

**INVESTMENT AND FINANCE**  
**UNDER *FUNDAMENTAL* UNCERTAINTY**

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## **Abstract**

This dissertation reports an application of Critical Realist methodology to the problem of identifying the causal relationships between corporate finance and industrial investment. The study employs both econometric analysis of aggregate time-series data for the UK and US for the period 1952-2001 and other quantitative methods, including an analysis of individual cashflow statements, as well as qualitative studies of the annual reports and financial statements of individual firms. The econometric analysis consists mainly of the estimation and testing of single equation and vector error correction models based on a co-integrating relationship.

The aggregate data reveal the anomaly that large industrial firms invariably use equity markets to finance business acquisitions but not capital formation. This can be explained by a differential new equity issue discount based on a fresh interpretation of Keynes's analysis of liquidity preference under fundamental uncertainty. This account makes an important link between the theories of Keynes and Kalecki. The resulting hypothesis is tested and confirmed by an individual study of all 217 new issues over £1m made by continuing UK listed industrial companies in 1999.

The thesis concludes that public policy and future research on aggregate investment will be more fruitful if based upon the Post Keynesian understanding of uncertainty, although this requires a major reconsideration of current standard theoretical and empirical methodologies. A distinctive conclusion is that econometric analysis can reveal the detailed nature of regular patterns grounded in conventional behaviour and institutions, but must not be used uncritically in the framing and testing of economic hypotheses.

Keywords: investment - uncertainty - liquidity preference - capital structure - cashflow - new issue discount - Post Keynesian - Critical Realism - methodology - co-integration

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## Chapter 1 Introduction

In common discourse, investment refers to financial assets such as deposits, bonds and shares. It is a curious thing that by contrast economists can discuss investment without ever mentioning finance. By investment they mean capital formation, the production of new capital assets, including intangible assets such as education. Economists have always debated the relationship between these two, investment and finance, and the controversy over its nature remains unresolved.

The question is controversial because the answer given has far-reaching implications for both economic theory and public policy. The neoClassical view is that investment and finance can be treated separately, linked only by the cost of capital, which in turn is a function of a preference for present over future consumption. This view is founded ultimately on the premise that the competition of free enterprise will ensure that no profitable opportunity will be neglected for lack of finance. Even if an individual firm is permanently constrained from exploiting an investment opportunity to the full, unconstrained competitors will sooner or later enter the market and complete the process. Given perfect competition, the only limit to investment is the social cost common to all players, the cost of capital for a given class of risk.

The vision of free enterprise as a fair contest between well matched competitors has always been a matter of intense dispute, most notably by Karl Marx and his intellectual descendants, including Michal Kalecki. Yet it was perhaps Keynes in *The General Theory of Employment, Interest and Money* (1936, hereafter referred to simply as *The General Theory* and in page references as *GT*) who delivered the sharper critique of the neoClassical view, because he accepted its terms of engagement. While maintaining the characterisation of capitalism as a competition on more or less equal terms, Keynes showed how the relationship between investment and finance is central to an understanding of the system as a whole. This relationship can explain involuntary unemployment and the trade cycle. The rate of interest is the price of finance, not of saving. A feature of a capitalist society more fundamental even than free enterprise is its character as a human society with a history in space and time. The historical nature of time means we do not know the future. From this fundamental uncertainty stem the volatility of financial markets

and the preference for liquidity which upset the neoClassical vision of equilibrium between investment and desired saving at full employment.

The neoClassical response to Keynes was on several fronts. The dependence of *The General Theory* on the speculative demand for money based on liquidity preference was extensively criticised. This led eventually to a reassertion of quantity theory, first in the strong form of monetarism and subsequently in a weaker form that maintains nonetheless that inflation is a monetary phenomenon, a view inconsistent with involuntary unemployment as defined in *The General Theory*. More subtly, fundamental uncertainty proved too intractable for neoClassical economic theory and was gradually emasculated and reduced solely to ‘actuarial’ or insurable risk.

Those who responded to Keynes by pursuing his understanding of fundamental uncertainty, such as Joan Robinson and Paul Davidson, came to be known as ‘Post Keynesians’. In her search for a stronger theory of aggregate investment and consumption Robinson turned to Kalecki’s theory of the relationship between investment and finance, in which the consequences of fundamental uncertainty are embedded in the institutions of capitalist society. While fully sensitive to the difference between finance and savings, Kalecki emphasised the role of profits both as savings and as a source of finance for investment. Kalecki’s approach rests ultimately on the failure of competition and specifically on an assumption of imperfect competition in capital markets, generally known as his ‘Principle of Increasing Risk’. Accordingly dialogue between Post Keynesian and neoClassical schools has proved difficult, because of mutually exclusive assumptions about either the degree of competition or the nature of uncertainty.

As the influence of Keynes on the economics profession diminished, and both economic data and statistical methods improved, economists sought to explain the observed path of aggregate investment in terms of the so-called ‘fundamental’ variables of the neoClassical price mechanism, marginal productivity and the cost of capital. The empirical studies have been at best inconclusive in terms of this objective. In particular they have persistently found a strong correlation between investment and cashflow (internal finance), as Kalecki suggested, despite the existence of highly active capital markets.

The dispute over the interpretation of this correlation is referred to throughout this dissertation simply as ‘the problem of interpretation’. If the possibility of cashflow

as a general financial constraint is ruled out on the grounds that competitive equity markets exist, the observed correlation must reflect either the role of cashflow as a proxy for the unmeasured element of the above ‘fundamentals’, or specific imperfections in the equity markets. Increasingly refined econometric techniques have been deployed in an attempt to isolate the relative contributions of ‘fundamentals’ and financial imperfections, including the role of cashflow, to the determination of aggregate investment.

Another neoClassical response to the mixed empirical results has been to take into account the implications of the irreversibility of investment under uncertainty, although by ‘uncertainty’ is meant actuarial risk. Real options theory implies that the empirical studies have mismeasured the ‘fundamental’ variables through omitting the value of timing, the option to delay investment. Yet nothing in this theory threatens the separation of investment from finance. The index to the leading work (*Investment under Uncertainty*, Dixit and Pindyck, 1994) contains no reference to finance, equity, borrowing, debt, or cashflow.

Within this context, the following pages present a study of the empirical relationship between investment and finance, and offer in response to the evidence a new synthesis of the theories of Keynes and Kalecki based on fundamental uncertainty. This synthesis represents a fresh interpretation of *The General Theory*’s analysis of liquidity preference. It purports to explain the new equity issue discount that is essential to Kalecki’s approach as an expression of the liquidity element of ‘lender’s risk’.

This explanation has the virtue that the investment-cashflow correlation can be taken at face value, and in a carefully defined sense, it thereby resolves the problem of interpretation. The title of this thesis, *Investment and Finance under Fundamental Uncertainty* alludes to the common ground with real options theory on the importance of irreversibility, but also to the material divergence resulting from two very different conceptions of uncertainty. That leads in this case to a renewed emphasis on the relationship between investment and finance.

### ***Defining terms***

Throughout this dissertation certain words are used as specific shorthand. In line with the rest of the economic literature, ‘investment’ denotes capital formation



unless the context clearly refers to expenditure on existing physical (produced or non-produced) capital goods or financial assets, particularly by way of business acquisition. Capital formation includes research & development, training, education and the production of any intangible assets that in turn are used in production. The term is not restricted to fixed assets although most empirical studies concentrate on this element.

Although there is some variation in usage among authors, in this dissertation unless otherwise stated 'cashflow' means undistributed income (profit after tax and dividends) plus the depreciation and amortisation charged in arriving at the profit. It is therefore a simple measure of cash generated by operations, which differs slightly from the measure reported in corporate accounting statements. 'Gross cashflow' means cashflow plus dividends, and 'net cashflow' means cashflow less investment.

'Fundamental uncertainty' will be addressed at length and here it is sufficient to note that 'fundamental' means incapable of reduction to statistical variance, which is also referred to variously as stochastic uncertainty and actuarial or insurable risk.

'Managers' includes directors, managers and other employees and the term treats the corporation as having a single mind. The corporation is distinct from 'investors', which refers to both new and existing shareholders unless otherwise stated. Ownership and control are assumed to be separate (although this does not prevent managers holding a minority interest) and the corporation is the public company limited by shares (or US equivalent) unless otherwise stated.

The term 'Price Mechanism' is used to describe the set of theories and models based on an underlying axiom that relative prices are the dominant forces determining investment and finance decisions, and that optimisation and competition based on these prices lead the allocation of resources towards full employment equilibrium. This set includes models where imperfections (*ie* non-price factors) play a significant role in terms of practical policy, since these imperfections are assessed against the benchmark of the equilibrium they prevent. This term 'Price Mechanism' allows a clear distinction between Post Keynesian models on the one hand, where relative prices do not play the determining role even in theory, and the others considered here. This does not mean discounting return on capital as the dominant managerial and investor objective; although some models (Post Keynesian and otherwise, *eg* agency models) emphasise other objectives. The phrase 'Price

Mechanism' is distinguished from adjectives such as 'competitive' or 'market' or 'equilibrium' or 'optimisation', since elements of all these play some role in Post Keynesian thought and this thesis. Conversely the use of 'market clearing' would do violence to New Keynesian theory despite its emphasis on the Price Mechanism.

The term 'competitive market' here refers to perfect competition in the sense of Marshall and Keynes, implying that individual firms take market prices as given and face perfectly elastic demand for their shares. It will be argued that this is a reasonable representation of the market for the equity shares of large firms, implying that their shares are close substitutes for each other and are valued solely on the basis of their prospective yield. It also implies a reasonable consensus about the share price among a wide range of investors, which as we shall see reflects the conventional basis of valuation. This assumption therefore abstracts from factors which influence share prices other than through the prospective yield, including the 'liquidity' or depth of the market for a particular share and the value of corporate control, perhaps through external economies arising from merger with another business. The study will not extend beyond capital markets so no assumption is made about the nature and degree of competition in other markets.

Following Keynes, the assumption of perfect competition in this form does not imply or require that competitive markets generate the general equilibrium proposed by Price Mechanism theory. In particular, the assumption does not imply perfect information about the future or a tendency towards full employment equilibrium. Marshall and Keynes do not assume that all markets exist, including all those for future delivery and insurance, as required for Walrasian general equilibrium (*cf* Arrow and Hahn, 1971:33). Indeed for Keynes the need to rely on expectations of future prices, rather than being able to enter into contracts at those prices, is very much the moot point. However he does implicitly make the simplifying assumption that information about the past and present is *common* to all investors and managers: competition is perfect in the sense that there is no price-sensitive information possessed (and acted upon) by insiders but not by others. This does not imply that all hold common expectations about the future.

Although futures and contingent markets are necessary to demonstrate general equilibrium, given the limitations of Marshall's partial equilibrium analysis, the latter remains serviceable for a discussion of the investment decision by an

individual firm, which is the primary concern of both Keynes and this thesis. It is reasonable for an individual firm to rank the investment opportunities available to it in descending order and act as though its own investment decisions do not affect the prospective yield of those opportunities. The proposed explanation of the relationship between investment and finance is not vulnerable to the fallacy of composition implicit in Keynes's assumption that the *aggregate* marginal efficiency of capital schedule slopes downwards<sup>1</sup>, since its parameters are particular to each firm and independent of those of other firms.

We make no assumption about the adjustment of the relative prices and quantities newly produced of each kind of good or any tendency towards full employment equilibrium. Share prices are a matter of stock rather than flow equilibrium, and our assumption of perfect competition requires only that shares are close substitutes in a deep market, so that the share price clears the market between investors who, for whatever reason, wish to buy or sell. We do not need to consider how prices and output interact, whether in the partial equilibrium industry-based model of Marshall, or the general equilibrium re-contracting model of Walras.

The term 'general finance constraint' needs careful definition in the context of competitive equity markets. The assumption of competition means that the expected rate of return on new investment (its marginal efficiency, to use Keynes's term) equals the marginal cost of capital (strictly, the cost of new equity finance for a firm without debt in a given class of risk)<sup>2</sup>. The argument can also be expressed in terms of the market valuation of investment opportunities, marginal  $q$ , and leads to the same conclusion.

A finance constraint may be absolute or relative, so that the marginal efficiency may be greater than or equal to the marginal cost of capital. An absolute constraint means that the marginal efficiency exceeds the marginal cost of capital so that finance for investment is rationed and not all profitable investment can be funded and take

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<sup>1</sup> At the aggregate level, investment by one firm affects the prospective yield of the investment opportunities faced by another, so that marginal efficiency may increase rather than decline as aggregate investment increases. There is a further problem that the same asset may have more than one marginal efficiency (the 'reswitching' issue), undermining the functional relationship between the marginal asset and the interest rate.

<sup>2</sup> The problems lurking within this definition of the cost of capital are addressed further in Chapter 6.

place. A relative constraint implies that the marginal efficiency equals the marginal cost of capital but that the marginal cost exceeds the average cost of capital (*ie* the return required by investors to hold the existing shares in a firm without debt in a given class of risk). This means on the one hand that all investment that is profitable at the marginal cost of capital does indeed take place, but on the other hand, investment with a lower marginal efficiency that would nevertheless have been profitable at the average cost of capital is not undertaken. The market clears at the marginal cost of capital, but this price constrains investment below the level that would have prevailed at the average cost of capital.

An absolute constraint breaches the assumption of competitive equity markets and is not plausible in the case of large firms that use new issue markets extensively. A relative constraint may reflect a lack of competition (*eg* an inelastic demand for shares), but the main burden of this thesis is to explain how the marginal cost of capital can exceed the average cost even under competitive conditions<sup>3</sup>.

This definition of a general finance constraint links to the objection that will here be defined as the ‘bootstrap hypothesis’. It will be shown that the general finance constraint relates to the effect of fundamental uncertainty on the competitive equity market. The thesis therefore depends on making a connection between the supply of equity finance and a general finance constraint.

The bootstrap hypothesis is the counter-argument that even if finance constraints exist in debt and equity markets, firms may still not need new equity finance. The finance constraint will not bind if firms can finance all profitable investment opportunities from cashflow and available debt. Even if there is an upper limit on gearing (*ie* debt markets are not perfectly competitive), this may yet be sufficient to take advantage of all available and worthwhile opportunities. The increase in cashflow resulting from successful investment increases the absolute borrowing capacity, given the gearing ratio, and investment ‘lifts itself by its own bootstraps’. The marginal cost of capital is then the opportunity cost of using cashflow to finance

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<sup>3</sup> The notion of a general finance constraint must be clearly distinguished from the issues surrounding the ‘finance motive’ for the demand for money, defined in Keynes (1937B). The effect of a planned increase in aggregate demand (not only for investment, see also Davidson, 1965, 1967) may be a rise in the rate of interest. In the present context this means an increase in the average cost of capital. However the finance motive has no bearing on the relationship between the marginal and average cost of capital.

investment rather than returning it to investors, and therefore equals the average cost of capital. On the bootstrap hypothesis, any increased marginal cost of new equity finance does not lead to a binding general finance constraint nor undermine the neoClassical analysis for practical purposes. Addressing this counter-hypothesis is an important part of the empirical work to be undertaken below.

The term ‘anomaly’ is used to refer to the Critical Realist contrastive demi-regularity or ‘demi-reg’. This application is strictly inaccurate, since its literal meaning is a departure from a law, which is the very concept to which Critical Realism objects. However ‘anomaly’ is both more familiar and more elegant prose.

### ***Plan of the dissertation***

Chapter 2 reviews the theoretical literature since Keynes on the relationship between investment and finance, classifying theories into neoClassical, New Keynesian and Post Keynesian schools of thought and relating each to *The General Theory*. Chapter 3 examines previous empirical studies of investment from the perspective of their treatment of finance constraints and explores the problem of interpreting the evidence. Chapter 4 considers methodology and draws upon Critical Realist philosophy to arrive at a structure for an empirical investigation intended to resolve this problem of interpretation. Chapter 5 begins the investigation by examining the aggregate time-series data for the UK and US industrial sectors for the period 1952-2001. This chapter confirms the investment-cashflow correlation and the absence of a contribution from external equity to the finance of capital formation, and finds evidence against the bootstrap hypothesis. Chapter 6 sets out an original explanation for this anomaly in terms of a differential new issue discount in competitive equity markets based on fundamental uncertainty and its consequence, liquidity preference. This explanation overcomes the shortcomings of New Keynesian and existing Post Keynesian theory, and creates a necessary link between *The General Theory* and the Post Keynesian theory of investment finance. Chapter 7 tests and confirms this explanation empirically at firm level. The dataset is all 217 new equity issues in excess of £1m made during 1999 by UK industrial firms listed on the London Stock Exchange. Chapter 8 draws together the conclusions for theory, research and policy. Chapter 9 restates the preceding argument in summary form.

## **Chapter 2 The relationship between investment and finance: the theoretical literature**

This chapter reviews the theoretical literature on the relationship between industrial investment and corporate finance, and on the finance of investment by new equity issues in particular. Accordingly the chapter touches only briefly on theories of aggregate investment (more attention is given in Chapter 3), and concentrates on the investment decision of the individual firm. Section 2.1 begins with a brief summary of Keynes's approach in *The General Theory* as a basis for reviewing later developments. Section 2.2 considers the financial invariance theorem (Franco Modigliani and Merton Miller, 1958, hereafter M&M) that was a turning point for the reaffirmation of the neoClassical separation of investment from finance after the introduction of fundamental uncertainty by Keynes. The theory of capital structure in terms of market imperfections that follows from M&M, including agency problems, abstracts from the main problem of interest here and is addressed in Appendix 2-A. Section 2.3 then moves on to New Keynesian theory, in which market imperfections may not be 'artificial' but relate to the unequal or asymmetric distribution of information between agents. Of particular relevance is the model of new issue behaviour in Myers and Majluf (1984). Section 2.4 reviews the Post Keynesian approach, highlighting the differences from the above Price Mechanism models and concentrating on theories of the new issue mechanism, particularly those stemming from Kalecki.

Section 2.5 concludes that both Post Keynesian and New Keynesian theories are vulnerable to the observation of large flows of new issues of equity, which would appear *prima facie* to support the neoClassical financial invariance theorem.

### **2.1 The General Theory: liquidity preference**

The framework of *The General Theory* provides a useful structure for charting the subsequent development of theory. A full study of Keynes's analysis is deferred until Chapter 6, but the following paragraphs set out the main elements of his view of the relationship between investment and finance.

*The General Theory* assumes that markets are competitive in the Marshallian sense (firms are price-takers and consider their selling price to be independent of their own

output). Keynes also assumes a given degree of competition (*GT*:245), by which he appears to mean the ease of entry into each Marshallian industry, including possible restrictions by organised labour. Although each firm is assumed to set its output at the level where price equals marginal cost (including Keynes's user cost) under diminishing returns, the degree of competition refers in the case of firms to the potential gap between short-run and long-run marginal cost. In the case of 'factors' ie labour, imperfect competition may drive a wedge between the wage and the marginal disutility of labour (*GT*: 5-6)

There is no suggestion that the failure of aggregate demand to reach a level consistent with full employment depends on imperfect competition and in this respect Keynes differs from many Post Keynesians. Keynes starts from an acceptance of the basic implication of perfect competition, that the marginal efficiency of capital will equal the rate of interest in equilibrium under conditions of perfect certainty (*GT*:136-137). The rate of interest is the 'net' rate of interest, with no allowance for risk, such as might be earned on a government bond. Keynes on the whole abstracts from transaction costs, including those of financial intermediation.

The introduction of fundamental uncertainty has several implications, which Keynes divides between its effects on the marginal efficiency of capital and the rate of interest (*GT*:144). The marginal efficiency must exceed the rate of interest by an amount sufficient to compensate for borrower's and lender's risk. Borrower's risk requires a premium both for 'risk proper' to compensate for the actuarial risk or expected rate of loss, and for liquidity risk, the possibility that expectations may be disappointed. Lender's risk requires a premium both for voluntary and for involuntary default, the latter also a function of liquidity risk.

It is significant that Keynes does not consider material his abstraction from the difference between capital assets and equity shares, or put another way, the difference between managers and investors. For the most part his discussion is conducted as though investors had direct claims to the capital assets represented by shares, and his discussion of financial markets treats the assets and the shares interchangeably. This means he treats the cost of capital as independent of financial structure, and anticipates the M&M financial invariance theorem, to be discussed in section 2.2. He discusses borrower's and lender's risk in relation to assets, not finance. The concept of moral hazard or voluntary default anticipates the literature

on agency and asymmetric information discussed in sections 2.2 and 2.3. The liquidity element of lender's risk is the main plank of this thesis, as will be seen in Chapter 6.

The emphasis of Keynes's discussion is not on these elements which divide the marginal efficiency of capital from the rate of interest, but on the effects of fundamental uncertainty on the two main variables themselves. Both fluctuate in the short term with confidence and conventions in financial markets. Investment "depends on two sets of judgments about the future, neither of which rests on an adequate or secure foundation – on the propensity to hoard and on opinions about the future yield of capital assets" (Keynes, 1937A:118).

In the long term the main economic implication of fundamental uncertainty for Keynes is liquidity preference. Perhaps his greatest stress in *The General Theory* itself is on the difference between his theory of interest and the neoClassical theory of interest (which he prefers to call the 'classical' theory). The rate of interest is the price of finance, not of saving, and he argues that liquidity preference may prevent the rate of interest falling to a level consistent with full employment.

Since the time of Aristotle there has been debate as to the nature and source of interest, which hinges on whether interest is at root a monetary or real phenomenon. *The General Theory* and the neoClassical theory of interest fall on opposing sides of this debate. The neoClassical school does not deny that the rate of interest is the price for the use of money, but argues that the money rate of interest is of no more independent causal significance than the absolute price level. In other words, money is neutral and financial transactions veil the real forces at work. The neoClassical school therefore separates the theories of money and finance on the one hand and of value on the other. The real rate of interest reflects the productivity of capital and regulates the supply and demand for savings, or as Irving Fisher puts it, the tension between opportunity (to invest) and impatience (to consume).

