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Can Ex Post Rates of Return Detect Monopoly Profits?

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Abstract

We review the ability of the ex post internal rate of return (IRR) to detect monopoly profits. When market values are used as entry and exit values, the ex post IRR simply reveals whether the firm did better or worse than the market expected at the entry date. It says nothing about monopoly profits. When replacement costs are used as entry and exit values, the ex post IRR can, in principle, reveal something about monopoly profits. However, since the ex post IRR is a noisy measure of ex ante monopoly profits, it will be very difficult to reject the null hypothesis given the sample periods typically available. The benchmarks typically used are market-determined, and therefore only comparable to IRRs calculated using market values – a situation when the ex post IRR reveals nothing about monopoly profits anyway. Furthermore, there is ample empirical and theoretical evidence that these benchmarks do not even represent fair rates of return.

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The IRR approach

Recently ex post rates of return have been advanced as a means of detecting monopoly profit-making by airports (Bertram, Dempster and Terry, 2000), electricity lines companies (Bertram and Terry, 2000), gas networks (Bertram et al., 2001), and ports (Bertram et al., 2002). These authors calculate a measure of the ex post rate of return earned by hypothetical investors who purchased an asset at a particular date t, received all the cashflows generated by the asset over a subsequent period of length s, and sold the asset at the exit date $t + s$. They present their return as an internal rate of return (IRR), although other approaches (for example, averaging annual returns over the same period) that provide essentially the same answer are also possible.[1]

These IRRs are compared with several benchmark returns. Because the ex post IRRs exceed the benchmarks, the authors claim that the firms under study must be earning monopoly profits.

Is this approach reasonable? That is, can we infer anything about monopoly profits from IRR calculations? As Marsden (2002) points out, the choice of entry and exit values is critical to answering this question. Three possible entry values come to mind.

- The hypothetical investor could purchase the asset as a going concern at date t, in which case the cost is the date t market value of the asset.

- Alternatively, the hypothetical investor could build an identical asset at date t, in which case the relevant cost is the date t replacement cost of the asset.

- Finally, the entry cost could be the historical cost of the asset, adjusted for depreciation up to date t.

The papers cited above seem to adopt the first approach. In the study of gas pipelines, the hypothetical investor buys shares at the time of flotation,[2] while in the study of port companies the "initial outlay corresponds to the amount which a hypothetical investor would have had to spend to acquire each port at the time of corporatisation." (Bertram et al. 2002, p. 10).

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[1] As a measure of ex ante performance, the IRR calculation has several well-known problems (see, for example, Ross et al., 1993, pp. 165–175); we ignore these here.

[2] "[A] hypothetical investor purchases one notional share in NGC at the time of flotation" (Bertram et al. 2001, p. 10), where a notional share is defined to be one-eleventh of a bundle comprising one ordinary share and ten convertible capital notes. Similarly, the hypothetical investor in Enerco buys one "notional" share at the time of flotation in April 1992 (Bertram et al. 2001, p. 15).

An identical range of choices also exists for exit values. In general, it seems reasonable to require that the choice of entry and exit values be consistent, i.e., both values are market prices, or both are replacement costs, or both are adjusted historical costs. However, the issues outlined below exist regardless of which combination we use.

In the next two sections, we explain exactly what the IRR approach can (and cannot) tell us about monopoly profits. We consider in turn the cases where entry and exit values are (i) market prices and (ii) replacement costs.

IRR, monopoly profits, and market entry and exit values

Consider first the case where the IRR is calculated using market entry and exit values. In an informationally-efficient market, assets are priced in such a way that investors expect to earn a 'fair' rate of return.[3] Sometimes a firm will perform better than the market expected, and the ex post return will exceed this fair rate of return; sometimes it will under-perform relative to market expectations, and the ex post return will be less than the fair rate of return. Therefore, when the entry and exit values are market values, the ex post IRR simply reveals whether the firm did better or worse than the market expected at the entry date. Anticipated monopoly profits just lead to a high market value now, not to *returns* being high over any given future period. For the latter to occur, the firm must convince the market that profit forecasts need to rise, e.g., by achieving earnings surprises. By definition, a 'surprise' is no more likely to be generated by a monopolist than by a competitive firm, so one cannot infer monopoly power from market rates of return.

