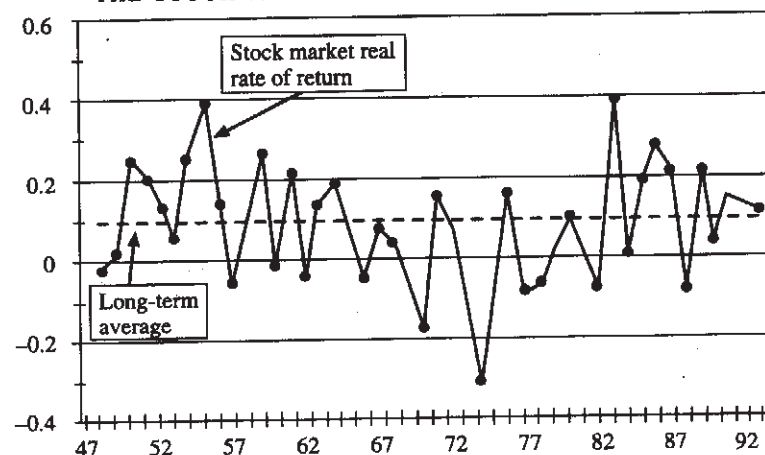


Figure 1 Stock market rates of return

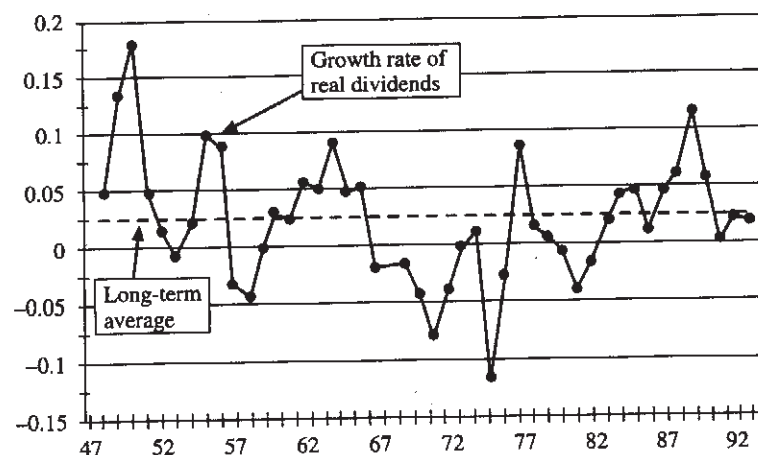


Figure 2 Real dividend growth rates: actual vs. long-term average rates

led several authors to explore alternative formulations. Barsky and De Long (1993: 302) retain the assumption of a constant discount rate but allow the expected dividend growth rate to vary slowly over time. On the other hand, Fama and French (1988), Shiller (1989: 81-2), Fama (1991), and Campbell (1994) experiment with time-varying expected discount rates. But by and

large these efforts have not produced strong results (see the discussion of Figure 5 for further details). Shiller (1989: 87–91, 118–32) provides an effective critique of this type of effort. Not surprisingly, recent attention has shifted away from fundamentals towards investor psychology, speculative behaviour, and bubbles (Shiller 1989: chapters 1–2; Cutler *et al.* 1990; and De Long *et al.* 1990).

A PROFIT-BASED APPROACH

The notion that the mobility of capital tends to equalize risk-adjusted rates of return across sectors is a fundamental one (Cohen *et al.* 1987: 375). But from a classical and Marxian point of view, competition creates both the tendency to equalize rates of return and the factors which differentiate these same rates (such as new products, techniques, etc.). The end result is a dynamic and evolving process in which rates of return are never equal at any one moment of time, but rather ceaselessly fluctuate around one another (Botwinick 1993: chapter 5; Mueller 1986: 8; Mueller 1990: 1–3). We will call this process ‘turbulent arbitrage’, to distinguish it from the more conventional view of a state of equilibrium in which rates of return are exactly equal. The possibility that capital flows between the stock market and the real sector equalize their rates of return raises an interesting question: how is this possible, given that individual (i.e. non-capitalist) investors play so large a role in the stock market? The answer is that it is only necessary for the flows of financial capital to add or subtract sufficient investments in the stock market so as to end up regulating its rate of return, over some relevant time scale. This is perfectly consistent with fads and fashions, as long as fundamentals rule in the end (Shiller 1989: 374–6).