*The Theory of Interest* (Fisher, 1930) is a mature expression of the neoClassical view just prior to *The General Theory* that avoids some of the pitfalls of cruder productivity theories of interest. Keynes acknowledges (*GT*: 140) that Fisher's inter-temporal rate of return over cost (Fisher, 1930:168) is an equivalent concept to his own marginal efficiency of capital, and Keynes's discussion of own rates of interest in Chapter 17 (*GT*) is similar to Fisher's (1930:40). The term 'investment



opportunity' (Fisher, 1930:151) has been widely adopted to describe the circumstances in which a (real) investment decision is available; where there is an 'option' to choose between different streams of income. On the other hand, Keynes criticises two of the assumptions of Fisher and other neoClassical authors that are necessary for a determinate theory. These are that an act of saving corresponds to an order for future consumption, and that the rate of interest regulates the degree of Fisher's 'impatience' or Marshall's 'waiting' at the margin. In terms of mathematical economics, the first point is the assumption of complete futures markets; the second is the assumption that the economy is in equilibrium, on the joint boundary of convex production possibility and preference sets. Keynes illustrates the first (tacit) assumption in his example that a decision not to have dinner today "does *not* necessitate a decision to have dinner or to buy a pair of boots a week hence or a year hence or to consume any specified thing at any specified date" (*GT*: 210, emphasis in original). On the second assumption, if output is within the boundary of the production possibility set, corresponding to one of Fisher's 'ineligible' options (1930:151), it is aggregate income that is the main force bringing investment and *ex ante* saving into line with each other (Chapter 14, *GT*). Fisher's definition of real income as consumption (1930:6-7) conceals a second tacit assumption that the level of current employment is fixed. Nevertheless it is Fisher's theory, in which *real* time preference substitutes for *money* rate of interest, that is the basis of modern neoClassical infinite horizon or overlapping generations dynamic equilibrium growth models.

In summary, *The General Theory* puts forward a relationship between investment and finance which is rich and many-faceted and contrasts starkly with the neoClassical dichotomy. Much play is made of the importance of financial markets and of fluctuations in confidence in creating short-term cycles, a line developed later by Hyman Minsky (see below). The concept of borrower's risk plays a key role in Post Keynesian thought. The aspect of finance most emphasised by Keynes is the independent nature and role of money itself and the supplanting of thrift by liquidity preference as the foil for marginal 'productivity' in the investment decision.

## 2.2 NeoClassical theory: uncertainty as risk

After *The General Theory* the development of the theory of the relationship between investment and finance initially proceeded mainly along the Post Keynesian lines to be discussed in section 2.4. The next key change of direction in the mainstream of thought came with the M&M invariance theorem (Modigliani and Miller, 1958). This seminal contribution (supplemented by their dividend invariance paper of 1961 and the tax correction paper of 1963) shows how under the assumption of perfect capital markets a corporation's cost of capital remains independent of its capital structure despite uncertainty. As already noted, this theorem was already implicit in Keynes's abstraction from the difference between assets and shares, managers and investors. Yet it played a key role in the reassertion of the neoClassical separation of investment and finance despite the introduction of a fundamentally uncertain future.

After Keynes, economists usually assumed, in accordance with the apparent facts, that firms faced a rising cost of capital, favouring cashflow, debt and equity in that pecking order. A good example of the state of thinking immediately pre-M&M is in Duesenberry (1958), who drew an inelastic cost of capital schedule, which shifted with variations in cashflow, leading to variations in investment. The theoretical foundation of this was Keynes's borrower's risk (Duesenberry, 1958: 92), which leads managers to impute a rising cost to debt as the level of gearing increases. The wide differential at the time between the income yield on bonds and that on equities led to the presumption that equity finance was the most expensive option.

The M&M theorem reinstates the concept of a parametric cost of capital. While under conditions of certainty this price is the interest rate, under uncertain conditions it is the cost of equity for a firm of a given class of risk without any debt. If the firm makes no new equity issues, the cost of capital schedule is horizontal for any level of debt. The assumption of perfect capital markets means that the marginal cost of any new equity issues by a firm without debt will equal the average cost of equity. Therefore the cost of capital schedule is horizontal, whether a firm is financed with cashflow, debt or equity. Once a risk premium is allowed for, the original neoClassical conclusion that the cost of capital equals the rate of interest is preserved without any more serious modification under conditions of uncertainty.

The core thesis of M&M (their Proposition I) is that investors can offset any effect on share prices of differences in capital structure by changing the structure of their

own portfolio, including their own borrowing. Given competitive markets for equity and for debt, on both corporate and investor account, arbitrage eliminates any price differential. Borrowing by investors (including institutions) is a substitute for corporate borrowing. In a famous analogy they suggest that separating whole milk into butterfat and skim cannot increase the net value of the milk. Stripping out an assured income stream in the form of interest cannot increase the value of an uncertain stream. This leads to their conclusion (Proposition III) that new investments will increase shareholder value if they offer a positive net present value discounted at the industry's cost of capital. This is the discount rate for ungeared uncertain income streams of that class of risk, irrespective of the actual capital structure (including dividend policy). The cost of capital may well in practice be *below* the return on geared equity and *above* the interest rate on debt.

The significance of the M&M theorem in terms of the analysis of *The General Theory* is subtle. On the one hand, it vindicates Keynes's abstraction from financial structure. Equity finance eliminates the need to consider lender's risk ("if a man is venturing his own money", *GT*:144), at least until the problems of principal & agent and asymmetric information are introduced. The premium for borrower's risk corresponds to the premium between M&M's cost of capital and the rate of interest. On the other hand, M&M elide Keynes's distinction between 'risk proper' and liquidity risk within borrower's risk. The liquidity premium disappears from the analysis of the investment decision and becomes part of monetary theory alone, where in turn Tobin (1958) eliminates it (see Chapter 6). The door to the reduction of uncertainty to actuarial risk has been opened.

Another subtle difference is that the focus of attention switches from the marginal efficiency of capital to the cost of capital, so that the differences between assets are neglected. While Keynes in principle treats each asset as freely traded on the stock market, M&M concentrate on the cost of equity finance for a given firm. M&M recognise this up to a point (M&M, 1958:292), when protesting that the theoretical independence of investment and finance does not make financing policy irrelevant. They make the important observation that managers and investors may have different perceptions of the value of a new asset. This 'imperfection' can explain a temporary preference for debt finance over a new issue until the new asset's earnings become visible. While M&M acknowledge this practical possibility of a

divergence between marginal and average cost (a new issue discount) they regard it as of secondary importance, particularly for large firms with ready access to equity markets. Chapter 6 of this thesis will argue to the contrary that this effect is long-term and primary, with its roots in the liquidity risk from which M&M abstract, rather than in (perhaps ephemeral) differences of view about marginal efficiency and actuarial risk between managers and investors.

The perfect competition assumption plays two roles in the M&M theorem. First, the supply of equity finance is perfectly elastic, so that the average and marginal cost of capital (ungeared equity) are equal for a given industry (class of risk). Secondly, investors can hedge their long or short positions (meaning they hold a claim to, or are obliged to deliver an asset). The high rate of innovation in financial products, the importance of institutional investors, and the development of markets for derivatives making it much easier to take short positions, together make this second assumption plausible.

A perfectly elastic supply of equity finance for a given class of risk leaves no avenue for cashflow or financial factors (other than the cost of capital) to affect investment. Observed capital structure becomes, in neoClassical theory, a matter of tax, bankruptcy and agency costs, none of which can drive a wedge between the marginal and average cost of capital. The theory of capital structure (see Appendix 2-A) cannot shed any light on the relationship between finance and investment since it does not allow for such a link. Within this Price Mechanism framework, finance becomes significant only with the qualification of the neoClassical ‘full information’ assumption through the introduction of asymmetric information, a concept broadly associated with the so-called ‘New Keynesian’ school of thought.

### **2.3 New Keynesian theory: asymmetric information**

Theories based on asymmetric information (‘AI’) have flourished extensively in the literature and address the labour and consumer goods as well as capital markets. They are usually called ‘New *Keynesian*’ (rather inappropriately, *cf* Fazzari and Variato, 1996:359 fn1) because they provide a theoretical basis in optimisation behaviour for the failure of prices to clear markets generally associated with the work of Keynes. These theories recognise the importance of incomplete information but concentrate specifically on the behaviour that can result from the differences in

the information set available to agents, rather than the aggregate effects of incomplete information, notably about the unknowable future.

Asymmetric information leads to problems of adverse selection ('sorting effects') and moral hazard ('incentive effects'). As noted above, Keynes recognised these effects as a source of lender's risk. They are well illustrated in Akerlof's celebrated example of the market for second-hand cars (Akerlof, 1970). The market price of a car known by the seller to be in perfect condition is discounted to the price of the average car because the buyer cannot be sure of its quality. Conversely the seller who knows he has a 'lemon' has an incentive to withhold this information. In this case AI provides an economic basis for the costs of expert inspection and purchased warranties to overcome the asymmetry. If such counter-measures are not available, high-quality sellers may stay out of the market and the poor quality of the remaining supply may lead ultimately to complete market failure.

This insight has been applied extensively in the theoretical finance literature. Stiglitz and Weiss (1981) develop a theory of credit rationing based on lemons when lenders share in the risk of default. Such 'risky debt' contracts are the optimal investment contract under AI, compared with either equity or secured debt. The proposition is that the price (interest rate) affects the nature of the transaction and therefore may not also clear the market. The interest rate affects the riskiness of the loan portfolio through adverse selection and moral hazard. Adverse selection means that lenders are unable to discriminate between borrowers in terms of the riskiness of their projects. Moral hazard means borrowers undertake higher risk projects with borrowed funds than they would with their own money, since the lender bears part of the cost of failure. Consequently the lender treats the willingness to pay a higher interest rate as a signal of poor loan quality and prefers to ration credit rather than raise interest rates to a market clearing level. In these circumstances a firm with adequate cashflow may make an investment where a firm dependent on external finance (and unable to issue new equity) will not. Financial quantities such as cashflow can therefore influence real investment decisions and the price mechanism cannot clear the market.

Credit rationing should not limit investment by large firms with ready access to competitive equity markets. In Greenwald, Stiglitz and Weiss (1984) the analysis is extended to show how adverse selection could affect decisions to finance investment

by a new equity issue. The crucial assumption is asymmetric information about the value of the firm's existing assets ('assets-in-place'), combined with stochastic risk about the outcome of the new investment. The expected bankruptcy cost for holders of risky debt implied by the quantitative probability of failure affects the optimal decision rule for equity issue in such a way that firms prefer to issue equity only if the value of assets-in-place is low. An equity issue is therefore a signal to investors of the poor quality of assets-in-place, *ie* of an attempt to pass off a lemon. This model implies that equity issues will never be preferred if managers act in the interests of existing investors, except in cases of financial distress when equity may not be forthcoming at all.

Myers and Majluf (1984) extend Greenwald et al (1984) mainly by incorporating the value of financial slack (liquid reserves and capacity to issue risk-free debt). Slack derives its value from allowing managers to proceed with profitable investments when asymmetric information deters a new equity issue.

The core assumptions of Myers and Majluf are that managers and potential investors acquire full information at different times. Crucially, both know from the outset the probability distributions of the returns on both assets-in-place and investment opportunities (which are one-time, with no real option value). In the second stage managers become aware of the actual outcomes and decide whether or not to issue shares, while potential investors remain ignorant. Finally the potential investors too learn the outcomes. If managers act in the interests of existing investors, potential investors can infer from their knowledge of the probability distribution of the return on assets-in-place that a new issue is a signal of a poor outcome, as in Greenwald et al (1984). They will mark down the share price accordingly, and a new issue will only proceed if the investment opportunity is profitable enough to offset the dilution of existing investors: a positive net present value calculated at the average cost of the existing capital is not enough. In these circumstances the cost of new equity capital exceeds the 'full information value'. The result depends on asymmetric information about the return on assets-in-place. If there is no asymmetry about this information, AI about the investment opportunity alone does not affect the issue decision (Myers and Majluf, 1984:201).

Myers and Majluf offer two observations on the possible source of this sort of AI (Myers and Majluf, 1984:196). First, managers may have information valuable to

competitors so that its release would reduce the value of the firm's assets and opportunities. Secondly, where such a threat does not exist, Myers and Majluf extends the concept of AI to the (internal) superior specialised knowledge and skill of managers. There is always AI in this sense about the value of assets-in-place. It is not clear how investors can have full knowledge of the probability distribution equal to managers', and yet be less able to judge the likely outcome, in the absence of additional undisclosed (external) information.

Myers and Majluf predict that there will be a 'pecking order' in a firm's choice of finance for a new asset, driven by the need to conserve financial slack and avoid equity issues. This implies a reliance primarily on cashflow (and therefore a limit on dividends) supplemented by risk-free debt, with new issues of equity and risky debt a last resort. When firms do use equity finance, the share price will tend to fall, but not when they use risk-free debt. Firms have an incentive to time the issue of shares carefully to avoid AI discounts. Capital structure is the resultant of these 'flow' decisions.

As Glickman (2001) has argued, the 'pecking order' is a well-established empirical regularity, for which New Keynesian theory offers one rationalisation. On the other hand, a further (implicit) prediction of the theory is that the preference against equity is independent of the application of the proceeds. There is no reason why equity would be issued to finance acquisitions but not new assets. This could only be understood if acquisitions were always expected to offer higher returns than new assets, sufficient to offset the dilution of existing investors. There is no evidence of this (Erard and Schaller, 2002).

The New Keynesian account would be more convincing if the relevant asymmetry of information was about the investment opportunity rather than the assets-in-place. New issues always require a prospectus with details of the firm's current situation and prospects. Managers are under a legal obligation to make full disclosure, and may be required to compensate investors for any misrepresentation. The prospectus provides investors, new and old, with a great deal of information on which to assess the value of the assets-in-place. By contrast the value of an investment opportunity depends heavily on future outcomes and is always a matter of judgement. It is in this area where the specialised knowledge of managers may confer an advantage, as indeed Myers and Majluf partly acknowledge (see above).

These New Keynesian models in common with the neoClassical models treat uncertainty as statistical variance. Both Greenwald et al and Myers and Majluf assume a single period between the issue decision and the revelation of the outcome to investors. This abstracts from the possibility that the ‘probability distribution’ could change over time and introduce another form of risk in addition to variance; in other words, from fundamental uncertainty in the Post Keynesian sense. Furthermore the assumption that both managers and investors know the probability distribution requires the objectivity of the distribution (Fazzari and Variato, 1994:363).

Ironically, AI theory postulates a *larger* information set than neoClassical theory (Crotty, 1996:337). In the latter case, price-taking agents need knowledge only of the market price and their own cost structure to reach optimal decisions, and need to know nothing about their counter-party’s situation. In New Keynesian theory agents are assumed to have full knowledge about the probability distribution of their counter-party’s profitability, and ignorance only of the specific outcome.

In summary, asymmetry of information offers one explanation of the new equity issue discount and thereby creates a potential role for finance as an influence on investment. AI is a market imperfection that drives a wedge between the marginal and average cost of capital for a given risk, and its effects are measured against the perfect competition benchmark. AI implies a ‘pecking order’ in which cashflow is the preferred source of finance. The influence of finance is only potential, since the constraint may not bind on all firms or on any firm at all times. The main behavioural assumptions are that managers act in the interests of existing investors, who in turn do not actively offset the value of financial slack by rebalancing their portfolios. The result hinges on the asymmetry of information about the value of assets-in-place rather than about the value of investment opportunities. Although some predictions of the theory are plausible, this premise is less so. Finally, there is no suggestion that the purpose of a new issue has any bearing on the decision to make it.

## **2.4 Post Keynesian theory: imperfect competition and cashflow**

The delineation of the Post Keynesian school is a matter of some debate (*cf* Arestis, 1996; Arestis, Dunn and Sawyer, 1999; Dunn, 2000). There appear to be three core propositions. First, the central axiom is that a market economy is essentially



monetary and is misrepresented by neoClassical ‘clearing house’ theory. This means, secondly, that output is determined by effective demand and prices do not necessarily clear markets. Thirdly, it also means that uncertainty is based in our ignorance of the future and is fundamental, impossible to reduce to a probability distribution.

From these foundations emerge many distinctive subsidiary characteristics. Among them, institutions matter and are rooted in history: the market itself is but one example of an institution and other institutions cannot be reduced, i.e. treated as fully endogenous, to the market. The level of overall demand (in the closed, pure market economy) is driven by investment demand, and this is a function of the institutional structure, in particular the distinction between employers and employed (or unemployed), and the financial system. Uncertainty is endemic and institutions (including conventions and rules) emerge as a necessary stabilising mechanism.

As a result of this framework, the Post Keynesian treatment of investment and its finance differs markedly from that of Price Mechanism models. Keynes’s own treatment was regarded mainly as negative in character. Although *The General Theory* contained a Price Mechanism relationship between the return on capital and its cost, his discussion of long-term expectations and liquidity preference implied this relationship was anything but dominant, although he did not provide a determinate alternative theory of aggregate investment. For Kalecki, “the limitation of the size of the firm by the availability of entrepreneurial capital goes to the very heart of the capitalist system” (1971:109). Post Keynesian writers have for the most part followed Kalecki in treating the phenomenon of industrial accumulation (the finance of investment by cashflow) as axiomatic. Among these authors, Kalecki, Steindl and Wood have attempted to explain the absence of equity finance from first principles, and the discussion below will concentrate on these theories of new issue behaviour in line with the primary concern of this thesis. Before doing so it is important to consider briefly the role of equity finance within the context of the Post Keynesian theory of investment finance as a whole, which contains several other elements: the determination of profits (our cashflow); dividend policy; and the borrowing or gearing limit.

### *The theory of profits*

Assuming for the moment a given dividend policy, a gearing limit and the absence of external equity finance, the level of investment is limited by the supply of internal finance or cashflow. The theory of profits (defined as our cashflow, gross of depreciation and amortisation) seeks to explain what in turn determines the level of cashflow. The proposition that firms always invest their cashflow in capital formation is insufficient. This would imply that their investment is independent of the level of their output or expected profitability, quite the other extreme from the M&M financial invariance theorem. A fuller explanation is required in which output and profitability play a role alongside cashflow.

Post Keynesian theory must give a leading role to effective demand. The role of cashflow as a finance constraint on investment may appear reminiscent of loanable funds theory, but no Keynesian can maintain that saving (as opposed to finance) determines investment! Examples of complete theories of profits are contained in Wood (1975) and Eichner (1976).

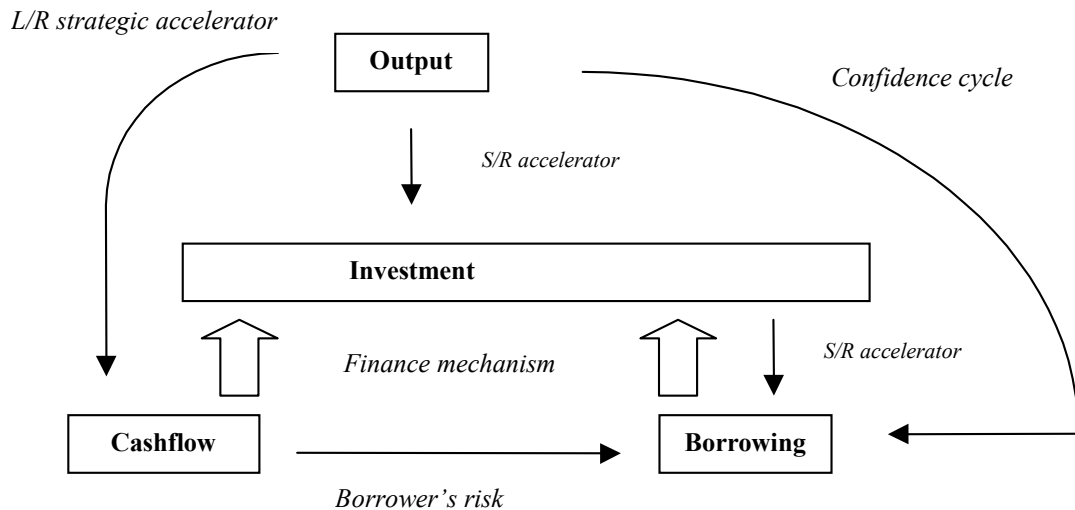
The core of Wood's theory is a simultaneous determination of investment plans and the long run profit (= cashflow) margin. A higher profit margin allows higher investment over time, but reduces product demand and therefore the need for investment. A lower profit margin stimulates product demand but does not generate enough finance for the required investment. These countervailing tendencies imply an equilibrium profit margin, subject to the uncertainty that surrounds the decision variables.

Eichner derives the implicit cost of cashflow within a dynamic model of oligopoly pricing. The rate of price increase is determined by the supply and demand for additional investment finance. Investment includes all expenditure unrelated to current production but intended to maximise long-term market share and protect profit margin. This includes not only physical equipment but also R&D, advertising and PR. The cost of additional cashflow, generated by an increase in price and profit, depends on the probabilities of product substitution reducing industry demand and of new competitors entering the industry. There is also a ceiling on price increases imposed by the threat of government regulation or anti-trust action.

Wood assumes managers' objective is growth of sales rather than profits, and in his model this ensures that firms lower prices to stimulate demand. Eichner's corporate objective function is also managerial, the maximisation of long run growth. The corporation itself ('the megacorp') is the claimant of residual profit (Eichner, 1976:59). He notes that this does not produce significantly different results from an objective of maximisation of long run shareholder value, but prefers the growth objective on empirical grounds. In particular he cites evidence that cashflow is invested at a lower rate of return than the cost of capital – in other words that managers do not act in investors' long-term interests (Eichner, 1976:27).

Investment plays a key role in technological change, whether in reducing costs or creating new products, yet innovation is best thought of as the adoption of a more profitable technique involving a mixture of current and deferred costs. For reasons fully explored in Harcourt (1972) there is no simple relationship between the balance of current and deferred costs (the labour/capital ratio) and productivity.