Consider, for example, Bertram et al.'s analysis of port companies. The authors note that when they changed hands in 1988, the ports' valuations "approximately matched the anticipated net present value of each business." (Bertram et al. 2002, p. 3) However, "[a]ctual volume growth exceeded expectations and resulted in windfall revenues for many ports." If the valuers had anticipated this volume growth, they would have set higher values at the purchase date. In turn, this would have resulted in lower ex post IRRs. Presumably Bertram et al. would not then be claiming that port companies made monopoly profits, despite the fact that both actual profit flows and the *original* investment in the assets are unchanged. Essentially, port companies are being accused of making monopoly profits because valuers did not anticipate volume growth. Of course, the volume growth may (or may not) have been due to unanticipated monopoly power, but this cannot be inferred from a single average rate of return calculation.

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[3]If markets are inefficient, then ex post IRRs based on market prices reflect under- or over-pricing and thus provide little information about economic performance. For example, an analysis of dotcom firms at the end of 1999 would have produced very high IRRs, but, at least with the benefit of hindsight, few would see this as an indication of monopoly profits.

A market-based ex post rate of return *cannot* shed any light on the existence or otherwise of monopoly profits. A well-known example of this problem is the investment folklore which advises investors to "buy land, they ain't making any more of it." But all investors know that no more land is being produced, so they factor this piece of information into the price of land. As a result, the price is bid up to the point where it offers its required return, *regardless of whether or not the land is used for an activity that generates monopoly profits.*

The following example formalizes this argument.[4] The market value of the asset at the purchase date is

$$MV_0 = \frac{E_0[\pi_1] + E_0[MV_1]}{1 + r},$$

where π_1 is the actual profit during the year, MV_1 is the market value at the exit date, r is the risk-adjusted discount rate (RADR), and all expected values are calculated only using information available to the market at the entry date. If market values are used as the entry and exit values, the ex post IRR i satisfies

$$MV_0 = \frac{\pi_1 + MV_1}{1 + i}.$$

Since

$$(1 + r)MV_0 = E_0[\pi_1] + E_0[MV_1]$$

and

$$(1 + i)MV_0 = \pi_1 + MV_1,$$

the "excess profit" equals

$$(i - r)MV_0 = (\pi_1 - E_0[\pi_1]) + (MV_1 - E_0[MV_1]).$$

Thus, excess profit equals the sum of (i) the random shock to planned profit and (ii) the random shock to the network's market value at the exit date. Neither of these quantities reveal anything about monopoly power.

IRR, monopoly profits, and replacement entry and exit values

We now show that if the hypothetical investor buys and sells the asset at its replacement cost, the IRR approach is capable, in principle, of saying *something* about monopoly profits.[5] However, we will see that practical implementation issues make it very unlikely that anything much can *actually* be inferred. In particular, we will see that the noise introduced by calculating ex post returns makes it almost impossible to reject the null hypothesis that the firm is not making excess ex ante profits.

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[4]We use one period returns to simplify the presentation. Our results extend easily to multiple periods.

[5]Similar arguments would apply if depreciated historic cost was used instead of replacement cost.

If the present value of future profit flows earned by the incumbent exceeds the replacement cost of its assets, then a rival firm could build an equivalent asset, earn lower profits, and still be financially viable. With this in mind, a regulator might require the firm to operate so that the present value of its future profit flows equals the replacement cost of its assets, as if this is the competitive outcome. That is, expected future profits must satisfy

$$RC_0 = \frac{E_0[\pi_1^*]}{1+r} + \frac{E_0[\pi_2^*]}{(1+r)^2} + \frac{E_0[\pi_3^*]}{(1+r)^3} + \cdots,$$

where r is the RADR, RC_0 is the asset's replacement cost at the entry date, and π_n^* is the profit which the regulator would like the firm to make in year n. This condition can be written in the form

$$RC_0 = \frac{E_0[\pi_1^*]}{1+r} + \frac{1}{1+r} E_0 \left[\frac{E_1[\pi_2^*]}{1+r} + \frac{E_1[\pi_3^*]}{(1+r)^2} + \cdots \right],$$

making it clear that the regulator's goal is for

$$RC_0 = \frac{E_0[\pi_1^*] + E_0[RC_1]}{1+r}, \tag{1}$$

where RC_1 is the replacement cost at the exit date.

From equation (1), the ex ante rate of return should equal r when replacement cost is chosen for the entry and exit values. The ex post rate of return i satisfies

$$RC_0 = \frac{\pi_1 + RC_1}{1+i}.$$

The excess profit therefore equals

$$(i-r)RC_0 = (\pi_1 - E_0[\pi_1^*]) + (RC_1 - E_0[RC_1]),$$

which we can write as

$$(i-r)RC_0 = E_0[\pi_1 - \pi_1^*] + (\pi_1 - E_0[\pi_1]) + (RC_1 - E_0[RC_1]).$$

Thus, excess profit equals the sum of (i) the excess profit planned by the firm, (ii) the random shock to planned profit, and (iii) the random shock to the network's replacement cost. When assessing the existence of monopoly profits, we are interested in the first component only. However, any calculation of ex post returns inevitably introduces the other two components, so the ex post IRR is a noisy (potentially very noisy) indicator of ex ante monopoly profits.