In any such process, it is generally recognized that it is the rate of return on *new* investment which is relevant to the mobility of capital (Cohen *et al.* 1987: 375). When analysing industrial investment, the traditional approach has been to focus on its *lifetime* rate of return. This same approach is then carried over to the analysis of the stock market, from which one gets the dividend-discount models of asset pricing. For both industry and the stock market, the rate of return on new investment is traditionally defined in one of two ways: explicitly as that constant-over-time internal rate (IRR) which discounts cash flows into the cost of the investment which generated them; or implicitly by the excess of present value over investment costs at some *a priori* constant-over-time discount rate.⁵ Both methods have well-known problems (Mueller 1990: 9). In addition, as previously discussed, both methods rely on the empirically implausible assumption of a constant (or at least slowly varying) real discount rate.⁶

An alternative approach is to try to directly estimate the lifetime rate of return on new investment. Here, the most common method has been to approximate the return on new investment by means of the average rate of

profit on *total* capital invested. The latter is directly observable and may, under certain quite restrictive conditions, be close to the long-run return on new investment. However, the general validity of this approach is a matter of vigorous dispute (Mueller 1990: 9–14).

I will take a somewhat different approach to the problem. To begin with, I would argue that uncertainty and ignorance in real historical time make the short run, as distinct from the long run, of ‘signal importance’ (Vickers 1993: 25). Current profits reflect many transitory factors, including the effects of short-run disequilibrium dynamics. Nonetheless, abnormally high or low profits alter capital flows, which in turn brings ‘new uncertainties and new positions of profits and loss’, which feed back on capital flows, and so on. What obtains is a series of ceaseless fluctuations in which near-term (as opposed to lifetime) rates of return on investment play a central signalling role (Geroski and Mueller 1990: 187; Mueller 1986: 8). This is obvious in the case of the stock market, which is inherently short-term because all stocks of a particular company (no matter what their ‘vintage’) are alike in the market.

The current rate of return in the stock market was defined previously in equation 1. If the relevant variables are expressed in real terms, then it is a real rate. What remains, therefore, is to approximate the corresponding near-term rate of return in the corporate sector.

We begin by recognizing that total current profits P_t can always be expressed as the sum of the current profits on the most recent investment ($r_t I_{t-1}$) and the current profits on all earlier vintages (P'_t). By subtracting past profits P_{t-1} from both sides of this identity, we can write

$$\Delta P_t = P_t - P_{t-1} = r_t I_{t-1} + (P'_t - P'_{t-1}). \quad (6)$$

Our aim is to estimate the current rate of return on near-term investment r_t . In equation 6 all other terms are observable except $(P'_t - P'_{t-1})$, since P'_t is unknown. But the shorter the evaluation horizon, the closer will be current profit on carried-over vintages (P'_t) to last period's profit on the same capital goods (P'_{t-1}). If we can assume that for relevant short-term horizons (say up to a year), the difference $(P'_t - P'_{t-1})$ is not large relative to the other terms, we can directly approximate the current rate of return on new investment (Elton and Gruber 1991: 454) as

$$r_t = \left(\frac{\Delta P_t}{I_{t-1}} \right). \quad (7)$$

If real profits P_t and investment I_{t-1} are net magnitudes, then r_t is the (net) incremental rate of return on capital (since net investment $= \Delta K_{t-1}$, where K_t is the real capital stock at the beginning of the period t). When profits and investment are in gross terms, we may think of r_t as either the gross incremental rate of return, or as an approximation to the net rate. Using gross variables confers a considerable advantage, because net rates require adequate

measures of depreciation and retirement investment, and there are many well-known problems associated with estimates of these magnitudes (Feldstein and Rothschild 1974; Usher 1980).

In comparing stock market and corporate profitability, it is important to recognize that existing measures of corporate profits are net of all interest payments. The appropriate stock market measure is therefore the *net* (of interest) rate of return, $r_{st}' = r_{st} - i_t$, where i_t = the real prime rate of interest charged by banks (see the Data Appendix for further details).⁷

Figure 3 compares the current real net stock market rate of return r_{st}' to the (gross of depreciation but net of interest) accounting rate of return $R_t = P_t/K_t$ often used as a proxy for the long-term rate of return (Mueller 1990: 9). Figure 4 then compares r_{st}' to the real gross incremental corporate rate of return r_t . It is immediately apparent that the average rate R_t performs very poorly in explaining the stock market rate of return. The real incremental rate r_t , on the other hand, performs extremely well indeed. The correlation between the stock market rate and the average corporate rate R_t is only 0.048, while that with respect to the incremental rate r_t is almost nine times higher at 0.414.