Although these ideas cannot be developed further here, they provide the elements of an understanding of the complex relationship between demand, investment and cashflow, summarised schematically in Figure 2-1. In this context the tendency of investment to follow cashflow is seen to be part of a larger process in which cashflow in turn responds to demand and technology. Investment cannot depart far from the path of cashflow, given the level of gearing and the need for finance in a monetary economy. Cashflow is indeed a quantitative constraint on investment, but cashflow is not totally exogenous and ultimately responds to growth in demand and the consequent need for investment. Demand cannot drive investment directly because equity markets do not provide finance for capital formation. The finance is generated by the corporate sector itself and the contribution from capital markets is limited to debt. These theories depend on assumptions about dividend policy and access to external debt and equity, to which the discussion now turns.



**Figure 2-1 Multiple mechanisms**

***Dividend policy***

There is no significant practical difference on dividend policy between Post Keynesian and other theory. It is common ground that corporations smooth dividends, which must be considered not as a residual but as a primary decision variable, following Lintner (1956). In practice companies are not free to vary their dividend policy in line with their investment requirements without adversely affecting their share price. Even Miller (1988:104, 1998:113-115) accepts this as a matter of practical policy but points out that it does not alter the invariance propositions and therefore does not *per se* undermine neoClassical theory. The independence of dividends does play an important role in the argument against the bootstrap hypothesis and will be considered further in Chapter 5.

***The gearing limit***

There is an established and developing Post Keynesian literature on the conventional nature of the gearing limit (eg Glickman, 2001, Crotty, 1996) which includes an important extension in the ‘financial instability’ hypothesis developed from Keynes’s original work by Minsky (1975).

The source of the difference from Price Mechanism theory is the role of fundamental uncertainty. This leads to emphasis on the irreversibility of most investment decisions and on the dire consequences of insolvency, which often leads to the destruction of assets (both tangible and intangible, including human skills) rather

than their reorganisation. The liquidity element of borrowers' risk, which plays no role in neoClassical or New Keynesian theory, becomes an important and for large firms the binding constraint. This explains how the markets for senior debt securities can be competitive within a conventional gearing range, with interest rates insensitive to the size of issues, and yet large firms will make only limited use of them.

Lenders' risk remains an issue, particularly for small firms, and uncertainty explains the ubiquity of collateral requirements for small firms, with 'risky debt' best seen as a derivative of equity available only to large listed firms, or as relevant to the very different circumstances of personal unsecured credit. Uncertainty is also the basis of the conventions that establish the acceptable limits to gearing but are themselves subject to changes in confidence, sometimes sudden, and open the possibility of financial factors leading to excess as well as deficient investment, and financial crisis.

The gearing limit is the link between current cashflow and the level of debt finance. Lenders and borrowers both wish to be assured that cashflow will cover debt service payments, and lenders in particular will be concerned about the borrower's net worth. Except in the case where the acquired asset produces an immediate and predictable stream of income, future earnings are heavily discounted and lending decisions are mainly influenced by current earnings; and indeed by past earnings accumulated as net worth.

Consequently, once a firm has reached its gearing limit (whether expressed as a function of cashflow or net worth, whichever constraint binds) its ability to increase its borrowing (in the absence of equity finance) depends on an increase in its current cashflow. At best debt finance can multiply the value of the investment possible with a given increase in cashflow. Current cashflow remains the medium-term constraint, and will itself vary only through the interplay of output, technology and competition as described in the theories of profits outlined above.

Nevertheless while a firm is below its gearing limit, the bootstrap effect could mean that investment and cashflow rise together at a moderate rate without the gearing limit ever being reached. It is therefore important to address that counter-hypothesis.

Kalecki (1937, 1971) addresses these considerations under the heading ‘the principle of increasing risk’ (of insolvency, as an increasing function of gearing), but does not refer explicitly to fundamental uncertainty nor use Keynes’s analysis to distinguish clearly between actuarial and liquidity risk. Minsky (1975, 1978) transforms these ideas from static to dynamic in his financial instability hypothesis, which follows up two key statements of Keynes. “During a boom the popular estimation of the magnitude of these risks, both borrowers’ risk and lender’s risk, is apt to become unusually and imprudently low” (*GT*: 145). “Different commodities may, indeed, have differing degrees of liquidity-premium amongst themselves” (*GT*:226). Minsky’s theory hinges on the significance of fluctuations in the level of the premiums required for borrower’s risk and lender’s risk, and in the level of the liquidity premium attaching to capital assets (as well as to money). The difference (shortfall or excess) between the actual level of gearing and the conventionally acceptable level of gearing, both of which fluctuate in a dynamic process, becomes the driver of a cycle of boom and bust. The absence of true equity finance<sup>4</sup> is crucial for this argument, and this assumption together with his interpretation of liquidity as transferability<sup>5</sup> and his consequent emphasis on cashflow makes Minsky’s argument rather different from Keynes’s. Minsky certainly reinforces the now generally accepted case for regulation of financial intermediaries, with particular reference to the matching of the maturity of assets and liabilities. As a theory of financial crisis his argument is vulnerable if, as a matter of empirical evidence, equity markets are judged to be competitive.

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<sup>4</sup> “Except when it involves shares this pledge [of debt service] is contractual, with penalties for default; for shares any deviation of dividends from the expected will affect equity prices.” (Minsky, 1975:106-107). This appears to neglect the serious difference between the two types of finance in terms of insolvency and bankruptcy.

<sup>5</sup> “Note that a value obtained by capitalising  $q$  for an illiquid asset - one for which  $l$  is zero - is *not* a price for which the asset can be sold in the market; it is a pure valuation of expected cash flows from operations” (Minsky, 1975:82, emphasis in the original). “There is a subset of assets in the balance sheet which have a good secondary market, so that the firm can expect to dispose of them at a fairly firm price” (1975:88). “[The expansion of the liquidity preference function to include as an argument the price of capital assets] includes in the valuation of assets their ability to generate cash by sale - *ie* their liquidity” (1975:92).

### ***The absence of equity finance***

The primary question for us then is why new issues of equity would not relieve the finance constraint if firms wish to invest in excess of their current cashflow and borrowing capacity. The separation of investment and finance based on the M&M theorem appears safe so long as equity markets are competitive, even if dividends are smoothed and corporations limit their use of debt markets.

The Post Keynesian position on this question divides into two strands labelled here for convenience the ‘Robinson’ and ‘Kalecki’ strands. The Robinson group (Robinson, Kaldor, Eichner) treats equity as a risky form of debt, while the Kalecki group (Kalecki, Steindl, Wood) recognises that in principle new equity issues are a substitute not for debt but for cashflow, and advances arguments as to why in practice new issues would not occur.

### ***The Robinson strand***

**Joan Robinson** and **Nicholas Kaldor**, among the first generation of the Post Keynesian school, address the question only as *obiter dicta*. Robinson (1962:38) treats equity and debt issues equally as ‘placements’ or ‘finance’ and explicitly argues that equity can be treated simply as a risky form of debt which somewhat extends the gearing limit. Her view is that the accumulation imperative over-rides the interests of investors, who like other lenders have to be paid a conventionally established fixed return by way of dividend to keep them content. The limitation on new issues of equity follows from the gearing limit that applies to all forms of borrowing. So new issues of equity can only complement, not substitute for internal earnings. Kaldor in fact uses that exact phrase in disputing Samuelson and Modigliani's treatment of external finance and cashflow as equivalent (in the debate over the ‘Cambridge’ theory of distribution), and cryptically attributes the phenomenon to uncertainty without further elucidation. ‘In a world of uncertainty, the biblical principle “unto everyone that hath shall be given” dominates the scene’ (Kaldor, 1978:xvi).

**Alfred Eichner** (1976) assumes that large firms both can and will resort to external finance when the implicit cost of cashflow (defined further below) rises above the cost of external capital. He regards the supply of external capital as perfectly elastic, but expects the demand to be relatively minor in practice because cashflow is

sufficient to cover the funding of investment. There is some reference to Kalecki's principle of increasing risk, in the risk of action by financial intermediaries to replace the controlling executive group. He makes no distinction between debt and equity, following Robinson in treating the rate of dividend on equity (or its growth rate) as the price of keeping investors at bay. In the long run debt and equity are indeed substitutes, and the cost of both is reduced to a single parametric interest rate. The short-run ratio of debt to equity is a rule of thumb which reflects the "attendant risks and other relative disadvantages" (Eichner, 1976, p86). It is clear that Eichner here is referring to the borrower's risk.

Eichner's model predicts that large firms will issue new equity and debt when their investment opportunities outstrip their capacity to impose a price increase without damaging their long-term growth prospects. This does not suggest in itself that large firms will avoid new equity issues to finance investment. In practice, one would therefore expect to find evidence of such issues, although only during periods of high investment (or, possibly, periods of low profitability).

### ***The Kalecki strand***

***Michal Kalecki*** addresses the question of new issues of shares by corporations in his essay on Entrepreneurial Capital (Kalecki, 1971), based on his original article 'The Principle of Increasing Risk' (Kalecki, 1937). After dealing with the limit on gearing implied by that principle as discussed above, he puts forward three reasons why new issues of equity are at best a complement to cashflow. These are (i) loss of control by the directors/majority investors (ii) the risk of dilution of the earnings of existing investors (iii) the portfolio limit on the holding of shares in a given company by an individual shareholder.

Control of a listed company by an individual shareholder, or even by a group of investors acting in concert, is very much the exception these days so that the maintenance of voting control cannot be a significant obstacle to new issues in aggregate. Rule 36 of the UK City Code on Takeovers and Mergers (Panel on Takeovers and Mergers, 2003) requires any shareholder that acquires 30% to make



an offer for the entire company. Kalecki did not anticipate the vast growth of institutional investment. However Edward Nell maintains Kalecki's line<sup>6</sup>.

The dilution of earnings is the factor this thesis will develop. However, Kalecki's formulation of the problem merely states that there is a risk that a new asset acquired with the proceeds of a new issue of equity may return a lower yield than existing assets, thus diluting the earnings of the existing investors. The neoClassical answer to this would be that, provided proper allowance is made for risk, a new issue will still benefit existing investors if the net present value of the new asset, discounted at the firm's cost of capital, is positive. The earnings of the existing assets are also volatile: risk is not confined to the new asset. In the form stated by Kalecki, this objection will not hold.

Thirdly, Kalecki argues that each firm faces an imperfectly elastic demand for its shares because there is a limit to how many of its shares an individual will be prepared to hold in a portfolio. A new issue will therefore require a discount from the market price if it is to be taken up. Such a discount again implies a dilution of the earnings of the existing investors.

The difficulty here is that (unusually for Kalecki) the analysis is one of static partial equilibrium. A new issue will take place as part of a process of accumulation and growth. It is reasonable to assume that any one individual firm will not be alone in seeking to invest in new capacity, so that a number of new issues would come onto the market at once. At the same time a flow of savings corresponding to the aggregate investment will become available. Therefore an individual new issue may do no more than maintain its firm's share of investment portfolios.

Index-tracking behaviour by investors implies that the relative portfolio limit for a given share is flexible. The value of the new shares adds to the market capitalisation of the company, changes its weight in the index, and therefore increases the portfolio

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<sup>6</sup> "To issue equity is to dilute ownership and risk loss of control; this must be compensated by a rise in profitability. Suppose a firm worth 50 shares issued another 50, and built a new project of exactly equal profitability to the first. The earnings per share of the larger firm are exactly the same as those of the original. But now a defection among the original shareholders of a single share could give control of the entire firm, the original projects as well as the new, to a new group of shareholders." (1998:503 fn1)

weighting which investors will wish to give it. In theory index-tracking investors should demand more shares in exact proportion to the amount newly issued.

Part of the flow of new savings will be invested in bonds or cash, requiring some adjustment of portfolios in favour of equity. However the prices of the different classes of investment are a matter of stock equilibrium, not flow. The value of the existing stock of financial investments, and the value of secondary trading or turnover in portfolios, dwarfs the value of the flow of new investment/savings. One cannot therefore discriminate between the value of existing shares and new issues on these grounds. There is no case here for the emergence of a discount on new issues.

*Josef Steindl* largely followed Kalecki's macroeconomic analysis in his advocacy of a stagnationist thesis for US capitalism (Steindl, 1952). On the other hand, Steindl was dissatisfied with an earlier argument of Kalecki (prior to the latter's final position summarised above) that new issues could safely be ignored because they would match the value of dividends paid to capitalists. Bearing in mind the US experience of the 1920s and 1930s, Steindl could rightly see no necessary connection between the values of dividends and new issues. In the 1920s new issues were easy to place outside the ranks of existing, controlling, investors. After 1929, not even controlling investors would reinvest their dividends in stock for some years.

Steindl developed the explanation in terms of the dilution of shareholder earnings. With the pre-M&M focus on the profits rather than the market value of the firm, he showed that the expected marginal rate of profit on a new asset must exceed the earnings yield on the existing shares if the existing investors are to avoid dilution. This result does not *per se* pose any obstacle to new issues, nor did Steindl suggest so. However in the context of his wider argument he needed to show why new issues could not overcome the finance constraint on investment represented by a falling rate of profit and cashflow. He therefore argued that as the rate of profit fell below the market earnings yield, new issues would cease, therefore amplifying the direct effect on investment of the falling rate of profit. He suggested that the development of capital markets over the 50 years before 1929 had led to a secular fall in the earnings yield required by investors. The establishment of investment markets in the first place, the emergence of large companies with a track record, the merger/acquisition process allowing financial concentration, and the establishment

of leveraged holding companies (the 1920s equivalent of the 1980s leveraged buy-out), either reduced earnings yields or increased gearing. These factors therefore postponed the day when the earnings yield would become a binding constraint.

Steindl grounds his arguments impressively in a wide sweep of empirical and historical data. However, there are two major problems with his approach. First, and of importance to the interpretation of the data, his view of the earnings yield as the cost of capital neglects the influence of capital gain on investor return. He suggests that the earnings yield must exceed the bond yield by a risk premium. This is hard to reconcile with the observed ratio of bond yield to earnings yield of about 2:1 at the end of the 20<sup>th</sup> century (at least before the crash of the early 21<sup>st</sup>). Clearly the cost of capital cannot be reduced to the equity earnings yield, although this may have been appropriate enough during the period that Steindl was studying. More generally it should include the expected capital gain.

Second, a serious theoretical objection to Steindl's argument (and to those of all the preceding Post Keynesian authors) is that it does not explain why firms would continue to invest cashflow once the rate of profit had fallen to the cost of (external) capital. The neoClassical view is that new assets should earn at least the cost of capital, whether funded internally or externally. The Post Keynesian authors imply that the investment of cashflow in new assets continues even when new issues are no longer possible because of the low return on investment. This would not be in the interests of the existing investors, who would be better off with a higher dividend or a re-purchase of capital. It may be argued (with Robinson, Eichner and the agency theorists) that the managers of firms ignore the interests of existing investors and maximise growth, but this is inconsistent with Kalecki's and Steindl's argument from dilution – which relies upon managers acting in the interests of existing investors.

*Adrian Wood* (1975), the last Post Keynesian author to comment explicitly at length on the question of new issues, relies mainly on the evidence of their minor net contribution in the corporate sector flow of funds accounts and of a new issue discount. He advances three arguments why new issues should be priced at a discount, and so avoided on grounds of dilution. Like Kalecki and Steindl before him he finds it necessary to explain clearly why new equity issues are not a

substitute for cashflow, and specifically why new issues should face inelastic demand.

He argues that companies face inelastic demand for new shares for three reasons. The need to rearrange portfolios to take up a new issue involves transaction costs, inconvenience and inertia, all of which have to be overcome. Secondly, expectations diverge between investors (the 'cliente' effect). Finally, if existing investors take up the issue the shares will represent a larger proportion of their portfolios, reducing diversification and increasing risk (Wood, 1975:55-60). He does however recognise that a new issue to finance an exceptionally profitable project may create an 'information effect', which may improve investor expectations and offset these factors. His view, in line with the consensus, is that the information effect of new issues is generally adverse.

As with Kalecki's, these arguments neglect the dynamic nature of the capital market, in which portfolios and share registers are constantly changing and the turnover in secondary trading dwarfs the value of any new issues. It is not clear that new issues carry any greater transaction costs than existing shares. Indeed the associated information provided by the firm reduces uncertainty and the cost of researching a purchase.

Wood's version of the portfolio limit argument depends on his second argument (limited clientele), since existing investors will only be 'obliged' to take up shares if there is insufficient demand from new investors. Wood suggests that divergent expectations, reflecting fundamental uncertainty, will lead to the formation of a clientele. By divergent expectations he means that the investor market is not homogeneous but graduated in terms of preferences for particular companies – rather like consumer preferences for products. The existing investors in a firm (its clientele) are by definition those who most prefer it or have the most optimistic view of its prospects. Accordingly any widening of the circle of investors must on this view depend on persuading less enthusiastic investors to join the club – which means offering a discount.

However, it is not explained why this does not apply equally to existing and new shares, given an active secondary market. Even if there is a core of long-term investors, the liquidity of a firm's shares depends on a healthy turnover in the share

register at least at the margin. The strong evidence of such trading volume and liquidity, for all major shares, undermines the clientele hypothesis.

Wood considers as a footnote (Wood, 1975:52) that shares issued as vendor consideration in an acquisition would not attract a new issue discount, although shares issued for cash to fund the same acquisition would do so. This places the emphasis on the cash payment, relying on his earlier arguments, even though the intrinsic value of the shares is identical in both cases. Nevertheless the hint that the new issue discount may not apply in the case of acquisitions is important and will be taken up below.

In summary, Post Keynesian authors have largely taken the absence of equity finance for investment as an axiom, rather than as a theorem requiring proof. The Robinson strand depends on managers having their own objectives rather than acting in the interests of investors. The Kalecki strand argues that the marginal cost of capital is increased by a new issue discount reflecting imperfect competition and inelastic demand in the market for shares. However these theoretical arguments have been secondary, with the main emphasis being placed on the empirical evidence from financial structure. This emphasis on the empirical without convincing theory is a weakness in the face of the manifest evidence of an active new issue market.

## **2.5 Conclusion**

The theoretical case for a relationship between investment and cashflow for large companies with ready access to capital markets depends on a new equity issue discount driving a wedge between the marginal and average cost of capital.

Keynes abstracted from financial structure and attributed the role of finance to the volatility of expectations in financial markets and the determination of the rate of interest by liquidity preference. It was perhaps his determination to differentiate his theory of the rate of interest from the classical theory that led him to neglect the role of cashflow, since this is easily confused with the flow of savings. His abstraction from financial structure prevents discussion in terms of a new issue discount, although the seed may be found in the liquidity element of lender's risk.

NeoClassical theory admits the possibility of such a discount as a second order market imperfection, reflecting a temporary divergence of expectations between

managers and investors. New Keynesian theory predicts a new issue discount arising from asymmetric information about the value of assets-in-place, and suggests this also may be intermittent. Post Keynesian theory emphasises imperfect competition as the source of the new issue discount but relies mainly on the empirical evidence of a limited *net* inflow of external equity to the corporate sector. The existence of a substantial *gross* flow of new issues of equity would appear to undermine the premises of both New Keynesian and Post Keynesian theory, and to support the neoClassical assumption, shared by Keynes, that the supply of equity finance to large companies is elastic. This would not however explain the limited role of equity finance for capital formation.

A synthesis of the views of Keynes and Kalecki will be attempted in Chapter 6. This will provide a theoretical account of the new issue discount in terms of fundamental uncertainty and liquidity preference consistent with Kalecki's models and the empirical evidence. To the latter we now turn.

## Appendix 2-A Capital structure and the agency model

The M&M theorem leads to a theory of capital structure in terms of market imperfections, which can be extended by including the implications of the agency model. The question becomes one of how to finance a given stock of assets rather than a flow of investment, and the answer lies in some form of market imperfection.

For M&M, capital structure reflects a trade off between tax considerations (of both corporations and investors) and the risk of bankruptcy. Transaction costs of new issues (both debt and equity) and asymmetric access to credit by corporations (with credit ratings and limited liability) and investors (perhaps without either) also play a role. M&M assume that managers act in investors' interests and creditors face no losses on default. Where debt is risk-free, the only bankruptcy costs relevant are those to the investors of enforced financial reorganisation (since capital markets are perfect, assets cannot lose value in a forced sale). In this formulation bankruptcy is triggered by erosion of net assets by trading losses, suggesting a tacit assumption that the creditors rely on the firm's assets as collateral. If there is an insufficient margin of safety between the gross value of the assets and the value of the firm's creditors, the latter will foreclose.

Glickman (1998) questions the consistency of the M&M conception of uncertainty (as variance) with the possibility of bankruptcy, by *reductio ad absurdum*. He argues that the subjective probability distributions invoked by M&M must in fact be assumed to have objective reality. Otherwise it would be possible for asset valuations to change over the life of the asset, introducing a source of risk in addition to that of variance. However if variance is the only source of risk admitted, a firm considered sound at the outset will always objectively be so. While a series of bad years might lead to temporary losses, it would not be rational for creditors to foreclose, given perfect capital markets. In other words, creditors do not need to rely on collateral, unless it is argued that collateral is taken to protect creditors, not from trading losses, but from moral hazard. Therefore, moral hazard aside, bankruptcy is not consistent with the idea of uncertainty solely as variance, and cannot be used to explain capital structure.

The agency model (Jensen & Meckling, 1976) offers one solution to this objection. This approach emphasises the conflicts of interest that can arise between the objectives

of different parties and the agency costs these conflicts may produce. Agency theory requires the assumption of uncertainty alone and not also of asymmetric information. The primary issue is the principal's degree of control over uncertain outcomes, not any difference in the information set between principal and agent. Agency costs include: monitoring costs (incurred by principals to ensure that agents perform); bonding costs (incurred by agents to re-assure principals that they will perform); and residual losses (the loss of welfare by the principal resulting from the divergence in the agent's actions from those corresponding to the principal's best interests).

The agency model may be relevant where debt (*eg* a traded bond) carries some risk of loss on bankruptcy. The conflict of interest between shareholders and creditors may result in a transfer of investment risk from shareholders to creditors, since shareholders may benefit from a higher risk strategy without bearing the full cost of failure. Since this is anticipated by rational creditors they require a higher yield or counter-measures such as covenants and collateral that together represent an agency cost of debt, in addition to the 'pure' costs of reorganisation in bankruptcy.