If the ex post IRR is to be used to detect monopoly profits, then detailed statistical analysis needs to be performed. To reject the null hypothesis that ex ante excess profits are zero (that is, that $E_0[\pi_1 - \pi_1^*] = 0$), the ex post excess profits (that is, $(i-r)RC_0$) have to exceed some positive critical value. The larger the variance of the combined noise term, the larger this critical value will be. And this variance is likely to be large. It seems

reasonable to assume that the two shocks are positively correlated — if the economy is booming, profits will be higher than expected and the cost of replacing the asset may also be high. If this is the case, then the variance of the combined noise term will be even greater than the sum of the variances of the components. Consequently, it will be very difficult to reject the null hypothesis given the sample periods typically available.

Thus, while in principle the IRR approach based on replacement cost entry and exit values can reveal something about monopoly profits, in practice it is likely to tell us very little.

Benchmark rates of return

Even if we could be confident that a high ex post IRR indicates a high ex ante expected return, there still remains the problem of determining whether or not it is "too high", in the sense of exceeding the benchmark applicable to a comparable competitive firm. Bertram et al. use two benchmarks: stock market returns and the weighted average cost of capital (WACC). Specifically, they compare gas IRRs with (i) the actual IRR of an investor who purchased the portfolio of NZSE40 stocks and held them over the sample period of the study, (ii) the Ministry of Economic Development's estimates of the appropriate WACC for electricity lines companies (Bertram et al., 2001, p. 23), and (iii) a WACC calculated using the Commerce Commission's approach to estimating WACCs for airfields (Bertram et al., 2001, p. 24). For their study of port companies, the same authors use the Ministry of Transport's specified WACC (Bertram et al., 2002, p. 23). In what circumstances are such benchmarks justified?

First, it is important to recognize that WACCs and stock market returns are market-determined benchmarks, i.e., they are measures of the opportunities available to investors who pay and receive market value for their assets. As a result, comparison of ex post IRRs with these benchmarks makes sense if and only if the IRRs are calculated using market values. But, as we have seen, the use of market entry and exit values means that the ex post IRR calculation is incapable of shedding any light on the extent of monopoly profits.

Second, even if this problem is ignored, it is by no means clear that these benchmarks represent fair ex ante rates of return. As is now widely recognized, a number of factors can drive a wedge between the theoretical fair return and simple single-period measures such as WACC: unsystematic risks and financing constraints (e.g., Stulz, 1999), dynamic risks and efficiency (e.g., Guthrie, Small and Wright, 2000), and growth and timing options (e.g., Dixit and Pindyck, 1994). Existing empirical evidence seems to support this idea: Summers (1987) and Poterba and Summers (1995) report that unregulated firms use investment benchmark returns up to three times as great as any possible WACC; Froot (1999) finds that benchmark returns for investments with high unsystematic risk (but

low systematic risk) such as catastrophe insurance frequently exceed 100%. In these circumstances, an IRR of 17% (the IRR calculated by Bertram et al. (2001, p. 12) for Natural Gas Corporation) does not seem too unusual.

Concluding remarks

We have three main reservations about the use of ex post IRRs to detect monopoly profits.

Firstly, with market values used as entry and exit values, the ex post IRR cannot shed any light on the existence or otherwise of monopoly profits — it simply reveals whether the firm did better or worse than the market expected at the entry date. Anticipated monopoly profits lead to a high market value now, not to *returns* being high over any given future period.

Secondly, while using replacement cost as the entry and exit values can, in principle, reveal something about monopoly profits, in practice the resulting ex post IRR is likely to tell us very little. If it is to be used to detect monopoly profits, then detailed statistical analysis needs to be performed. Since the ex post IRR is a noisy measure of ex ante monopoly profits, it will be very difficult to reject the null hypothesis given the sample periods typically available.

Finally, the typical benchmarks (stock market returns and WACCs) are market-determined and therefore only comparable to IRRs calculated using market values — a situation when the ex post IRR reveals nothing about monopoly profits anyway. Furthermore, there is ample empirical and theoretical evidence that these benchmarks do not even represent fair rates of return.

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