Since the stock market rate of return is essentially a normalized measure of the change in earnings (net of interest), the parallelism between it and the stock market rate strongly validates the practical concern of stock market investors with interest rates and changes in earnings.⁸ It also confirms the general sense of empirical students of the stock market that its 'investors should not expect a much greater or fear a much smaller rate of return than that provided by businesses in the real economy' (Diermeier *et al.* 1984).

The concept of turbulent arbitrage proposed in this paper does not actually

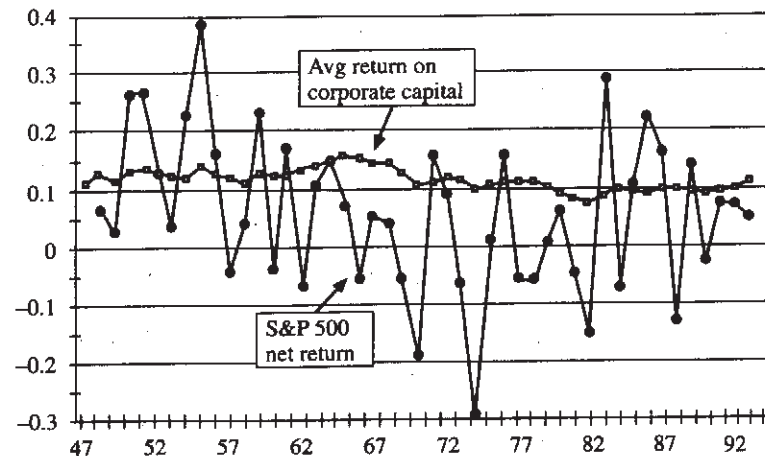


Figure 3 Rates of return: stock market vs. average corporate rate

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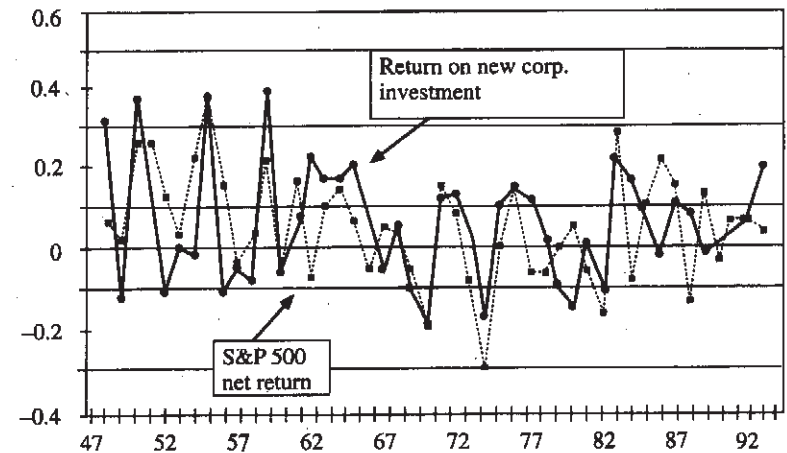


Figure 4 Rates of return: stock market vs. incremental corporate rate

require a close correlation between two variables. It would be possible, for instance, to have two variables fluctuate around each other and yet not be statistically correlated.⁹ But they would have to be 'close' in some sense, such as in the mean, or perhaps in terms of percentage mean absolute or squared deviations. But in our case the close visual correspondence between the two rates of return depicted in Figure 4 is also well reflected in the similarity of their means, standard deviations, and coefficients of variation (standard deviation/mean), as shown in Table 1.

A central puzzle in the stock market literature concerns the 'unexplained volatility' of equity prices relative to those predicted by standard models (Shiller 1989: 79; Tease 1993: 42), which as we have seen are predicated on empirically unsupportable assumptions of constant discount rates and dividend growth rates. The preceding findings shed new light on this problem too. Since dividends per share are relatively smooth, it is largely the task of stock prices to vary in such a way as to keep stock market returns on track with the underlying fundamentals. If the fundamentals themselves are volatile, as they

Table 1 Comparative statistics for stock market and corporate real returns

	Mean	Standard deviation	Coeff. of variation
S&P 500 net rate of return ($r_{st}' - i_t$)	0.0603	0.1361	2.2570
Return on new corp. investment ($\Delta P_t / I_{t-1}$)	0.0678	0.1463	2.1578

are, then the stock prices must also be volatile. It is therefore the volatility of the incremental rate of profit which becomes the issue. And here, it can be shown that it is short-term fluctuations in aggregate demand, as expressed in the capacity utilization rate, which largely account for the observed volatility of the incremental profit rate.¹⁰