The agency model can also be applied to the conflict of interest between inside and outside shareholders, where inside shareholders include managers. This argument concludes that the cost of equity capital can be increased by agency costs resulting from managers having different objectives from outside investors, leading managers to waste cashflow on unprofitable investments or bloated organisations rather than pay dividends. The weakness of the formal model in Jensen and Meckling (1976) is that it is only determinate in cases where managers have a large and controlling shareholding. 'Free cashflow' theory (Jensen, 1986) answers this objection in part, and Hart (1995) develops his approach further as part of a theory of incomplete contracting. According to this argument, given the need for external finance, managers prefer a lower debt ratio and investors a higher one, on the grounds that a high debt ratio increases the risk of monitoring and enforced reorganisation, and therefore the personal cost to managers (whether or not they too are investors) of unprofitable expenditure. The implication is that within a certain range the firm's overall cost of capital increases as the level of debt falls. The optimal debt ratio is determined by the equality of the marginal agency cost of debt with the marginal benefit in reduced managerial waste.



Agency theory is about the limits to the effectiveness of economic organisation through competitive markets, and as Jensen and Meckling emphasise (1976:133) agency costs should be regarded as a cost of large-scale co-operation rather than a market imperfection. Agency costs can explain a preference for internal over external finance, and the balance between debt and equity. They do not of course arise on the normal neoClassical assumption that managers fulfil their fiduciary duties and act in the interests of their investors. There is something unsatisfactory about a theory that depends on breach of fiduciary duty to explain widespread phenomena, a point raised by Bohren (1998), since such behaviour ultimately leads to market failure. In the present context, the key point is that agency costs cannot explain a divergence between the marginal and average cost of capital, *ie* the new issue discount. They affect the price of new and existing shares equally.

Post Keynesian and New Keynesian theories agree on the basic prediction that “firms will borrow rather than [issue] equity when internal cashflow is not sufficient to fund capital expenditures. Thus the amount of debt will reflect the firm’s cumulative need for external funds” (Myers, 2001:81). The two schools of thought reach this conclusion by separate routes reflecting different conceptions of the nature of uncertainty and of the information problem. They share the idea of gearing as a flow rather than a stock concept, in contrast with neoClassical thought.

### **Chapter 3 The relationship between investment and finance: the empirical literature**

The purpose of this chapter is to review the literature on past attempts to reach a conclusion based on empirical evidence about the validity of the theories of the relationship between investment and finance set out in the previous chapter. This endeavour proves to have been complex, contentious and rather unsuccessful.

The complexity and contention stem from the problem of interpretation, the difficulty that the same data appear consistent with conflicting theories. Section 3.1 sets the scene by reviewing this problem and that of interpreting the correlation between investment and cashflow in particular.

Sections 3.2 to 3.4 set out competing econometric models of aggregate investment, divided for the purposes of this study into three categories, depending on which view of the finance constraint (if any) they test. Section 3.2 contains models that do not admit a finance constraint; section 3.3 considers models where finance constraints are important for certain firms, but not others (*particular* constraints); and section 3.4 contains models where aggregate investment is subject to a *general* finance constraint. These categories correspond broadly to the three schools of thought reviewed in Chapter 2, the neoClassical, New Keynesian, and Post Keynesian. Somewhat confusingly the term ‘neoClassical’ tends to be used in a more restricted sense in the empirical investment literature, to refer solely to models containing the ‘factor price’ of capital relative to labour.

These empirical studies have not always aimed explicitly at testing between the alternative hypotheses about the role of finance. The interest in modelling investment has also been driven by the desire to forecast, predict and explain investment for its own sake. Such models remain of interest to this argument, since at least in principle success in prediction by one model would strengthen the case for the corresponding hypothesis about the role of finance which it represents. Section 3.5 considers studies comparing the relative performance of aggregate investment models, and notes an overall lack of conclusiveness. This raises important questions of methodology, to be considered further in the next chapter.

On a slightly different tack, section 3.6 briefly notes the literature on the direct evidence for a new equity issue discount. Such a discount was identified in the

theoretical discussion as a necessary condition for the existence of a general finance constraint.

### **3.1 The problem of interpretation**

A frequent starting point for empirical studies of investment is Meyer and Kuh (1957), who study a cross-section of 600 listed US manufacturing firms for the period 1946-1950. Their work also contains in turn a useful summary of still earlier studies (Meyer and Kuh, 1957:25-35), including those by Tinbergen, Klein and Eisner from 1938-1953. Meyer and Kuh inspect the aggregate funds flow accounts for the corporate sector and note that 74% of the gross needs of US corporate manufacturing from 1946-50 was met from cashflow. They find a similar pattern at the level of individual industries, despite their heterogeneity (Meyer and Kuh, 1957:141). If, following Corbett and Jenkinson (1994, 1997), the acquisition of financial assets is offset against the increase in financial liabilities, the proportion of physical investment (including inventories) financed by cashflow rises to 91%. This is identical to the proportion identified for the US in the period 1970-1989 by Corbett and Jenkinson (1994:11), who also report very similar figures for the UK, Germany and Japan, and by van Ees *et al* (1997) for Dutch manufacturing industry between 1950-1987. An accounting relationship so stable over long periods of time, as well as between heterogeneous industries and economies, deserves explanation, and seems likely to have its roots in some essential characteristics of corporate business operating in a market economy.

This long-term correlation is matched by evidence of short-term correlation between changes in investment and cashflow at the level of the corporate sector as a whole (this will be demonstrated independently in Chapter 5). There can be no real question that the correlation exists; the dispute is over its meaning.

There are several possible interpretations. The simple (or naïve?) conclusion is that the evidence supports the Post Keynesian view. As will be recalled, this view maintains that cashflow ultimately supplies the finance for investment, both directly and indirectly through the service of borrowing. Long-term output growth and technology change ultimately drive the demand for investment, and variations in the output cycle and gearing ratio have a short-term influence, but the medium-term or trend rate of investment at any time is constrained by the supply of internal finance

in the form of cashflow. The distinction reminiscent of Marshall's (albeit with very different adjustment mechanisms) between the different time-horizons of each decision element is important in this argument, between long, medium and short. On this view an investment-cashflow correlation is fully to be expected, with the direction of causation running from cashflow to investment.

There are several good reasons for questioning this conclusion. Perhaps the simplest and strongest is the empirical evidence that large firms have ready access to competitive equity markets and make extensive use of them (this evidence will also be considered in Chapter 5). It would seem that Post Keynesian theory falls at the first hurdle, since the absence of equity finance for capital formation appears to be a matter of convenience rather than constraint, at least for large firms. Consistent with this objection, New Keynesian authors have interpreted the correlation in a more limited fashion as evidence of particular finance constraints, which apply to firms that do not have ready access to securities markets.

Alternatively the correlation may reflect a quite different mechanism and have nothing to do with finance constraints. It could be that both investment and cashflow are correlated with output. A given level of output requires a minimum level of investment simply to replace capital consumed and maintain production. Sustained increases in output usually require additional investment. The investment-output ratio can be stable on a steady growth path. Correspondingly, the share of cashflow in income tends to be stable. If dividends are a residual, and there are tax or other incentives for corporations to retain sufficient profit to fund their physical investment, cashflow will track investment. Investment is the independent variable, and cashflow dependent. This view underpins the bootstrap hypothesis.

This is the essence of Jorgenson's critique of what this thesis would class as Post Keynesian models. His interpretation of the results of the empirical studies included in his survey is that "where internal finance variables appear as significant determinants of [investment], they represent the level of output" (Jorgenson, 1971: 1133). The investment-cashflow correlation is merely a particular choice of capital structure that does not affect the investment decision, in line with the M&M propositions.

This proxy argument can be extended further. Cashflow may have a significance that relates to its role as a proxy for expectations, rather than its role as a source of

finance. Cashflow may be a proxy for the expected profitability of investment, beyond the influence of output. Higher cashflow may be associated with a strong market position, buoyant demand and better investment opportunities, resulting in a self-financing virtuous circle. Again Jorgenson suggests that, since sales and profits are closely correlated, the “expectational hypothesis for profits cannot ... be distinguished from ... the [output] accelerator hypothesis” (Jorgenson, 1971:1113). A more sophisticated version of this proxy interpretation arises with time series estimations where the variable intended to control for investment opportunities is subject to measurement errors (Erickson and Whited, 2000).

In summary, the problem of interpretation means that the empirical evidence cannot be taken at face value. Specifically, the interpretation of the investment-cashflow correlation as evidence of a general finance constraint cannot be sustained unless it can be reconciled with the evidence of the extensive use of equity markets. Other interpretations of the correlation are also possible, based on quite different causal mechanisms<sup>7</sup>. It is not easy to isolate and identify the effects of the different potential causal mechanisms and the literature reflects a series of attempts to do so by the application of econometric techniques.

### 3.2 Models with no finance constraint

This section considers models of investment that ascribe no role to finance and seek to explain investment purely in terms of the fundamental variables of marginal productivity and factor cost. The first generation studies were based on the so-called ‘flexible accelerator’ model, in its earlier fixed co-efficient and eventual neoClassical forms. The bulk of the empirical literature in this category was surveyed by Jorgenson (1971) and by Chirinko (1993).

The first generation model is best understood as composed of a number of elements, each of which have had different treatments. **Gross** investment is derived from two

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<sup>7</sup> A further Post Keynesian interpretation is that the relationship between investment and cashflow is an identity, as in the simple Kaleckian model of aggregate demand, where investment is the only form of autonomous expenditure and undistributed gross profit (our cashflow) the only form of saving out of income. No sooner is this proposition stated than it is clear that it does not hold automatically other than in a closed private sector economy, without government and overseas sectors. Even in that case there could still be a separate link between lagged cashflow and current investment, since the identity relates only to the current values.

separate components, *replacement* of consumed capital and *net* increase in the capital stock. These two components are treated quite differently and separately in the first generation models. Investment in inventories and intangibles is not addressed.

Replacement investment is modelled as determined by technology. The usual assumption is that a constant proportion of the net capital stock is consumed and replaced each period. This geometric mortality allows the capital stock to be expressed as a weighted sum of past gross investment with geometrically declining weights.

Net investment is modelled in three main stages, addressing in turn the determinants of the *desired capital* stock, the formation of *expectations* and the *technical* dynamics of the investment process.

### ***Desired capital***

Common to all these models is the idea that firms do not target investment itself, but the capital stock. Net investment is the result of changes in the desired capital stock. Desired capital is a function of real output (or capacity), and in the neoClassical extension becomes a function of factor prices. The postulated relationship between capital stock and output originates with Clark's simple accelerator (1917) and develops through the addition of a dynamic structure into the flexible accelerator of Chenery (1952) (also associated with Goodwin and Koyck).

These accelerator models implicitly assume a fixed coefficient production technology and Jorgenson (in a series of articles summarised in his 1971 survey) develops the relationship between capital and output into a relationship between capital and its rental cost. His theory requires the assumptions that a neoClassical production function relates capital to output, and that investment is fully reversible without adjustment costs. The assumption of an aggregate production function is not trivial, and marks an important change in the theoretical approach to the accelerator model. The basic idea that investment is driven by changes in output, shared by Post Keynesians such as Kalecki, does not require the assumption of a homogeneous measure of capital, a neoClassical production function or the implicit assumption of full employment equilibrium.

Another common feature of these models (other than Kalecki's) is that the cost (or availability) of external finance does not enter into the equation. In the accelerator case, desired capital is a function of output, while in the neoClassical case there is no distinction between internal and external finance, and the cost of finance is subsumed within the rental cost of capital. These versions of the accelerator model contrast with Kalecki's model, which contains both capacity and cashflow variables.

### ***Expectations & technical lags***

In these models, decisions to invest depend on firms' expectations of the fundamental variables thought to influence their desired capital stock. Different versions of the process by which firms form their expectations have provided the second generation in this category.

Chirinko (1993) distinguishes between *implicit* and *explicit* models of expectation formation. The first generation models described above and surveyed by Jorgenson (1971), including his own, treat the process implicitly. By this is meant that investment decisions are related to fundamentals by a distributed lag, estimated from the data and to some extent confirmed by independent survey results. Indeed the neoClassical model does not distinguish between lags reflecting the formation of expectations and lags arising from the technical processes of delivery, installation and gestation. Chirinko (1993:1879) notes an inconsistent treatment of delivery lags in the neoClassical model, which apply to net investment but not desired capital stock. These treatments can only be rendered consistent by making the assumption of Jorgenson's earlier work that expectations are static, somewhat undermining his use of adaptive expectations in his later models.

Explicit models are characterised by a separation of the technical and expectations processes, and a modelling of both in terms of optimising behaviour. This second generation of model shares a common assumption about the technical process that changes in the capital stock impose internal adjustment costs, which are convex in the rate of adjustment. The optimal rate of change of the capital stock will therefore reflect a balance between these costs and the marginal product of capital. External adjustment costs (such as the effect of the rate of investment on the supply price of capital goods) pose problems of non-convexity and externalities for a Price Mechanism framework, although Keynes considered external costs important

(GT:136). No account is taken of the irreversibility of investment and the value of flexibility under conditions of uncertainty (real options). Because these models are based on equilibrium between the costs and benefits of investment at the margin, they do not require a direct plot of the path of desired capital stock and no longer require the division between net and replacement investment required by the first generation models. Accordingly they are able to dispense with the assumption that consumed capital is immediately replaced.

Among the explicit models of expectations highlighted by Chirinko, the two most referred to in subsequent literature are those based on Tobin's  $q$ , and upon dynamic optimisation modelled by an Euler Equation. The use of Euler equation or 'transformation' models is coupled with the assumption of rational expectations to justify the use of leading variables in the estimation of the parameters of the investment equation.

The  $q$  model deals with the problem of unobservable and changeable expectations by assuming these are fully reflected in the financial market valuation of the capital stock. In the terminology of *The General Theory*,  $q$  is the ratio of the present value of the prospective yield (or 'shadow value') to the supply price (or replacement cost) of a capital asset. Since we are concerned with new assets, the theoretically relevant ratio is the  $q$  of the marginal asset or marginal  $q$ .  $q > 1$  implies disequilibrium and an incentive to add to the capital stock. A critical assumption for empirical studies is accordingly that unobservable marginal  $q$  can be proxied by observable average  $q$ , which depends on the assumption of constant returns to scale in both adjustment cost and production functions alongside the normal neoClassical assumptions (Hayashi, 1982).  $q$  theory relates neatly to adjustment costs and indeed the value of real options, both of which can be modelled as an addition to the supply price.

In terms of results, all these models have been disappointing (Chirinko, 1993) in the sense that price effects (whether user cost or market capitalisation) are not significant. The dominant influence in all these models according to Chirinko appears to be output; in other words some form of accelerator mechanism.

One response has been to abandon theory altogether and model investment as an ARMA (auto-regressive moving average) process. Kopcke and Brauman (2001) regress the change in capital stock on lagged values of itself and of real output. They find this model far superior to the macroeconomic models in terms of degree of



explanation and forecasting errors, but recognise this is essentially a statistical effect reflecting inertia in the level of investment (Kopcke and Brauman, 2001:35). The ARMA model's ability to forecast more than one quarter ahead without recursion to correct errors is no better than the accelerator model (Kopcke and Brauman, 2001:26). They stress the empirical importance of industry specific factors and changes in capital consumption rates neglected by the aggregate models and argue for a more disaggregated approach.

### **3.3 Models with particular finance constraints**

Chirinko's recommendation in the light of the poor performance of both implicit and explicit time-series models of investment was to develop better explicit models of the processes of expectation formation and of technical adjustment of the capital stock. In fact, most subsequent research has followed the path first explored by Fazzari, Hubbard and Petersen (hereafter FHP) (1988). They addressed the problem of distinguishing the influence of finance from other variables by using panel rather than pure time-series data, and limiting their firm conclusions to those based on the cross-sectional results. The theoretical base for their model, which Chirinko considers insufficiently explicit (Chirinko, 1993:1903), is supplied by the replacement of the concept of the representative firm implicit in earlier studies by an assumption of heterogeneity in the face of asymmetric information.

FHP test investment equations including finance variables (both flow and stock) as well as  $q$ , accelerator and neoClassical variables against annual data for 422 US manufacturing firms for the period 1970-1984. They divide their sample into three cross-section samples, based on median retention ratios (calculated on net income, not cashflow), which they take as proxies for financing constraints. They find robust significant coefficients on cashflow variables for all three classes under a variety of specifications both excluding and including the competing variables. They discount the evidence of cashflow sensitivity among unconstrained firms on the grounds that this may be the consequence of mis-measurement, in particular of the  $q$  variable (because of tax effects and inadequate mapping of average on marginal  $q$  [1988:168 fn37 and 1988:183]). FHP claim this objection cannot be raised against the difference in coefficients between classes (although Erickson and Whited (2000:1049) disagree). Since the classification by retention ratio also corresponds to

size of firm, they take this as evidence of financial constraints reflecting asymmetric information problems, which are thought to diminish with net worth.

The FHP results have been confirmed by a number of tests by different authors of other measures of financing constraints, including age of firm and dispersion of ownership (Schaller, 1993); size of firm and formal credit rating (Gilchrist and Himmelberg, 1995, 1999); and membership of an industrial group with access to a main bank (Hoshi, Kashyap and Scharfstein, 1991). The FHP method of sample splitting has also been used to identify differences in financial constraints between countries (Bond, Elston, Mairesse and Mulkey, 2003).

The methodology behind the FHP results and subsequent literature has been challenged on two grounds: on whether significant cashflow coefficients imply finance constraints, and on whether they represent specification or measurement errors. Kaplan and Zingales (1997, hereafter KZ) present theoretical conditions under which the sensitivity of investment to cashflow *increases* as financial constraints reduce and propose a different classification of the firms in FHP's Class 1 sample (low pay-out, presumed most constrained) which supports this view. FHP (2000) seeks to refute this critique and shows that for constrained firms to have greater cashflow sensitivity depends only on their facing a steeper supply curve for external finance. Gomes (2001) constructs and calibrates a neoClassical model incorporating heterogeneity between firms based on stochastic shocks to a common production function, and finds the model predicts cashflow effects for unconstrained firms. Alti (2003) develops a similar model distinguished by the inclusion of stochastic long-term project quality, defined as the ultimate size of the project. Young firms only discover the quality of their project over time from the 'news' revealed by cashflow. Cashflow proves a better proxy for short-term information than Tobin's  $q$ , which is dominated by 'noise' generated by variations in the value of the firm's long-term growth options. When calibrated, this model generates a simulated panel of data similar to that of FHP. These papers therefore question the inference of finance constraints from the significance of the cashflow variable.

Other studies have addressed the extent to which differences in investment opportunities have been allowed for, either in the measure of  $q$ , or through their direct influence on cashflow. This is the problem of interpretation again in a different form, of distinguishing whether cashflow is a proxy for expected profits

instead of net worth. The  $q$  model, and the mapping of average  $q$  onto marginal  $q$  upon which empirical applications of the model depend, breaks down in the presence of imperfect competition, inter-relationship between investment and financing decisions, and because finance constraints may be reflected in market capitalisation. Estimations may therefore pick up a coefficient on cashflow which should be attributed to  $q$ . An Euler equation approach (Hubbard Kashyap & Whited, 1995; Bond & Meghir, 1994) overcomes these shortcomings, but in turn does not pick up financial constraints that do not bind in consecutive periods. A third approach is to decompose the influences on investment into their ‘fundamental’ and ‘financial’ components by direct estimation using the vector autoregression (VAR) technique of measuring the response of the estimated system to orthogonalised shocks (Gilchrist and Himmelberg, 1995, 1999). In this context ‘fundamental’ means proxies for the shadow value of capital and ‘financial’ means measures of cash flows and balances, and borrowing. Finally, Erickson and Whited (2000) argue that if the problems of measuring marginal  $q$  are overcome by the use of generalised method of moments (GMM) estimators, the cashflow coefficients become insignificant.

Other tests of a role for cashflow independent of investment opportunities have included allowing for productivity shocks by modelling autoregressive residuals (Hayashi and Inoue, 1991); the use of tax payments as an instrumental variable for cashflow (Hubbard, Kashyap & Whited, 1995); testing the effect of a temporary tax bias against retained earnings (Calomiris and Hubbard, 1995); the effect of shocks to net worth such as oil prices (Lamont, 1997), exchange rates (Froot and Stein, 1991) and legal settlements (Blanchard, Lopez-de-Silanes and Shleifer, 1994); and testing for the use of working capital to smooth fixed asset investment (Fazzari and Petersen, 1993). Schankerman (2002) plots revisions in investment plans against ‘news’ in cashflow (defined as the residuals from a second-order vector autoregression of cashflow) and finds no significant difference in response to cashflow between constrained and unconstrained firms (as defined by FHP).

Hubbard (1998) considers two other explanations of the observed investment-cashflow sensitivity. Finance constraints, interpreted as a higher cost of external funds, may reflect a difference in default rates between the classes of firm (*ie* different M&M risk classes). Alternatively, investment spending may be a function

of Jensen's 'free cashflow', independent of profitability, as a result of managerial objectives or agency costs. Hubbard finds both these hypotheses inconsistent with the evidence, although both Lamont and Blanchard *et al* favour the agency model.

Most of these studies have found an independent empirical role for cashflow, although they differ markedly in their interpretations. For present purposes, it is important to note that the FHP measure of cashflow is different from earlier studies of finance variables, being net income after interest and tax but before both depreciation and dividends (FHP 1988:194). Subsequent studies of the FHP hypothesis have used either this or a similar measure of gross operating cashflow before tax, depreciation and all finance costs (*eg* Bond and Meghir, 1994). The rationale for this is that cash *flow* is a proxy for the *stock* of net worth (the value of assets-in-place in the language of asymmetric information theory), independent of external finance decisions.