The question can be addressed directly by comparing actual equity prices to those warranted by our assumption that turbulent arbitrage makes the net stock market rate of return $r_{st}' = r_{st} - i_t$ (where i_t = the real rate of interest) roughly equal to the current return on new corporate investment r_t . Following Shiller, we can calculate which particular warranted equity price in any period would make the stock market rate of return exactly equal to the corporate rate. In this case equation 1 holds exactly, and we get

$$p_{st}^w = p_{st-1} [1 + (r_t^* - y_{st})] = \text{the real warranted equity price} \quad (8)$$

where $r_t^* = r_t + i_t$ = the incremental corporate return inclusive of interest opportunity cost, and $y_{st} = d_t/p_{st-1}$ = the equity yield. Figure 5 compares the estimated real warranted equity price p_{st}^w to the actually observed real equity price p_{st} . Again following Shiller, both of them are detrended by dividing them by a thirty-year moving average of real earnings per share. This makes them comparable to his own famous diagrams (Shiller 1989: 78–82).

Several things are striking about this data. First, it is clear that the actual price fluctuates around the warranted price, precisely in the manner one would expect from the the notion of turbulent arbitrage. Second, in sharp contrast to standard results, the actual equity price is less, not more, volatile

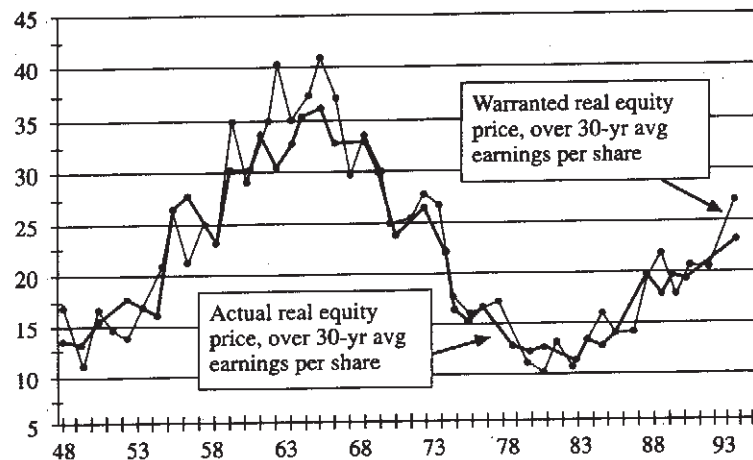


Figure 5 Actual and warranted equity prices, detrended by 30-yr average earnings

than our measure of warranted price. This is of course a reflection of the difference in the models employed. Finally, the simple correlation coefficient between the two series is 0.935 ($R^2 = 0.875$), which compares extremely favourably with typical results for the standard dividend discount model. Shiller (1989: 81–2) gets a simple correlation coefficient of 0.296 ($R^2 = 0.088$) with constant discount rates, and of 0.048 ($R^2 = 0.0023$) with varying discount rates. Barsky and De Long's (1993: 302) best estimates based on a varying dividend growth rate only explain 9% of the variance of annual stock price changes. And Campbell's (1990: 46) annual stock return forecasting equation with time-varying interest rates and stock market yields produces an $R^2 = 0.025$ between the two sets of prices.

SUMMARY AND CONCLUSIONS

This paper finds that the empirical movements of stock prices can be explained directly by fundamentals. The connection derives from the fact that the stock market rate of return, which is an intrinsically short-term or contingent rate, is tied to the near-term rate of return on new corporate investment (which we proxy by the incremental corporate rate of profit) by the intersectoral movements of capital between the two sectors. The two rates track each other quite closely (Figure 4), never equal but always fluctuating around each other, displaying similar means and standard deviations (Table 1). The same holds, even more strongly, for the relation between actual equity prices and those warranted by this process of 'turbulent arbitrage' (Figure 5). The correlation between the two is 0.935, which is far higher than (say) Shiller's findings of 0.296 for the conventional dividend-discount model.

The theoretical approach taken in this paper implies that the incremental profit rate in the real sector is the opportunity cost (i.e. the 'required' rate of return) for financial capital invested in the stock market. Since this real sector return is itself highly volatile, driven by short-term fluctuations in aggregate demand, the volatility in returns (Figure 4) and stock prices (Figure 5) is thereby explained by movements originating in the real sector, which are themselves rooted in fluctuations in aggregate demand. It is then easy to see why conventional theoretical models, which typically assume constant required rates of return (discount rates) and constant dividend growth rates, are largely unable to explain the movements in stock prices. On the other hand, since the incremental rate of profit is the change in earnings normalized by investment, the findings of this paper accord well with the experience 'on the street' that stock price movements are driven by interest rates and changes in earnings.

Lastly, it is interesting to note that the approach taken in this paper is consistent with a fixed investment function identical in general form to that proposed by Kalecki. In arguing for the equalization of incremental profit rates across sectors, I have explicitly argued that these incremental rates

strongly influence relative investment flows across sectors. If we normalize investment decisions D_t relative to (say) the level current profits P_t , one plausible form of the investment function is

$$\frac{D_t}{P_t} = f\left(\frac{\Delta P_{t+1}^e}{I_t}\right). \quad (9)$$

Now, if future rates of return on new investment are projected on the basis of current rates¹¹ (and current new information, which we ignore here), then we can rewrite equation 9 as

$$D_t = P_t \cdot f\left(\frac{\Delta P_t}{I_{t-1}}\right) = F\left(P_t, \Delta P_t, \Delta K_t\right) \quad (9')$$

where $I_{t-1} = \Delta K_t$ = the change in the beginning year capital stock.

Kalecki himself arrives at a fixed investment decision function of exactly the same general form. 'When the profitability of new investment projects is being weighed', he writes, 'expected profits are considered in relation to the value of the new capital equipment' (1968: 96). One would think that this would lead straight away to a formulation such as in equation 9 above. But in fact Kalecki separately lists the change in current profits ΔP_t as a positive factor in investment decisions because with a given volume of investment a change in profits 'renders attractive certain projects which were previously considered unprofitable and thus permits an extension of the boundaries of investment plans', and then separately lists the change in capital stock ΔK_t as a negative factor 'because an increase in the volume of capital equipment, if profits P_t are constant means a reduction in the rate of profit' (Kalecki 1968: 97-8; Sawyer 1985: 50-1). It seems to me that even this is a somewhat roundabout way to arrive at his own starting point, namely that investment decisions are dependent on the ratio of the increment to profits produced by new investment to the value of this investment. Finally, Kalecki also adds a third factor to account for the effect of internally accumulated funds, which he defines as the sum of depreciation, retained earnings, and 'the "personal savings" of the controlling group invested in their own companies through subscription to new share issues' (*ibid.*). This total 'gross savings out of profit' (Sawyer 1985: 49) is obviously a function of aggregate gross profits P_t , although Kalecki chooses to proxy it by total economy-wide gross savings S_t . With this we can immediately see that the general functional form of Kalecki's own investment function¹² is identical to that derived from the premise of the equalization of profit rates across industries and sectors.

$$D_t = f\left(S_t, \Delta P_t, \Delta K_t\right) = F\left(P_t, \Delta P_t, \Delta K_t\right) \quad (10)$$

since $S_t = h(P_t)$ = a function of total gross profits.

The equality of the two general forms of investment decision functions is merely a reflection of their common emphasis on the importance of profitability in the investment decision (*ibid.*: 52). The possible differences in interpretation about the individual components should not be allowed to obscure this important fact.

DATA APPENDIX

The stock market data refers to the S & P 500 index of common stocks (Standard and Poors 1993, and earlier data). Nominal dividends per share d' were derived by multiplying the current yield (d'/p'_t) by the nominal stock price index p'_t . Both were deflated by the implicit price deflator for total gross private domestic fixed investment (1987 = 100) as shown in the *Economic Report of the President* (ERP 1995: Table B-3) and then used to calculate the real stock market rate of return r_{st} (equation 1 and Figure 1) and the growth rate of real dividends (Figure 2). Finally, the real rate of interest i_t was calculated as the difference between the nominal prime rate of interest charged by banks (ERP 1995: Table B-72) and the rate of growth of the investment deflator described above, and this was used to calculate the net stock market rate of return $r'_{st} = r_{st} - i_t$ (Figures 3-4). Average real earnings used to detrend the price series (Figure 5) was constructed from data on long-term earnings per share and on producer prices (1982 = 100) generously provided by Robert Shiller.