Studies testing for a general finance constraint have used the definition of cashflow in this dissertation. If the FHP cashflow coefficients for 1970-84 in their Table 4 (FHP 1988:167) are normalised by the average retention ratios reported in their Table 2 (FHP 1988:159) they become close to each other. This crude comparison suggests that regression on cashflow net of dividends would show less variation between classes, quite possibly not statistically significant. FHP's choice of cashflow measure is appropriate where the null hypothesis is that internal and external finance are close substitutes (FHP 1988:142). This in turn implies that dividends are treated as a residual (Hubbard, 1998:202), which is a strong and counter-factual neoClassical assumption. In summary, the best interpretation of the purpose and tenor of the FHP study and its derivative literature is indeed as a test for capital market imperfections.

### **3.4 Models with a general finance constraint**

Despite the problem of interpretation there have been several attempts to assess the evidence for what we have classed as the Post Keynesian model of investment finance.

Meyer and Kuh's main empirical conclusion is "firms in general displayed a strong reluctance to finance needs from external sources; this was true not only for the manufacturing sector as a whole but for most component industries as well. When

external sources were used in the post-war period, long term debt was very strongly preferred to equity” (Meyer and Kuh, 1957:157). They found some exceptions in industries that were growing very quickly or faced less oligopolistic markets with lower barriers to entry. Their interpretation of these cases was that the desire of oligopolistic firms to deter new entry forced them to use external finance in order to pre-empt profitable opportunities (Meyer and Kuh, 1957:203).

Meyer and Kuh’s interpretation of the evidence is set out as an “accelerator-residual funds” theory, meaning that investment is influenced *in the short term* by cashflow during stable or recessionary periods (1949-50). On the other hand, they consider the accelerator more important during expansionary periods (1946-1948) *and in the longer term*, reflecting the technical relationship between capital equipment and output (Meyer and Kuh, 1957:134-135). They believe that imperfect competition in product and capital markets, combined with the separation of ownership and control of corporations, are important features of the empirical evidence. Nevertheless, they do not regard their results as undermining the long-term importance of capital markets (Meyer and Kuh, 1957:198). The results may be interpreted as evidence of a ‘weak’ general finance constraint, which binds intermittently, as opposed to a ‘strong’ constraint that binds continuously.

For present purposes, there are some methodological issues with the Meyer and Kuh study. Inventories are treated as part of liquidity rather than part of investment (Meyer and Kuh, 1957:58) so that the study examines the determinants of fixed, rather than physical, investment. In testing various combinations of explanatory variables, they use both depreciation expense and net income, but not their sum, despite a reference to the role of cashflow in the works of Kalecki and of Tinbergen (Meyer and Kuh 1957:20). They do test for the product of net income and depreciation expense, although the economic rationale for this function is not given. Their reason for excluding cashflow is that depreciation alone may be a better indicator of liquidity flows, since net income may also be a measure of expectations (Meyer and Kuh, 1957:101). They fully recognise the problem of interpretation. Accordingly the relationship between capital formation and cashflow is not directly estimated. However they do note that the coincidence in time of the rise in importance of both depreciation expense and net income “tends to strengthen the

view that the profit-investment relationship is founded on liquidity rather than expectational considerations” (Meyer and Kuh, 1957:125).

Another feature is the relatively short period investigated, from 1946-50. The general finance constraint hypothesis postulates medium-term equilibrium based on a conventional gearing limit and the absence of external equity finance. This is consistent with shorter periods when investment is financed by increased debt and by running down surplus liquidity. Meyer and Kuh note that corporations began the period with excess liquidity, together with a backlog of investment opportunities, as a result of the wartime moratorium on investment for peacetime purposes. On this basis 1946-48 may have been exceptional, while the strong influence of depreciation expense in 1949-1950 reflected the binding of the long-term constraint. This could mean that the long-term implications of their findings would have to be reversed, with the cashflow constraint dominating the pull from output growth, and with very different implications for the role of capital markets. In marked contrast with the rest of their study they do not offer any empirical evidence for their conclusion that capital markets remain “of great importance” (Meyer and Kuh, 1957:199).

After Meyer & Kuh and the other studies surveyed in Jorgenson’s 1971 review (by Anderson, Evans, Kuh and in particular Meyer and Glauber), there is a dearth of empirical work on the hypothesis of a general finance constraint until Fazzari and Mott (1987). There can be little doubt that this reflected the influence of M&M theory combined with Jorgenson’s interpretation of the evidence (see section 3.1 above), notwithstanding the empirical rejection of his neoClassical model by Elliott (1973).

Fazzari and Mott (1987) was the first study consciously to set out to overcome Jorgenson’s criticism by including sales alongside the cashflow variables, relying upon the large size of a longitudinal sample of over 9,000 observations to overcome the problem of multicollinearity. They tested for the influence on fixed investment of accelerator, cashflow and debt service variables, using annual US data for a panel of 835 firms over the period 1967-1982. The data was deflated by the US GNP deflator and transformed to remove serial correlation and heteroskedasticity effects. They found significant co-efficients on all three explanatory variables in the pooled time-series sample, allowing for annual and firm-specific fixed effects, while cashflow dominated the explanation of the pure cross-section variation with an

elasticity of between 32-50%. The time-series estimation produced estimated long term elasticities on sales of 32% and on cashflow of 21%. No  $R^2$  or other diagnostic statistics are reported.

In an earlier study Stegman (1982) tested a model of a 'weak' (intermittent) general finance constraint against quarterly Australian data for the period 1966-1977 (45 observations), deflated to constant prices, using a linear switching regression technique. Although the addition of lagged cashflow terms improved the estimation compared with a pure accelerator model, the finance constraint was binding only in 7 out of 45 quarters. These quarters coincided with periods of general liquidity shortage. Stegman was unable to give a clear account for the significant negative coefficient on cashflow lagged by 2 periods. These qualifications and the small size of the sample make his conclusions tentative.

In a later study together with Chapman and Junor (1996), Stegman moved from testing for a general finance constraint to testing a model of particular finance constraints, in the spirit of the FHP models, using annual panel data for 58 Australian listed companies in the period 1974-1990. The distinguishing feature of this model is the use of undistributed cashflow (*net* of dividends) to identify years in which a firm was constrained on the assumption that dividends are conventional and therefore not a discretionary residual. On this measure it was found that small and large firms were equally likely to be constrained, suggesting asymmetric information may not be the explanation (under the usual assumption that information on small firms is less available to the financial markets than information for large firms). The cashflow co-efficient was found significant and dominant for constrained firms, while unconstrained firms showed influence from all three of cashflow,  $q$  and accelerator variables. On the other hand the explanatory power of the constrained estimation ( $\bar{R}^2 = 10\%$ ) is very low.

Hans van Ees *et al* (1997) specify a Kaleckian model including both cashflow and accelerator variables, and deal with the problem of interpretation by testing for the predicted fluctuation in the parameters of the structural equation. In particular, theory predicts counter-cyclical variation in the influence of cashflow on investment. They estimate the parameters indirectly from a transformed reduced-form autoregressive equation in terms of output, with a lag structure derived implicitly (in Chirinko's terminology). They use time-series data for Dutch manufacturing

industry partitioned into five sectors for the period 1950-1987. They note the simple time-series correlations between investment and cashflow in each sector are about 90%, which they take as evidence that the data do not reject the model, if not sufficient to deal with the problem of interpretation. From their estimation they find that the cashflow co-efficient is negatively correlated with profitability (in 4 out of 5 sectors) and with the index of industrial production (in all sectors), as predicted.

### **3.5 Comparative studies**

The previous sections have reviewed empirical studies that tested models of investment in absolute terms, against the hypothesis that the postulated independent variables were not significant. There have also been a number of studies comparing the relative performance of different models against each other.

Meyer and Kuh (1957) itself contained a detailed comparative survey of earlier studies. Jorgenson's conclusions in his 1971 survey reflected his 1968 comparative study with Siebert based on data from 15 US firms that came out in favour of the neoClassical model. Elliott (1973) reached quite the opposite conclusions testing the models used by Jorgensen and Siebert against a much larger sample of 184 firms.

Bernanke, Bohn and Reiss (1988) apply tests of statistical significance for non-nested models and find that each of the tested investment models is rejected by at least one of the others, in other words, no model is dominant and all appear to omit significant variables. In a recent application of this approach to quarterly UK manufacturing investment time-series data for 1972-2001 Baddeley (2002) compares accelerator and  $q$  models and finds the same result.

Vilasuso (1997) tests linear neoClassical and  $q$  models both independently and expanded by cashflow variables using a band-pass filter moving average technique on a small sample of annual US data for 1960-85 (26 observations), deflated to constant prices. Using the CUSUMSQ test, he notes that the pure neoClassical and  $q$  models provide unstable estimates, which become stable with the inclusion of cashflow. The cumulative cashflow co-efficient in the expanded model indicates investment changes by 85% of a prior change in cashflow. His conclusion is that cashflow is the key determinant of aggregate fixed investment, but he does not address the view that this result may reflect the mismeasurement of  $q$ .



Samuel (1998) compares alternative models of investment using firm-level data. Versions of the cashflow,  $q$ , accelerator and neoClassical (*ie* factor price) models are tested against panel data for 331 US firms for the period 1972-1990. The different models are ranked by the significance of parameters and of the overall regression, as estimated by three different methods, time-series, cross-section and fixed/random effects. The  $q$  model comes out worst on all counts. The neoClassical model scores highest using time-series estimation and the cashflow model highest with fixed effects estimation. Samuel concludes that “if the results from cross-section regressions [including fixed effects] can be viewed as representing the long-run equilibrium” (Samuel, 1998:102) the single most important determinant of investment is cashflow (elasticity not reported). He infers that in the short-run firms also take account of the cost of capital, but not of their market capitalisation.

Kopcke and Brauman (2001) compare accelerator,  $q$ , neoClassical, cashflow and ARMA models (already referred to in section 3.2) against quarterly US data for non-farm non-financial corporate business for the period 1960-1999. They judge relative performance mainly by the ability of the models to predict investment for 1991-99, given parameter estimates based on 1960-90, and report no diagnostics. They find in favour of the neoClassical model, if the recursive ARMA is disregarded.

In summary, these comparative studies often contradict each other and have not settled the problem of interpretation. This may partly reflect differences in model specification and other technical issues, but it is clear that econometric methods cannot easily distinguish between the different models and the underlying schools of thought they represent.

### **3.6 The new issue discount**

The theoretical discussion of the previous chapter concluded that a new equity issue discount is a necessary condition for the existence of a general finance constraint where equity markets exist.

In a definitive study that does not yet appear to have been overtaken, Asquith and Mullins examine 531 US new issues and registered secondary offers during the period 1963-1981. It is not clear whether the primary offers exclude those made in connection with acquisitions (this is suggested by the statement “a sample ... uncontaminated by ... merger bids” in order to control for different information

effects, Asquith and Mullins, 1986:66, also fn 9). Their results indicate that industrial firms face dilution of an average 31% of the amount of the offer in the case of primary offers and 78% in the case of secondary offers. Primary offers by utilities produce a lower level of dilution, 12%.

Masulis and Korwar consider the application of new issue proceeds and distinguish between capital expenditure, debt repayment and 'mixed' purposes (Masulis and Korwar, 1986:105). It is not clear whether capital expenditure includes acquisitions, and they are not explicitly excluded. They find no significant difference in the issue discount between the different applications of proceeds. They specifically exclude rights issues. In a more recent study of 110 UK issues in 1989-91, Burton, Lonie and Power (1999) divide issues between those made initially to existing investors (rights issues) and those open to the general public. They find the new issue discount dominated by a heavy discount on rights issues that does not apply to other issues, the opposite to the New Keynesian prediction.

Faced with such discounts, the issuing firms must either have had exceptionally good reasons for accepting equity on these terms, or paid scant regard to the interests of their existing shareholders. Asquith and Mullins find no evidence of neoClassical tax or capital structure effects and interpret their results in terms of New Keynesian asymmetric information effects. They note that their tests cannot distinguish between the hypotheses of AI effects on the one hand and of inelastic demand for shares on the other. Chapter 6 will put forward another explanation of the new issue discount that puts their results in a different light.

### **3.7 Summary and conclusions**

The empirical investment literature has for the most part neglected the hypothesis of a general finance constraint. The presumption is that the frequently observed aggregate investment-cashflow correlation is misleading. The assumption is that cashflow is a proxy for the unmeasured element of the fundamentals of expected profitability and output, or for market imperfections based on asymmetric information in particular cases. This assumption reflects the understandable view that there cannot be a general finance constraint if large firms have ready access to equity capital markets. So, resolving the problem of interpretation requires new theory about the operation of equity markets, as well as new empirical work.

## **Chapter 4 The case for a Critical Realist approach**

This chapter argues that the solution of the problem of interpretation that besets empirical studies of investment requires a different approach to that found in the literature. The standard use of econometric techniques is associated with a particular understanding of the nature of reality (or ontology) and of the appropriate methods for gaining knowledge about aspects of that reality (or epistemology). The question is therefore whether the use of econometric techniques in the standard fashion can be expected to yield fruitful results, to which the answer given here is broadly negative. The response is to apply Critical Realist methodology to provide a research strategy and guidelines, including an appropriate use of econometric techniques, but also other quantitative and qualitative methods of testing hypotheses. The conclusion is a structure for an empirical investigation that resolves the problem of interpretation.

### **4.1 The standard methodology of econometric studies**

The appropriateness of econometric methods of estimation for the purpose of testing hypotheses about economic behaviour is rarely questioned in the studies themselves. The main debate over methodology has been in response to the ‘Lucas Critique’. This originally related to the use of econometric models for the purposes of forecasting the results of changes in government policy when people’s perceptions and expectations of government policy influence the outcome and where those perceptions change over time. From this developed the prescription that econometric models must have ‘micro-foundations’, which is usually extended by the assumption that such micro-foundations must be grounded in individual optimising behaviour. This is the basis of Chirinko’s (1993) distinction referred to above between explicit and implicit models of capital formation.

At the heart of econometrics and indeed any mathematical economic theory is the concept of functional relationships. The value of a dependent variable is uniquely related to a set of independent variables by a function, in practice nearly always linear and well behaved in terms of differential calculus. In a simultaneous system, the dependent variable of one function may be an independent variable in one or more other functions. The main difference between theory and empirical work is that in the latter case the functions include a ‘white noise’ random term.

Behind this use of functions lies a view of the world such that causal mechanisms are expected to lead to the observation of regular conjunctions of events ('event regularities'). The empirical discernment of such event regularities at an aggregate level requires three main conditions. Firstly, 'extrinsic closure' means that all relevant independent variables are included and accurately observed. Secondly, 'intrinsic closure' means that the functional relationship between them is unique and stable, within probabilistic limits represented by the noise term. The third condition is that there exists a valid 'principle of combination' in cases where the underlying functional relationship exists at a level of aggregation below that of the observed variables. Together these conditions form a 'closed system'.

The Lucas Critique is framed primarily in terms of the extrinsic closure condition, the omission of the influence of policy variables on expectations and behaviour. The problem of interpreting the evidence of the empirical investment studies is also stated in terms of this condition, insofar as it is argued that the significance of cashflow is explained by the omission or mismeasurement of the fundamental variables. The models based (explicitly or implicitly) on the production function deal with the intrinsic closure condition by the usual assumption that the actions of firms are determined by optimisation subject to the constraints of well-behaved production function and demand curves. Given prices, the technology of production and installation, and (in the case of imperfect competition models) the demand curve, the rate of investment is fixed uniquely. Finally the aggregation problem is 'solved' by the assumption that the whole sector can be modelled as though it were a single representative firm.

Given this ontological framework, the epistemology of standard econometrics is 'deductive'. This means that knowledge of reality is gained by framing 'functional hypotheses', *ie* hypotheses about the functional relationships between the variables in question. The objective of empirical work is then initially to confirm these relationships and ultimately to discover situations where these relationships do not hold as a spur to further research. In this mode of reasoning explanation consists in the prediction of the dependent variables from the initial conditions, so that there is no difference of principle between explaining past and future values. There is a practical difference to the extent that the future values of exogenous variables (those outside the model) are unpredictable. The bulk of standard econometric work

consists in the framing of functional hypotheses in the form of structural and reduced-form equations, the devising of appropriate methods for estimating their parameters given the assumed stochastic properties of the data, and the devising and application of diagnostic tests of statistical significance.

## **4.2 The economy as an open system**

What are the implications for econometric analysis if in fact reality is not a closed system in the above sense, but open? A positive definition of an open system as the main feature of a stratified reality must await a discussion of ontology further below. For the immediate purpose of answering this question, by an open system is meant one where the closure conditions are not, or cannot be, fulfilled. Even in the natural sciences (astronomy apart) the classical experimental method relies upon imposing extrinsic closure. The particular ‘local closure’ or sub-system under investigation is isolated, or ‘control’ samples are run in parallel to isolate the influence of a particular variable. In the social sciences the problem is much greater. Not only is extrinsic closure difficult if not impossible to achieve, but intrinsic closure is inconsistent with human agency. The atomistic optimising individuals of neoClassical ‘choice-theoretic’ economics have in fact no choice: their appetites and constraints determine their actions. The description of real individuals in these terms is tantamount to denying that the ‘representative agent’ has any real freedom of action. The description of a whole sector by a single representative implicitly assumes homogeneity and denies the possibility of complex social structures whose behaviour cannot be reduced to that of their component individuals.

The recognition of physical reality as an open system takes seriously its immense complexity and chaotic nature. Particular outcomes are always the result of countervailing tendencies. In natural science intrinsic closure is usually assumed to be plausible. Even then it is impractical, if not strictly impossible, to predict the path to earth of a given autumn leaf despite well-established physical laws, since the outcome of the interplay of gravity, wind and temperature cannot be predicted in a particular case (Lawson, 1997: 28).

In relation to the investment literature, the idea of an open system raises specific questions relating to the conditions for closure, both extrinsic and intrinsic, and for aggregation. Some problems of extrinsic closure are generally recognised under the

rubric *ceteris paribus*, but not so the usual underlying assumption of ‘ergodicity’. This assumption means that “future events are always reliably predictable by using a probabilistic analysis of past and current outcomes ... The future is merely the statistical reflection of the past. Economic activities are timeless and immutable” (Davidson, 1994:89-90). A technical expression of this property is that estimations based on cross-section and time-series data converge as the number of observations increases (Davidson, 1999:126).

There are also a number of problems in connection with intrinsic closure. This closure condition depends, first of all, on the reduction of fundamental uncertainty about the future to statistical risk. In particular, the assumption of rational expectations usually employed in Euler equation models implies that, not only do objective stochastic functional relationships exist, but also agents discover them and act in accordance with them.

Secondly, intrinsic closure requires that the concept of ‘desired capital stock’ is determinate and operationally valid. This unobservable variable lies behind both the production function and the standard accelerator models (although the Post Keynesian version of the accelerator does not rely upon it). There are formidable problems in constructing a valid aggregate measure of the capital stock. Even at the level of the individual firm it is not clear why a decision about the profitability of the purchase of a specific capital good has to be intermediated by a comparison between the existing and desired stock of all the different capital goods held by the firm. This is not the place to enter into a discussion of the controversies over capital theory (Harcourt, 1972) or the empirical validity of the aggregate production function (McCombie, 2001a, 2001b). Nevertheless that extensive body of work calls into serious question the realism of the concepts of capital and the production function that are essential to these empirical models.

Alongside fundamental uncertainty and the capital critique, a third and independent obstacle to intrinsic closure emerges from ‘real options’ theory (Dixit and Pindyck, 1994). This is particularly relevant to the sophisticated investment models based on direct estimation of marginal  $q$  (eg Gilchrist and Himmelberg, 1999). Real options theory depends for its results solely upon the irreversibility of investment, while retaining neoClassical assumptions about uncertainty (*ie* stochastic risk or ergodicity) and production functions.

The core result of real options theory is that marginal  $q$  needs to cover the opportunity cost of exercising an option to invest as well as the cost of the capital invested. The crucial implication is that the relationship between investment and the cost of capital is non-linear, since the required discount rate depends on the option value. This is the case for an individual firm, and since different firms face different circumstances, there is no determinate principle of composition to arrive at an aggregate function. As Dixit and Pindyck remark with masterly understatement, “unfortunately, incorporating irreversibility into econometric models of aggregate investment spending is not simple” (Dixit and Pindyck, 1994:421).

The homogeneity assumption behind the use of a representative firm solves the aggregation problem simply by abstracting from the differences between firms and industries. There is some recognition of this in the FHP tradition of distinguishing at least between financially constrained and unconstrained firms. The use of dummy variables for firm effects in panel estimations partly recognises the problem, but still assumes that the differences can be subsumed in a single variable that contributes to a functional relationship otherwise common to all firms, including in particular the production function.

### **4.3 The limitations of the deductive method**

The lack of closure leads to severe problems for the method of testing functional hypotheses about an open social system by deduction. These hinge upon the fragility of the functional specification and the unavailability of the controlled experiment (certainly in macroeconomics).

It is a commonplace that econometric results suffer poor replicability. Estimates of functional relationships are found to be statistically significant in one context and routinely rejected by another study. The previous chapter has reviewed a number of such examples. This lack of replicability leads to a loss of refutability. The standard response to the statistical rejection of a particular model is not the abandonment of the model, but a search for a better, more sophisticated, specification or estimator.

The unwillingness to accept refutation by tests of statistical significance may indeed often be justified in an open system. It is quite possible that the predicted effects of a valid mechanism are offset by a countervailing mechanism. The question is whether it is ever possible to ‘close the model’ by including all the operative mechanisms in

the functional relationship. Natural science often overcomes this problem by the experimental method of imposing closure, which is not available to macroeconomics. Yet in disciplines such as geology and palaeontology experiments are often not possible and research places primary emphasis on the discovery of additional data to discriminate between competing hypotheses.

The point is illustrated by an example from the popular science program, *Horizon* (2002). The Permian mass extinction of 250 million years ago may have been the result of global warming caused, so the alternative hypotheses hold, either by a meteor strike or by the massive volcanic eruptions that formed the Siberian Traps. However, analysis of the amount of carbon dioxide released by the eruptions shows they cannot explain a sufficient rise in temperature to account for the observed 95% extinction. On the other hand, there is no evidence of a crater similar to that ascribed to the postulated meteor strike of 66 million years ago (the Gulf of Mexico). One theory argues that a sufficiently large meteor would leave no crater, and collateral evidence of quartz fractures from the Antarctic Permian strata may support this. This is challenged not by another theory, but by empirical evidence that the strike at the end of the Cretaceous Period left widespread deposits of iridium (a mainly extra-terrestrial element) not found in the Permian Period.

At this point in the argument the volcanic hypothesis has been found insufficient to trigger the necessary global warming, and the evidence for the meteor hypothesis is inconclusive. The next step is further fieldwork in the Greenland Permian strata, which indicates the extinction event took place over 80,000 years rather than 10,000, rejecting the meteor hypothesis but revealing an anomaly in the level of the carbon-12 isotope. Neither hypothesis can explain the anomaly.

The resolution of the argument (at least in this TV programme!) comes from the synthesis of new and quite separately gathered geological data. It appears possible that the global warming resulting from volcanic activity raised the temperature of the sea sufficient to melt frozen methane hydrate reservoirs on the sea-bed and to release sufficient carbon dioxide to raise the global temperature enough to account for the mass extinction. So the evidence suggests a chain of causation more complex than either one of the original hypotheses.

This example makes the point that progress in scientific explanation requires constant confrontation by empirical evidence. The inability of econometric testing



either to confirm or deny theoretical propositions conclusively to the satisfaction of the economics profession is a major handicap. The dominance of econometrics in empirical work, despite this handicap, has led to a dangerous undermining of the empirical basis of the subject and to its scientific method. Empirical evidence rarely, if ever, decides between competing economic theories.

Our problem of interpretation is a further symptom of the unavailability of the experimental method. There is only limited data available at the aggregate level. Most of the theoretical models invoke relationships between variables that are not directly observable in the aggregate data, if at all (*eg* expectations), and therefore rely on the postulation of further relationships between the causal variable and a proxy (*eg* marginal and average  $q$ ). However the same observable variable may be used as a proxy for one or more unobservables, and may also have a causal role of its own. Even if a robust model specification can be found, it is not always possible to discriminate between the functional hypotheses from given data.

The point is illustrated as follows. Suppose there exists a perfect correlation between cashflow and output, and that investment really is constrained by cashflow. The latter means that an investment-cashflow correlation is observed. However the substitution of output for cashflow produces a correlation with exactly the same characteristics, as would be found if there was no finance constraint and there existed an accelerator relationship between investment and output. It is not possible to decide between the accelerator and finance constraint hypotheses on the strength of the regression result. Jorgenson's interpretation of the data along these lines (referred to earlier) does not reflect statistical tests so much as the brute fact that equity markets appear to be competitive. A general finance constraint is held to be 'implausible' from the outset and the statistical work sheds no light on it.

#### **4.4 A Critical Realist approach**

An alternative to the deductive method exists in the 'retroductive' method put forward by Lawson (1997) and associated with the philosophical approach to methodology known as 'Critical Realism'. Indeed the above discussion has already drawn heavily on this perspective. The epistemology underlying the retroductive method reflects the ontology of an open system.

The application of Critical Realism to economics is regarded by Lawson as a generalisation of the Lucas Critique (Lawson, 1995). Both address the same problem of the difficulty of applying econometric methods to an open system. While Lucas concentrates on the extrinsic closure condition, Lawson emphasises the equal importance of the intrinsic closure and combination conditions. The breach of any of these conditions is fatal to standard practice in the use of econometric techniques. The New Classical macroeconomics espoused by Lucas represented one response to this problem, replacing the attempt to estimate structural relationships, with the attempt to calibrate models derived from pure theory. This research effort is focussed on the creation of closed-system models from the axioms of optimisation that produce predictions comparable with the stylised facts of experience (Alti, 2003, referred to in section 3.3, is an excellent example).

Critical Realism calls into question the deductivist perspective that underlies this New Classical methodology and that of wider neoClassical and New Keynesian theory in general. This includes not only standard econometric practice, but application of the methodology of atomistic individualism and constrained optimisation to social phenomena. A full discussion of the critique is not appropriate here. It is sufficient to state that many Post Keynesian writers regard Critical Realism as providing the philosophical foundation necessary to give coherence to their school of thought (Lawson, Dow, Lewis and Runde, Rotheim, 1999). For present purposes, the relevance of Critical Realism is in its positive implications for methodology, and whether these can provide a structure for an investigation that resolves the problem of interpretation. Our discussion therefore returns to the meaning and use of retrodution.

Critical Realism links the deductivist approach to positivist ontology. The ontological difference between positivist and critical realist perspectives is that the latter distinguishes three 'levels' of reality where the former addresses only one. The positivist deals only in the empirical, what can be sensed. The critical realist distinguishes the *empirical* from the *actual* and in turn from the *real*. The level of the *actual* contains the events that produce, but are distinct from, empirical impressions. The level of the *real* refers to structured objects and their related powers, exercised through mechanisms that may not be directly observable (*eg* gravity), but do create tendencies in the course of actual events. In an open system,

different mechanisms may conflict but are none the less always operative, leading to tendencies, as a leaf tends to fall to the ground despite being lifted by the wind. On this definition, objects at this level are real in the sense that they exist independently of our knowledge of them. They are structured in the sense that they cannot be reduced to the actual events or empirical impressions they produce.

Within this ontological context, retrodution may be contrasted with induction and deduction as follows. The latter two relate empirical events and the laws or functional relations between them. The inductive method moves from observation of (a series of) particular events (*eg* “I have seen white swans on several occasions”) to a general claim (“all swans are white”). The deductive method moves from a general claim to the prediction of a particular event (“the next swan I see will be white”). Both methods operate at the empirical level. Retrodution is the inference from knowledge of phenomena at one level of reality, to non-empirical explanatory events or mechanisms at a deeper level (“the colour of a swan is determined by its genetic structure”). Indeed it is the ascription of causality rather than direct perception that identifies the hidden reality.

These levels are not necessarily fixed. Physical science has proceeded from a theory that actual substances can be understood in terms of earth, water, wind, and fire through the full periodic table of the elements and on to quantum mechanics. At each stage the development of knowledge depended on the invention of suitable measuring instruments, to turn the actual into the empirical, and thereby confirm the validity of a new understanding of the real. Each generation of scientists has laboured to uncover the next deeper layer of reality beneath the current level of empirical observations. There appears to be no limit to this process.

The feature of social reality that distinguishes it from the natural world is its relation to human agency. Social structures are the product of human choices, and in turn influence human choices: they are mutually dependent. Human choice (in the sense that someone could always have done otherwise) is not reducible to actual events and consequently is always part of an open system. It follows that social structures and the mechanisms by which they influence actual events cannot usually be assessed by the use of deductive methods under quasi-experimental conditions. On the other hand their existence can be inferred by retrodution based on underlying causality rather than empirical pattern.

## 4.5 Applying the retroductive method

The task now is to relate this discussion to the specific research question addressed here. In particular, there is the question of whether econometric techniques are likely to yield meaningful conclusions. The overall question is how a critical realist approach to inference differs from the deductivist in this case, and what are the logical steps through which the argument needs to proceed

The first point is that it simply may not be possible to disentangle the influences on investment of opportunities and cashflow (in particular) as causal mechanisms, at the level of events in studies of time-series data. Both mechanisms may be operative and result in tendencies that sometimes reinforce, and sometimes offset, each other. Econometric analysis usually attempts to reproduce the experimental method. In particular the experimental technique of control groups is emulated by ‘controlling’ for variables that are expected to influence outcomes, other than those of interest. An example of this from the investment literature is the various efforts to control for investment opportunities (marginal  $q$ ) when assessing the influence of cashflow. However the insight that we are dealing with an open system suggests this method may be inconclusive, as indeed the literature suggests. The cross-section method has been more successful in isolating cashflow effects, but this technique can test for the presence only of a particular, and not a general, finance constraint.

Secondly, the insight that social structures are dynamic and capable of continuous transformation should encourage careful attention to the historical and geographical context. The time period over which any empirical relationship is estimated must take account of the longevity of the hypothesised structures and their mechanisms. The concept of an aggregate production function is particularly vulnerable here, both to technology change over time and to the heterogeneity of firms.

Lawson (1997) suggests research in open systems should begin by identifying rough empirical patterns (‘demi-regularities’) that are anomalous or surprising (‘contrastive’) either when compared with the patterns observed at other times or places, or in terms of received theory. Lawson distinguishes contrastive social demi-regularities from Kaldorian ‘stylised facts’ by emphasising the contrastive element and the partial regularity implied. He considers the term ‘stylised facts’ to have been appropriated to denote law-like predictions based on closed-system models (Lawson, 1997:208). As discussed in Chapter 1, the term ‘anomaly’ is here used as shorthand

for ‘contrastive social demi-regularity’ in preference to ‘demi-reg’, without intending any implication that there is a strict law (‘nomos’) from which the anomaly is a departure.

The anomaly offers an opportunity for inference similar to the controlled experiment, with a crucial difference. The process of explanation works backward (hence *retro*-duction) by seeking to discover the mechanism behind the anomaly, rather than forward (*de*-duction) by seeking to trigger the mechanism and generate the anomaly. Continuing the example given above, the anomaly could be “most swans are white, but Australian swans are black”.

Lawson continues by suggesting that a hypothesis arrived at by retroduction may then be assessed by its explanatory power, in the widest sense of the term. Deductive reasoning may be used to predict results with a different sample, but with the recognition that neither confirmation nor rejection can be regarded as conclusive under non-experimental conditions. More weight may be placed on ‘*retro*-dictive’ reasoning (the reverse of *pre*-dictive), again moving backwards from the empirical outcome rather than forward to a prediction. This means that where the outcome in question is found in another sample, evidence is sought of the initial trigger events or conditions required if the hypothetical mechanism were to have brought about the observed outcome. Lawson is sceptical about the usefulness of econometric techniques, if defined solely as regression analysis, but emphasises the importance of grounding theory in empirical data and the value of the whole spectrum of techniques of data collection and analysis.

It is important to underline that Critical Realism does not abandon the concept of testing hypotheses against the empirical evidence, which is perhaps the hallmark of the scientific method. The difference is in the nature of the hypothesis and in the manner of testing. Standard econometric methodology requires a hypothesis that specifies the functional form of the relationship between empirical variables, so that predictions can be made. By contrast, retrodiction requires a hypothesis to specify clearly what empirical conditions and events will, or will not, trigger the postulated mechanism. To some extent this is a difference between cardinal and ordinal, but Critical Realism also allows a greater emphasis on non-quantitative factors, and opens up the range of possible test methods beyond those of regression analysis.

## **4.6 Putting the research question into the critical realist framework**

This framework for inference requires clear definitions in critical realist terms of the objects of analysis. The social structure under examination is the listed public limited company, characterised by a separation of ownership and control between investors and managers, and an elaborate network of accountabilities involving external agents such as auditors, merchant banks and financial regulators. The relevant power of this structure is the power to issue shares to raise external finance from equity markets. The mechanism is the new issue mechanism, which may itself be a complex of components. The mechanism is the process by which the power is exercised, a process that is triggered by certain events or conditions, and results in a specific new issue.

The first part of the empirical work (Chapter 5) establishes the anomaly that leads by retrodiction to a particular theory about the nature of the new issue mechanism (Chapter 6). The anomaly in question here is the absence of external equity finance for capital formation in the presence of active equity markets. The theory draws upon Keynes's analysis of the effects of fundamental uncertainty and leads to a hypothesis that particular events and conditions, and not others, will trigger the mechanism. The second part of the empirical work (Chapter 7) uses the retrodictive method to examine the evidence of cases where the power has been exercised, to check for the trigger events implied by the hypothesis. This involves looking at the experience of individual listed companies that in fact made new issues in a given period. A sequence of logical tests eliminates most of the sample, leaving a small number of apparent exceptions or breaches of the hypothesis. These exceptions are then examined in detailed case studies for evidence of other countervailing mechanisms at work, which explain the departure from the maintained hypothesis.

If the hypothesis is confirmed (as submission of this thesis indicates), there is always scope for explaining the explanation. Any mechanism is normally composed of sub-mechanisms which themselves are open to further investigation and explanation. As with the development of atomic theory since the Greek philosopher Democritus, the postulated mechanism may provide good service as a 'black box' until it is confronted by another anomaly, when the cycle of research begins again.

#### **4.7 Critical Realist methodology as work in progress**

Critical Realism certainly does not lack its own critics, both internal and external. The main concerns relevant here are a perception of epistemological weakness and a debate over whether econometric techniques have any role to play. Epistemological weakness means mainly that Critical Realism offers little guidance to researchers on the formation of explanatory hypotheses about causal mechanisms and the assessment of their explanatory power against the empirical evidence. There is also debate as to whether the use of econometrics can ever be legitimate given the nature of the functional relationships upon which it depends.

Arestis, Brown and Sawyer (2002) and Brown, Slater and Spencer (2002) suggest retrodution is useful in understanding localised, concrete situations. On the other hand they argue that the process of abstraction (leading to the formation of a hypothesis) needs to be accompanied, not followed, by the process of synthesis into a larger or deeper explanatory framework ('systematic abstraction'). In other words, the mechanism hypothesised by retrodution in a particular situation will tend to, and indeed should, reflect the researcher's understanding of the mechanisms governing the wider economy. To some extent that is indeed the approach adopted here, since the choice of the anomaly and starting point for the novel explanation are both informed by existing Post Keynesian thought. It is a moot point whether systematic abstraction is an essential aspect of methodology, or whether on the other hand Critical Realism as a general philosophical approach should profess an initial agnosticism about causal mechanisms when confronting anomalies. Lee argues that theory must at all times be fully grounded in the data, and modified as the data changes, and this view could be interpreted as in conflict with that of Brown, Slater & Spencer, in his demand "that the economist be sceptical of all pre-existing theory" (Lee, 2002:797).

Walters and Young argue that, inter alia, Critical Realism provides no guidelines for evaluating contradictory theories with the same explanatory power and that "For the idea of explanatory power to be useful it must be associated with a method of establishing the evidential space" (Walters and Young, 2001: 498). This appears to undervalue Lawson's argument that the answer can only lie in continuing "to search out conditions for which the competing hypotheses bear different implications for the empirical phenomena" and that if this fails "the correct epistemic attitude... must

be... to suspend judgement” (Lawson, 1997:215). Runde (1998) expands on the notion of explanatory power and gives four main criteria for establishing causality. These are whether a causal factor is present, operative, sufficient and primary in a given situation. Runde (like Lawson) acknowledges that these criteria may not be sufficient to discriminate between competing theories and Walters and Young consider this admission significant (Walters and Young, 2001:498). The point is surely that no method can be guaranteed to discriminate between theories where the empirical evidence is insufficient. The task of science should be to seek new evidence in precisely these circumstances. The critical realist claim is that in an open system its methodology is more powerful, not all-powerful.

On the use of econometrics, Downward, Finch and Ramsay (2002) argue that ‘quasi-closures’ do arise in an open system. This is the result of the rules, conventions, customs, and habits adopted by agents and embodied in institutions as a method of coping with the fundamental uncertainty and complexity of such a system. These structured objects may give rise to discernible event-regularities that are in turn amenable to description by statistical analysis, although not necessarily a basis for prediction or inference.

The use of econometrics to assist in the identification of a localised closure based on rules, conventions and habits represents a quite different approach to inference. Tests of the statistical significance of estimated coefficients measure whether random variation, rather than the postulated functional relationship, can account for the variation in the dependent variable(s). Under the standard method, the significance of the coefficients corresponds to the validity of the model and therefore of the causal hypothesis. In other words the econometric techniques are assumed to test the causal hypothesis directly.

By contrast, the econometric description of a local closure does not represent a direct test of the causal hypothesis. The role of econometrics is to help in the detailed description of the anomalous quasi-closure and ensure that the impression of correlation given by less formal methods is not spurious. The tests of statistical significance relate to the existence of the functional relationship, not to the explanation of the anomaly. The econometric results imply nothing directly about the latter. Nevertheless if a functional relationship can be discovered it may be possible to rule out one or more alternative functional hypotheses as inconsistent



with it. This may be one of the few cases where a hypothesis can be rejected conclusively on the strength of econometric evidence.

#### **4.8 Conclusions for the structure of the argument**

In summary, the following chapters proceed in accordance with this methodology as follows:

- 1 The *anomaly* in question here is the absence of external equity finance for capital formation. In Chapter 5, this *anomaly* is initially detected in the difference between gross and net measures of debt and equity inflows to the corporate sector, in both the US and the UK. Because we are dealing with aggregate measures, this *anomaly* cannot be discounted as an exception based on market imperfections affecting a minority of firms.
- 2 However inference from net measures of equity inflow depends on the legitimacy of the ‘hypothecation premise’ (the meaning of this is explained in Chapter 5). An econometric analysis confirms the existence of an equilibrium relationship between capital formation and cashflow. This justifies the hypothecation premise and inference from net measures at the aggregate level, and also means the relationship can be modelled as a finance *mechanism*. Furthermore, the properties of the relationship are not consistent with the bootstrap hypothesis, indicating the finance *mechanism* acts as a constraint on investment. This is a first-order constraint, a single *mechanism* that does not rule out independent influences on both cashflow and investment. However the constraint does mean such influences must affect cashflow proportionately if they are to affect investment.
- 3 Chapter 6 works *retroductively* back from this *anomaly* to a theory of the finance *mechanism* in terms of a differential new equity issue discount. This draws upon a Post Keynesian understanding of the effect of fundamental uncertainty on the use of the *power* to issue new equity, given also the *structure* of a listed company.
- 4 Chapter 7 then presents the results of a second empirical study intended to provide an independent test of the hypothecation premise and of the *retroduced* theory. This test is *retrodictive* in character and has two aspects.

First, the hypothecation premise can be checked at firm level. Secondly, the theory implies a testable hypothesis that new issues are in general *triggered* either by the acquisition of existing assets or by shocks to solvency, but not by capital formation.

- 5 The conclusion is that the problem of interpretation can be resolved by approaching the macroeconomic data from a different perspective. This approach recognises that the theory of the *mechanism* postulated by *retroduction* may not be directly testable in the form of a functional relationship between observable time-series variables. This can be either because the relationship cannot be so expressed, or because more than one functional relationship is consistent with the data. The functional relationship revealed by the econometric analysis in this case is evidence only of the detailed nature of the *anomaly*. The econometric analysis does not directly test the explanatory hypothesis, which cannot be expressed as a functional hypothesis. That test is undertaken by *retrodiction*, looking for the events that *trigger* new issues.

## Chapter 5 The equity finance anomaly

### 5.1 Introduction

Chapters 2 and 3 have reviewed the theoretical and empirical literature on the relationship between investment and finance. We have seen that the existing Post Keynesian theory of a general finance constraint on investment is hard to reconcile with the existence of competitive securities markets. Evidence of a substantial flow of new equity into the industrial sector would appear to support the neoClassical view and run counter to both the Post Keynesian and the New Keynesian theories. Related to this is the general presumption of the literature that any general investment-cashflow correlation is an example of the problem of interpretation, where cashflow is a proxy for the unmeasured element of fundamental variables such as output and profitability, or for market imperfections such as asymmetric information.

This chapter examines the long-term evidence on these questions in the aggregate national accounts for the UK and the US, over periods of up to 50 years. Section 5.2 considers the financial flows into the industrial sector and finds *prima facie* evidence of the substantial use of new equity issues, although also evidence of equity withdrawal through the process of business acquisition. This use of equity finance appears to favour the neoClassical view, which depends above all on competitive equity markets. By contrast, the movements in the gearing ratio favour the Post Keynesian and New Keynesian concepts of capital structure as a resultant of flow decisions about changes in debt and equity, rather than the neoClassical idea of an equilibrium ratio between stock variables of outstanding debt and equity.

Section 5.2 also suggests the crucial anomaly of a general absence of equity finance for capital formation, which is the key to the reconciliation of Post Keynesian theory with competitive securities markets to be attempted in Chapter 6. Before this anomaly can be drawn out definitively, the ‘hypothecation premise’ must be justified. Unless equity issues can be hypothecated (earmarked) against expenditure of a financial nature, such as business acquisitions, it is not legitimate to draw conclusions about the finance of capital formation from aggregate net measures of equity inflows. Section 5.3 addresses this problem using evidence from the

aggregate capital accounts of a stationary relationship between investment and cashflow. This relationship is sufficient to justify the hypothecation premise. Section 5.4 goes on to explore the dynamics of the functional relationship and finds the econometric evidence consistent with a model of a finance mechanism, in which cashflow supplemented by borrowing alone supplies the finance for capital formation. Section 5.5 considers whether this finance mechanism is also a constraint, against the alternative bootstrap hypothesis.

Chapter 4 has discussed the methodology problems of the standard approach to econometrics and suggested that such techniques cannot resolve the problem of interpretation reviewed in Chapter 3, the question whether cashflow is only a proxy or itself has an independent influence. The main purpose of this chapter is accordingly to establish the anomaly from which an explanation will be retrodeduced in Chapter 6 and tested retrodictively in Chapter 7. Nevertheless it appears that econometric techniques can demonstrate that a properly specified model of a finance mechanism is consistent with the data. In particular the dynamics of the relationship are in line with the survey evidence on time lags in the investment process, and strongly indicate that the direction of causation runs from cashflow to investment rather than the reverse. This makes the case against the bootstrap hypothesis fairly conclusive.

The main text of this chapter summarises the results of the formal econometric analysis. The full discussion of the estimation techniques and results is contained in appendices along with the detailed results. These can safely be omitted on a first reading so as not to interrupt the flow of the overall argument. The definitions of the measures of variables and the sources of data for each figure and table are set out fully in Appendix 5-A.