The corporate data refer to the domestic US economy. The beginning-of-year capital stock K_t is for total (non-residential and residential) fixed private corporate capital, gross stock, end-of-year, constant-cost valuation, in millions of 1987 dollars, shifted forward one year (BEA 1993: Tables A6, A9, and subsequent updates). Real investment I_t , in 87-\$, is the sum of fixed private corporate non-residential and residential investment (BEA 1993: Tables B4, B6, and subsequent updates). Real corporate profits P_t were calculated by deflating nominal total domestic (corporate) profits, gross of capital consumption allowances, by the investment deflator. The former was calculated as the sum of non-financial and financial profits, lines 3+4, Tables 6.16 A-C, *National Income and Product Accounts* (BEA 1992-93, and subsequent updates) and corporate consumption of fixed capital (*ibid.*, Table 8.11, line 2). The average real rate of profit (Figure 3) was calculated as P_t/K_t , and the incremental rate of profit (Figure 4) as $r_t = \Delta P_t/I_{t-1}$.

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NOTES

- 1 'The efficient market hypothesis says that the price of an asset should fully reflect all available information. The intuition behind this hypothesis is that if the price does not fully reflect all available information, then there is a profit opportunity available' which, even if small, 'presumably would be attractive at large scale to many investors' (Dybvig and Ross 1992: 48). On the assumption that arbitrage moves to eliminate discrepancies, actual prices and those expected on the basis of the available information, the remaining 'deviations of actual returns from expected returns should be random - they ought, on average, to be zero and uncorrelated with information to the market' (Tease 1993: 43).
- 2 Various measures of risk include the familiar variance and standard deviation, as well as less familiar ones such as the mean absolute deviation, the interquartile range, and entropy. But importing such univariate measures into standard economic constructs has proved problematic. Less restricted characterizations of risk, on the other hand, only offer partial orderings of random variables (Machina and Rothschild 1992: 202-3).
- 3 For instance, in work on the aggregate stock market, Shiller (1989: Figure 4.1, pp. 78-9) and Ibbotson Associates (1994: 136-46) estimate the discount rate from the sample mean of the real rate of return in the stock market; Barsky and De Long (1993: fn. 9, p. 300) assume a real discount rate of 6%; and Campbell uses the long-term average stock market yield as the discount rate (Campbell 1991: 178).
- 4 Shiller (1989: Figure 4.1, pp. 78-9) and Ibbotson Associates (1994: 136-46) calculate the real rate of discount in this manner.
- 5 We could define the rate of return on new investment as $r = i + (PV(i) - I)/I$, where i = the rate of discount chosen and the rest represents the excess return (the percentage excess of present value $PV(i)$ over investment I). Then no investment would be chosen unless $r \geq i$.
- 6 Dumenil and Levy (1990) undertake an interesting attempt to directly estimate the lifetime flows of profits associated with given investments, by making particular assumptions about the time paths of the capital-labour and capital-output ratios associated with a given investment, and about the expected path of the real wage over the lifetime of that investment. However, they use these to estimate the constant discount rate, i.e. the constant internal rate of return which will equate the discounted present value of the lifetime profit flows to the value of the given investment in a given year. They calculate this discount rate for every year's investment, and find that the resulting measure is quite smooth and follows the long-term average of the rate of profit on total capital (Dumenil and Levy 1990: 406-10).
- 7 The net interest component of corporate income excludes corporate interest payments to the financial sector. One could try to estimate these and add them back into total profits, but the relevant data from the US Internal Revenue *Statistics of Income* appear only after a three-year lag.
- 8 Peavy argues that 'variations in stock prices can largely be explained by changes

in the cash flow [gross profits] of corporations and changes in the discount rate that prices these cash flows ... [which is why] investors carefully monitor movements in corporate profits and interest rates' (1992: 10).

- 9 A simple case is of two (say) rates of return $r_{2t} = r_{1t} + \epsilon$, where ϵ = a small random variable with zero mean, and r_{1t} = a constant. Then r_{1t} and r_{2t} are close to one another, fluctuate around each other, have the same means, but are completely uncorrelated.
- 10 Although we cannot pursue it here, it is possible to show that changes in corporate real investment can be linked to changes in real profits, and that the sharp fluctuations in the latter reflect changes in capacity utilization.
- 11 If current investment decisions determine actual investment flows at some point later (Kalecki 1968: 96), there is no contradiction here between the proposition that current investment decisions D_t depend on the current rate of return, and the proposition that current investment I_t (based on past investment decisions) helps determine current realized profits P_t .
- 12 Sawyer (1985: 51) makes it clear that the particular linear form in which Kalecki writes his investment decision function is merely a 'linear approximation' of the general functional form.

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