## **5.2 Evidence from the financial account**

The UK and the US publish long runs of data on the corporate industrial sector (see Appendix 5-A). The industrial sector is defined as non-farm non-financial incorporated business (US) or private non-financial corporations (UK). Most previous empirical studies have been restricted to the manufacturing sector, presumably because of the historical importance of fixed asset investment by that sector. Since this thesis relates to the equity finance of capital *formation*, the

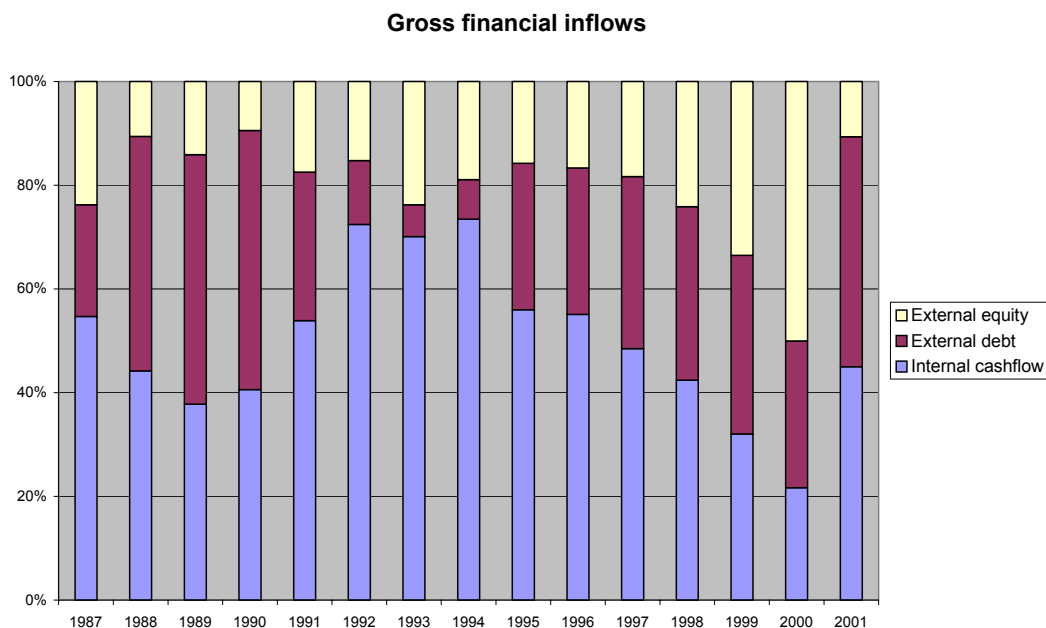
exclusion of the primary and financial sectors is justified by the dominance of financial and non-produced capital assets (*ie* land) in their expenditures. The use of external equity finance is a function of legal form, so the public, non-profit and unincorporated or personal sectors have to be excluded. The sectoral definition used here includes private services (*eg* retail and transport) that now represent a larger proportion of national income than manufacturing in both economies.

Large firms dominate the aggregate data on financial flows, particularly of equity. There is little dispute that finance is a major issue for small firms. The hypothesis of a general, rather than particular, financial constraint on investment must be shown to apply to large firms with ready access to equity markets, if it is to overcome the neoClassical view that competition from large firms will ultimately overcome any financial constraints on small firms. If a general constraint is visible at sector level it must apply to large firms as well as small, so the use of aggregate data favours the null hypothesis that there is no general financial constraint.

The following paragraphs examine the data on gross and net sources of funds, distinguishing between internal and external finance, and then between internal cashflow and the individual components of external finance, equity and debt. The UK data on long-term financial investment by the sector is compared with independent data on acquisition expenditures. The movements in the external debt (gearing) ratio are then plotted over time and compared with measures of interest rates and confidence.

### ***Gross and net external finance***

The available evidence suggests that large firms face no significant non-price obstacles in raising external finance. Figure 5-1 sets out an analysis by source of the gross financial inflow (*ie* before repayments, redemptions, and purchases of financial assets) to the UK industrial sector, drawn from the Blue Book for the period 1987-2001.



**Figure 5-1 UK sources of gross financing**

*Source: National Statistics*

Cashflow provides, on average, half the gross financial inflow over the period, with external equity providing 20% and debt 30%, although there is wide variation from year to year in the contributions of each source. In 2000 external equity provided 50% of gross finance, and debt about a further 30%, with only 20% from cashflow.

Unfortunately the financial data for the US shows only net flows of equity and debt, as noted by Corbett and Jenkinson (1997:73), so comparable data are not readily available for both economies. It does not seem likely that US equity and bond markets are any less active in terms of new issues than those of the UK.

Figure 5-2 shows the ratios of internal and external finance, *net* of the acquisition of long-term financial assets including corporate debt and equity, to capital formation for the UK industrial sector. A combined surplus over 100% represents the net acquisition of short-term financial assets, and only in 1992 is there a slight deficit. The external contribution appears largely to correspond to increased holdings of short-term financial assets, although there is a significant contribution towards capital formation at the end of the Lawson boom, in 1988-1990.

Internal and external finance ratios 1987-2001

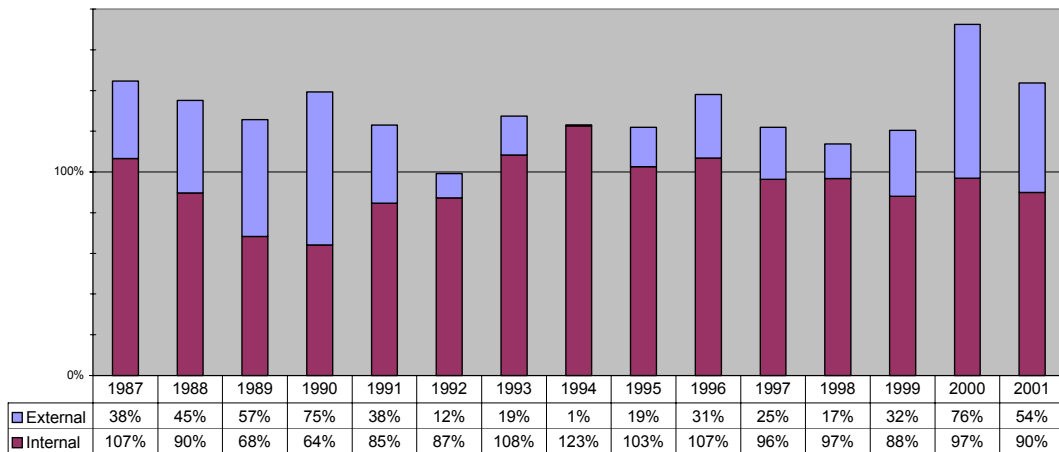


Figure 5-2 UK internal and external finance ratios

Source: National Statistics

In the US case over the same period (Figure 5-3) the net acquisition of short-term financial assets is less pronounced, and unlike the UK, there are significant deficits in 1991-1993. External finance makes a negative contribution in 1991, and makes a positive contribution in 1997-2001, tracking the technology boom and its aftermath.

Internal and external finance ratios 1987-2001

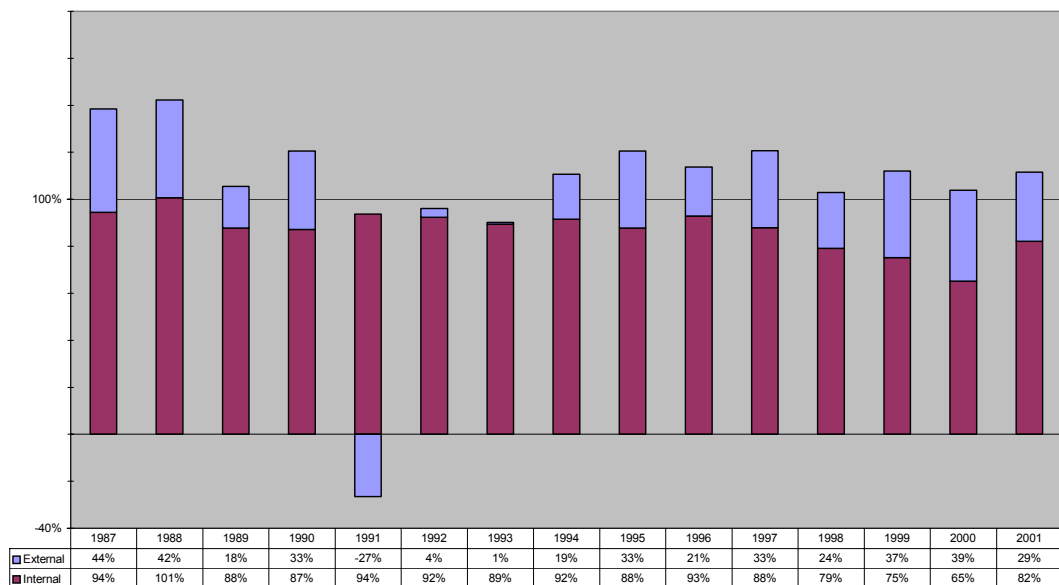


Figure 5-3 US internal and external finance ratios

Source: US Federal Reserve Board

Taken together these three charts present an immediate difficulty for Post Keynesian and New Keynesian theories, although not for neoClassical theory. The latter two charts indicate that investment is substantially, if not wholly, financed internally by cashflow, if indeed it is legitimate to offset the acquisition of long-term financial assets against external finance. Post Keynesian and New Keynesian theories predict that outcome, ultimately on the grounds of the equity new issue discount, but it is also consistent with neoClassical theory on the bootstrap hypothesis. On the other hand, Figure 5-1 suggests there is no significant cost premium for equity finance, since it represents a major part of the gross inflow of funds. Frank and Goyal (2003) reach a similar conclusion against the (New) Keynesian pecking order hypothesis.

The neoClassical interpretation is further strengthened if the hypothecation premise proves invalid, and the acquisition of long-term financial assets cannot be offset solely against external finance. Since these are aggregate data, they may include firms which use positive net cashflow (i.e. after financing capital formation) to acquire long-term financial assets. Conversely some firms may make heavier use of external finance for capital formation than the aggregates suggest. On this view the apparent dependence of investment on cashflow may be spurious. Corbett and Jenkinson (1997:72) acknowledge this objection to the use of net measures.

### ***Net debt and equity***

Figure 5-4 and Figure 5-5 show measures of *net* debt and equity inflows to the UK & US sectors for 1987-2001, normalised as ratios of cashflow. As discussed, the use of a net equity measure does not necessarily imply that equity issues *finance* equity purchases, which may have been funded by a debt issue or by cashflow. On the other hand the net measures do give a valid indication of the changes in the total equity and debt stocks of the sector.

The results for the two economies are very similar. Three aspects are striking. First, there is a positive net equity inflow in only two or three years, 1991-1993. Second, the two measures display strong negative correlation throughout most of the period. Third, except for 1991-1993, the value of the net equity outflow is less than the value of the net debt inflow, normally substantially so.



Net debt and equity inflows as % cashflow

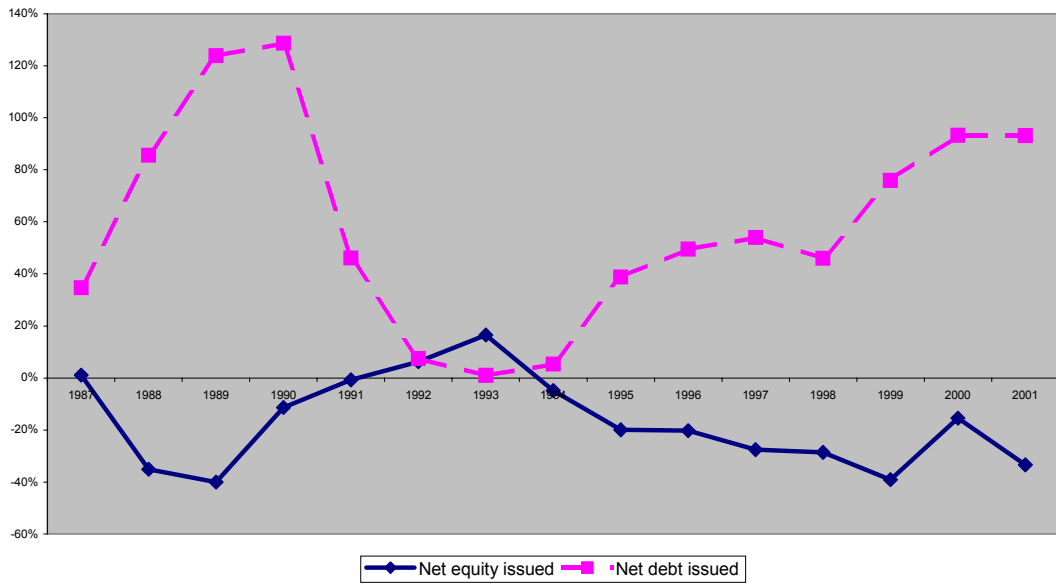


Figure 5-4 UK net debt and equity inflows

Source: National Statistics

Net debt and equity inflows as % cashflow

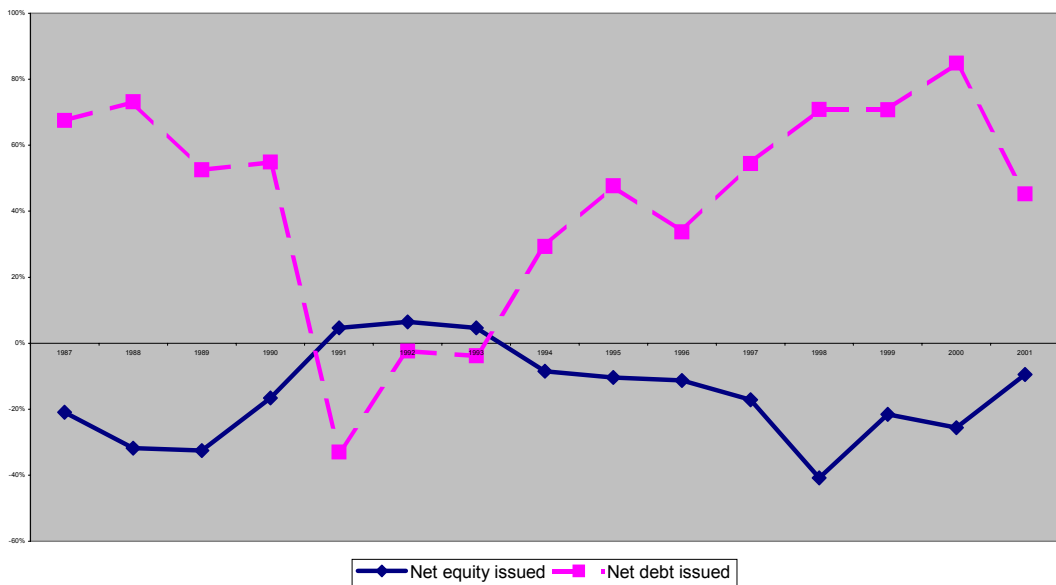
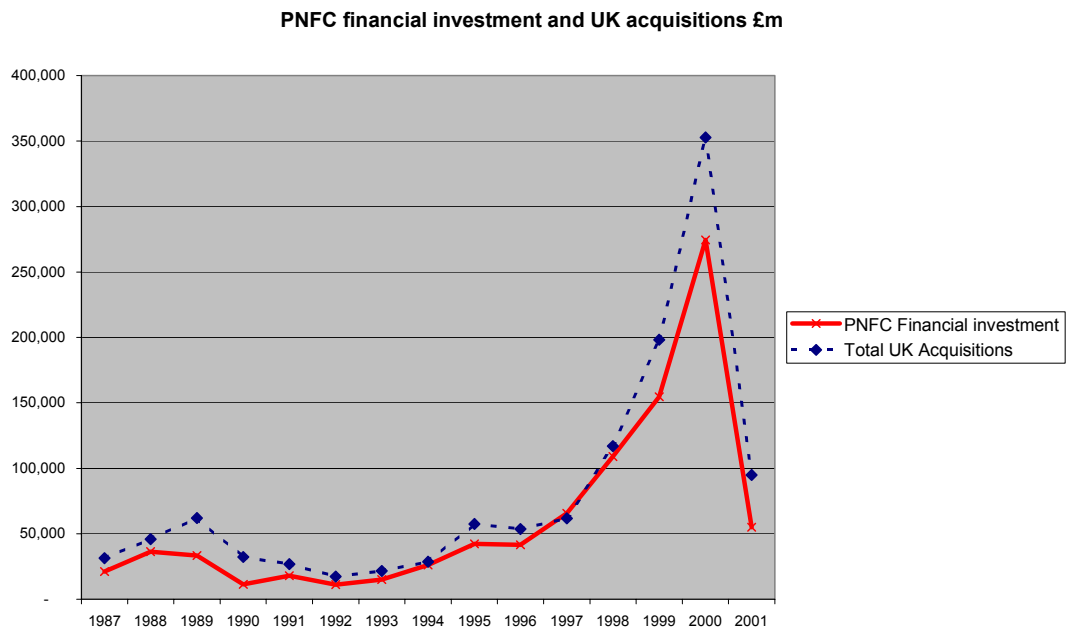


Figure 5-5 US net debt and equity inflows

Source: US Federal Reserve Board

These two charts strongly suggest a process of intra-sector business acquisition, involving a net withdrawal of equity and replacement with increased levels of debt. The net equity outflow arises because in the UK (similar data are not available for the US) equity represented 84% of the value of purchases from 1987-2001 and only 45% of the gross finance raised. Almost by definition, non-financial corporations do not make long-term financial investments except when they acquire control or at least have a close strategic trading relationship.

To corroborate this, the next chart (Figure 5-6) plots the UK sector's long-term financial investment (gross acquisitions of loans and equity) over the period 1987-2001 against the total value of business acquisitions, domestic and cross-border, involving UK companies. Since the latter measure includes financial companies, its value generally exceeds the corresponding value for the non-financial corporate sector alone. However the strong correlation suggests the purchases of long-term financial investments may indeed safely be treated as made by way of business acquisition.



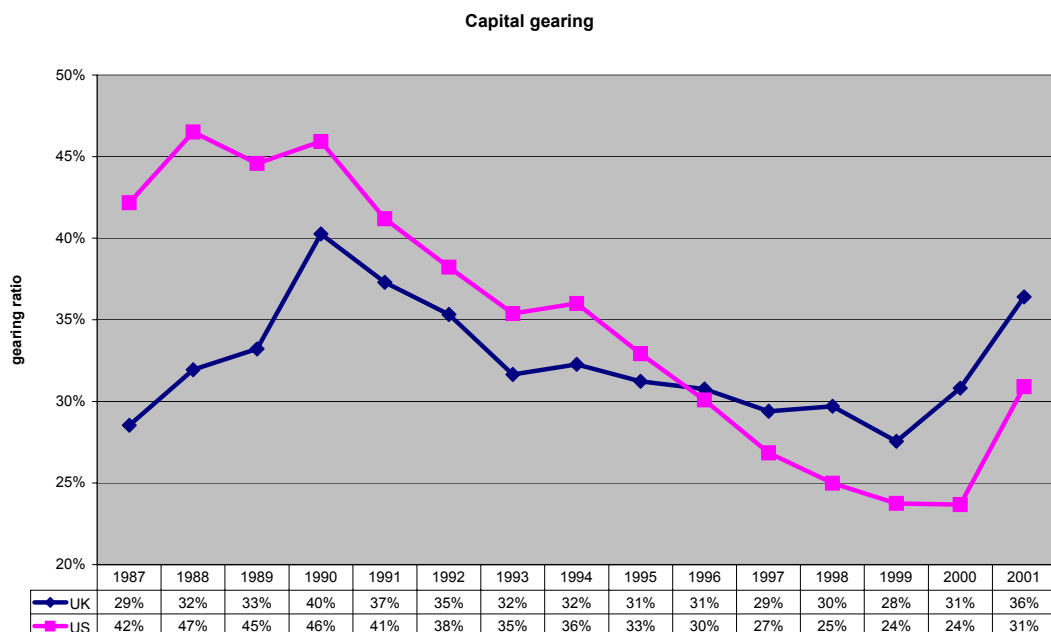
**Figure 5-6 UK financial investment and acquisitions**

*Source: National Statistics*

### *The gearing ratio*

It was explained in Chapter 2 that the differences between neoClassical and other theories lead to attention being given to different aspects of the data. The neoClassical theory of capital structure is concerned with a stock ratio, the gearing ratio of debt to assets at market valuation. The New Keynesian and Post Keynesian approaches are concerned with flows of finance and investment. In Post Keynesian theory gearing is the extent to which a given cashflow can be mortgaged to ‘gear up’ the rate of investment, whether physical or financial.

Figure 5-7 and Figure 5-8 plot two measures of gearing for the UK and US. The first is a measure of capital gearing and the second of income gearing. Capital gearing is defined here as the ratio of the outstanding stock of debt to the combined value of debt and equity at market value. Income gearing is defined as the ratio of net interest payable to the sum of cashflow and net interest. Figure 5-8 also plots measures of short-term interest rates.

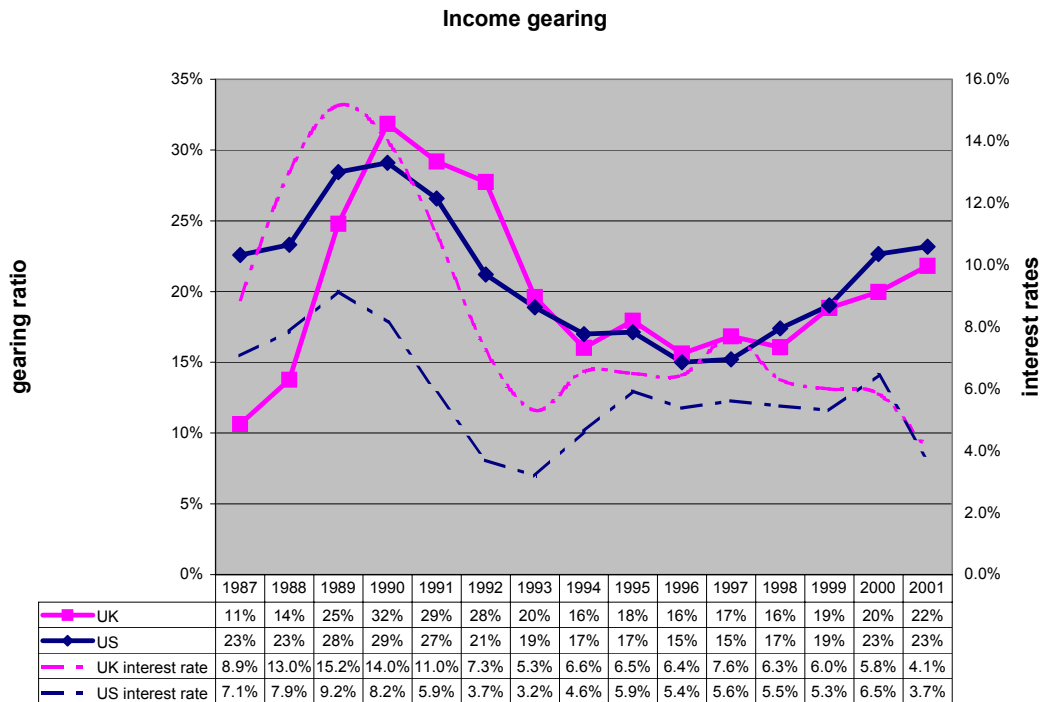


**Figure 5-7 Measures of capital gearing, UK & US**

*Source: National Statistics and US Federal Reserve Board*

The measure of capital gearing reflects the twin influences both of the growth of the value of debt through new borrowing and of variations in the market value of equity. After the ratio had reached a peak in 1990 it fell sharply. It will be recalled from the discussion of net inflows that 1991-1993 was a short period when the process of

debt-financed equity withdrawal appeared to reverse, suggesting that this was a period of refinancing. During the latter half of the 1990s the capital gearing ratio continued to fall, for different reasons. Debt increased substantially, but equity valuations did so to an even greater extent, despite continuing equity withdrawal. This was reversed in 2001 as stock markets fell.



**Figure 5-8 Measures of income gearing, UK & US**

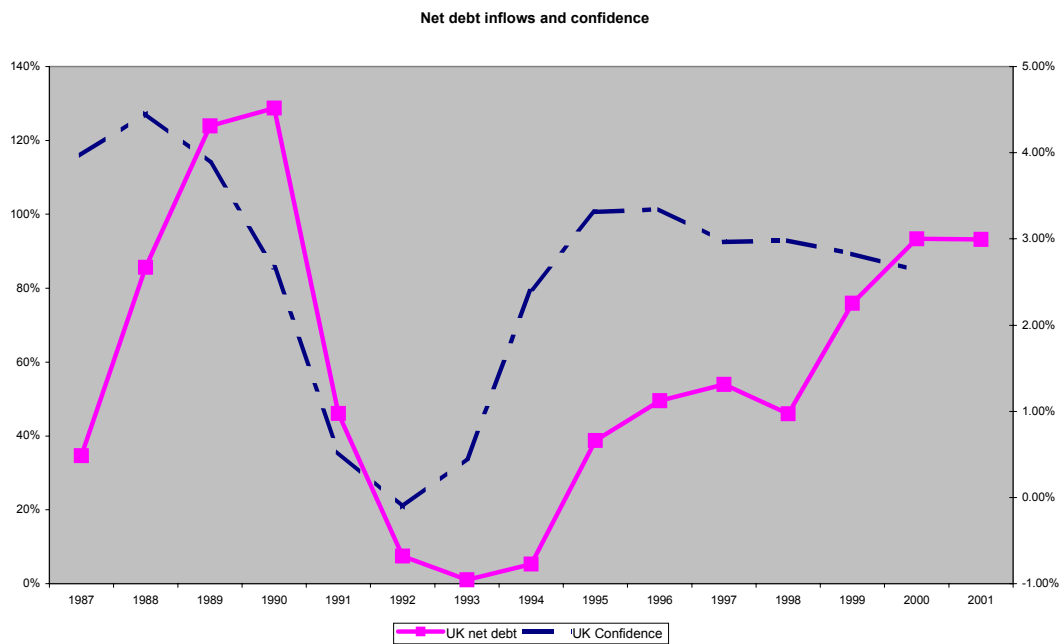
*Source: National Statistics, US Federal Reserve Board, and US Department of Commerce Bureau of Economic Analysis*

The income gearing ratios for the two economies track each other closely and until 1997 follow the path of interest rates. Thereafter the ratios rise despite a fall in interest rates, reflecting the rise in the absolute value of debt.

What conclusions can be drawn for theory? It seems unlikely that a neoClassical ‘trade-off’ between the tax benefits and bankruptcy costs of debt can explain the large swings in the capital gearing ratio. The fall in the ratio did not arise from the refinancing of debt with new issues of equity. Indeed the stock of debt grew throughout the period when capital gearing was falling. Except for a brief period in the early 1990s, the net contribution of equity was negative.

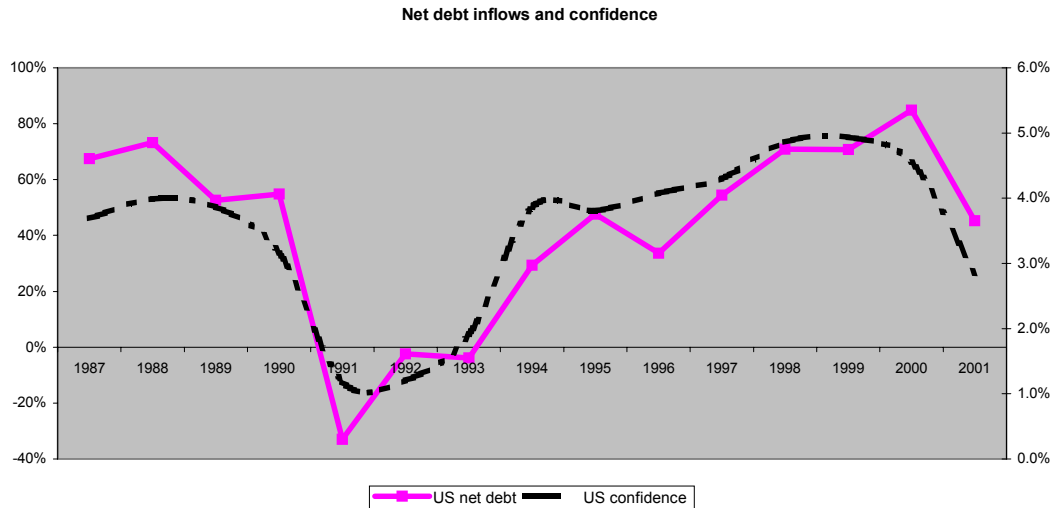
The income-gearing ratio is also the resultant of a number of influences. It depends on the absolute growth of debt, the inherited stock of debt and the interest rate. The causal relationships cannot be determined by inspection.

As discussed in Chapter 2, Glickman (2001) among others has sought to demonstrate from a Post Keynesian perspective that the conventional gearing limit is a function of the state of business confidence. Glickman argues that the best proxy for the conventional gearing limit is the incremental borrowing ratio (similar though not identical to the net debt inflow ratio calculated here), and for the state of confidence, a twelve-quarter moving average of lagged values of the growth rate of real income. That pattern is clearly visible in Figure 5-9 and Figure 5-10 for the UK and US respectively, based on the net debt inflow ratio plotted in Figure 5-4 and Figure 5-5, and published indices of real output.



**Figure 5-9 UK net debt inflow and confidence measure**

*Source: National Statistics*



**Figure 5-10 US net debt inflow and confidence measure**

*Source: US Federal Reserve Board and US Department of Commerce Bureau of Economic Analysis*

Glickman’s article investigated the UK series alone, and it is of interest that the relationship is, if anything, stronger in the case of the US. The pattern suggests the income and capital gearing ratios are best regarded as outcomes of a process rather than being themselves determinative. The main driver of changes appears to be the state of confidence, which alters the conventional gearing limit, which in turn affects the net growth of debt. The income-gearing and capital-gearing ratios are the outcomes of this primary process together with other, partly endogenous, factors.

**Conclusions**

The evidence from the UK national financial account for the 15 year period 1987-2001 suggests that new equity issues form a significant part of the finance available to corporate industrial firms, and although comparable data is not available, the position is highly likely to be the same in the US. This appears to favour the neoClassical view over both New Keynesian and Post Keynesian theory.

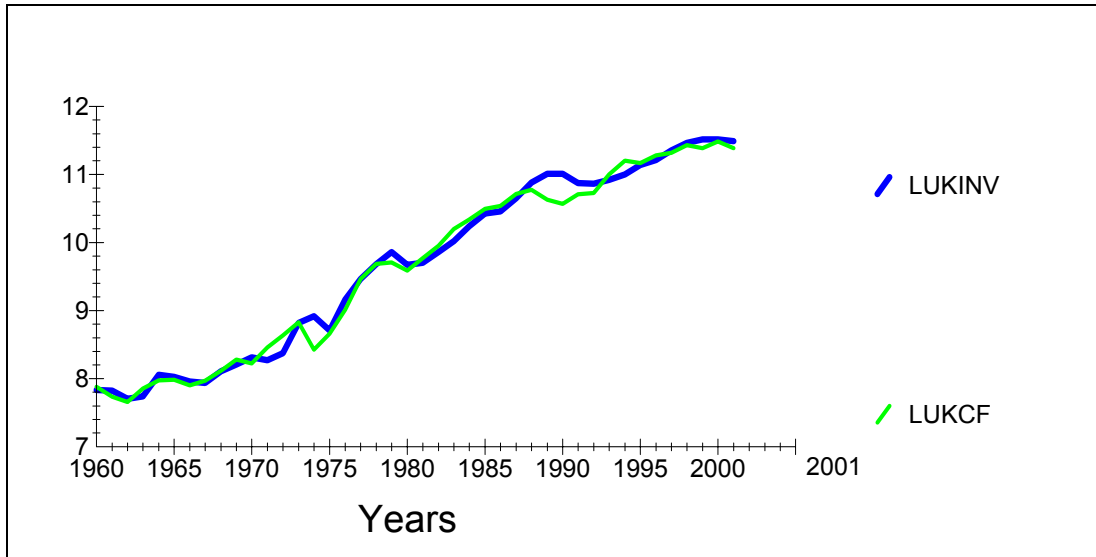
Provided that business acquisitions can be netted off against external finance (the ‘hypothecation premise’), it also appears that capital formation is substantially, if not wholly, financed from cashflow in both economies. Net equity inflow is negative throughout most of the period and inversely correlated with net debt inflows, which in turn are positively correlated with Glickman’s measure of business confidence. It

seems that the main role of external finance is in the finance of acquisitions and this activity is highly pro-cyclical. On this basis, although equity finance is an important part of gross finance, it makes little or no contribution to the finance of capital formation. This is an anomaly from a theoretical perspective, since the application of the proceeds of a new equity issue should not be relevant in either New Keynesian or neoClassical theory. Existing Post Keynesian theory hints at but does not fully explain such an anomaly.

A definitive conclusion that this anomaly exists depends on confirming the hypothecation premise. It is not implausible that ‘cash cows’ use their net cashflow to make acquisitions, thus obscuring the contribution of external equity to the finance of capital formation by individual firms within the sector. The next section will show that there is a stable relationship between the aggregate capital formation and cashflow of the sector, which indicates this aggregation problem is not significant, thereby justifies the hypothecation premise and so renders legitimate the use of net aggregate measures of the contribution of external finance.

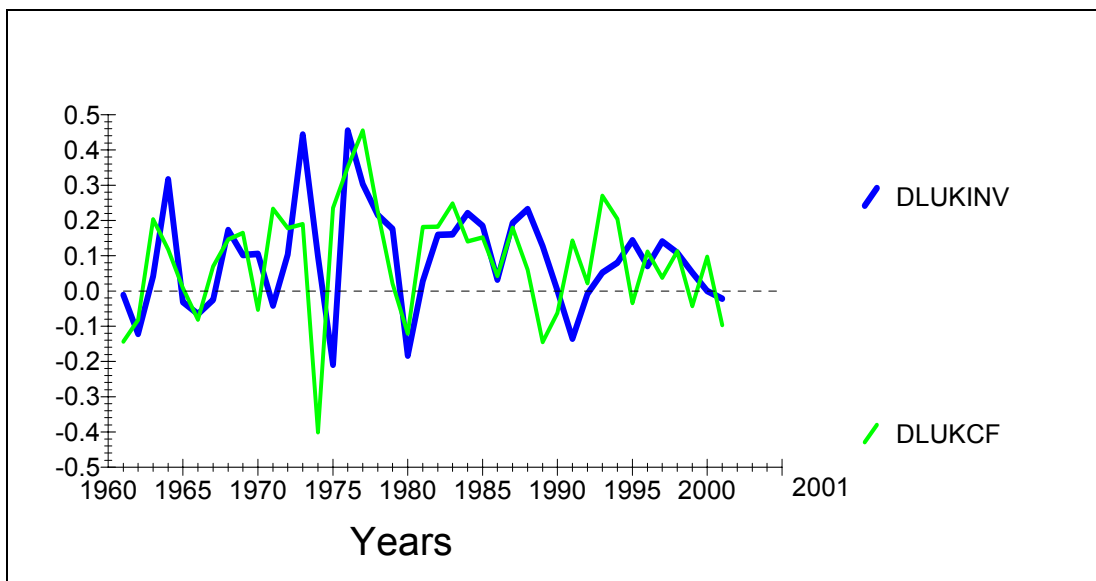
### **5.3 Evidence from the capital account**

The time-series data in the national accounts for the sector capital account are available for longer periods than for the financial account, from 1960 for the UK and 1952 for the US. Figure 5-11 and Figure 5-12 plot the log levels and first differences in the underlying UK cashflow (CF) and investment (INV) variables for the period 1960-2001, where these variables are measured as in the previous section. The prefix L refers to natural log values, DL to first differences in log values, followed by the country prefix. Figure 5-13 and Figure 5-14 show the same data for the period 1952-2001 for the US.



**Figure 5-11 UK cashflow and investment – log levels**

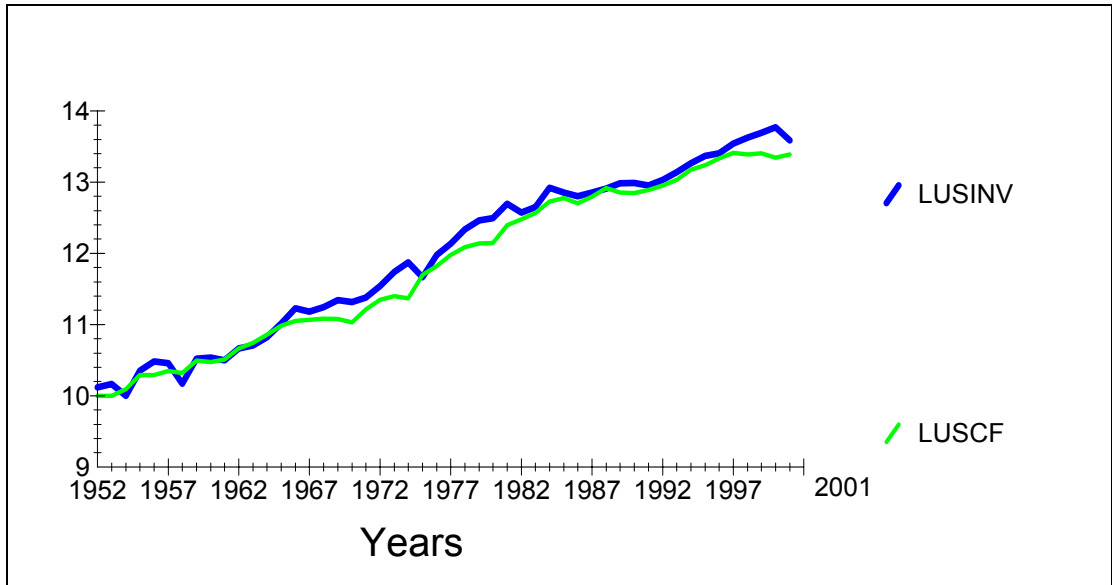
*Source: National Statistics.*



**Figure 5-12 UK cashflow and investment – log changes**

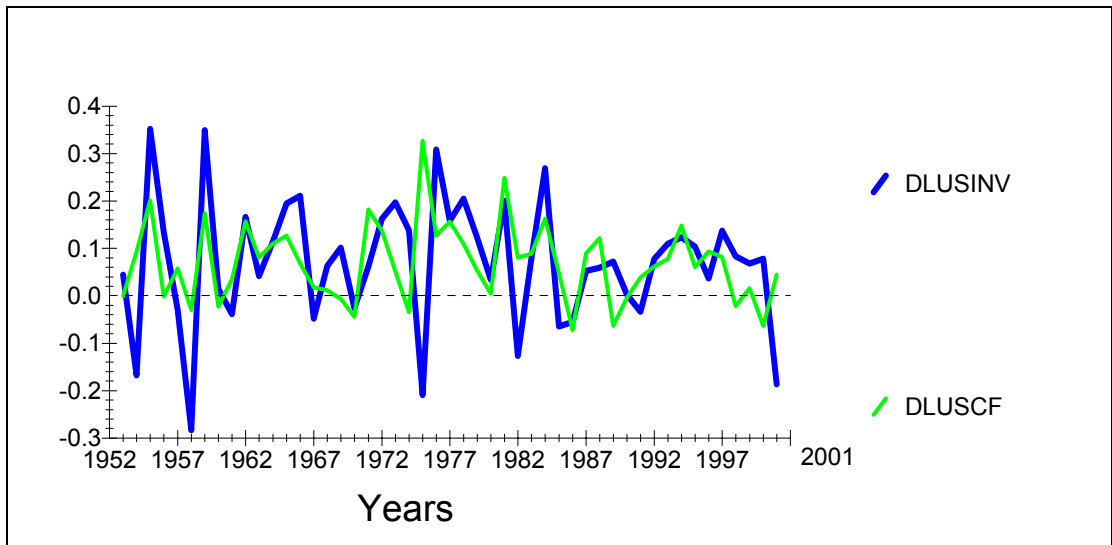
*Source: National Statistics.*





**Figure 5-13 US cashflow and investment - log levels**

*Source: US Federal Reserve Board.*



**Figure 5-14 US cashflow and investment - log changes**

*Source: US Federal Reserve Board.*

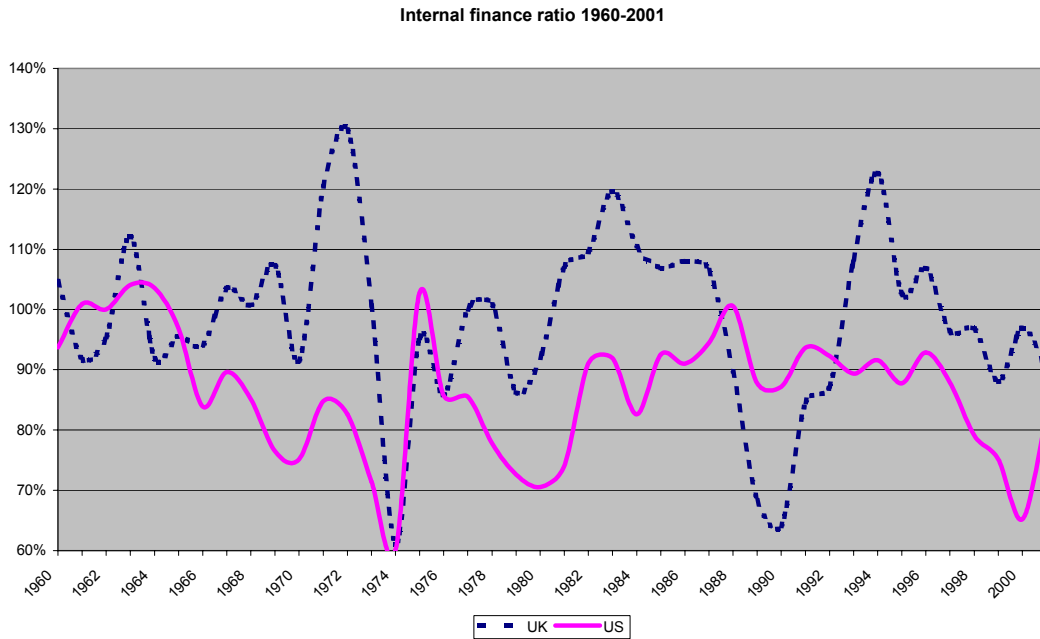
The graphs indicate a strong correlation between levels, and changes in the levels, of the two series for both economies, although the time lag between them appears itself to vary over time. In the US case, investment is slightly greater than cashflow over the period and investment fluctuates more than cashflow. In the UK the two sets of series track each other closely.

Before applying more sophisticated techniques, the simple ratio of cashflow over investment, the internal finance ratio, is set out below in Figure 5-15. The estimates of mean, variance and standard error of the internal finance ratio are set out in Table 5-1 below. The UK ratio is not significantly different from 100% over the period in question. For UK quarterly data the variance is greater but the estimate of the mean is unaffected. The US ratio (for the full available period 1952-2001) is lower at 88% and there is no material difference between the sample variances of annual and quarterly data. The ratio is significantly less than 100%.

An average ratio below 100% may mean that a proportion of US investment is financed by a ‘permanent’ accumulation of debt, notably mortgage and inventory finance. Unfortunately the published data do not allow this point to be tested conclusively. The primary result is that the ratio is constant, suggesting there are two mechanisms at work, one an independent function of investment, the other related to cashflow. The difference between the UK and US is itself an anomaly worthy of further research.

Although a long-term internal finance ratio below 100% means a positive contribution from external finance, it can equally be negative if equity is withdrawn through acquisitions financed from cashflow. If equity finance is widely used but largely invisible in the aggregate, a stationary ratio can only arise if the equity issued by some firms to finance capital formation exactly offsets over time the equity withdrawn through acquisitions by cash cows. *There is no reason why these values should coincide.* A test for stationarity is therefore a reasonable test of the validity of the hypothecation premise, and suggests it may be possible to model the relationship between investment and cashflow in terms of a finance mechanism.

For both the UK and US the difference between the log levels proves to be stationary (see the results of the unit root tests in Table 5-5 in Appendix 5-B). This also implies that both the UK and US internal finance ratios are stationary, albeit in the latter case at a level below 100%.



**Figure 5-15 Internal finance ratios, UK and US 1960-2001**

*Source: National Statistics and US Federal Reserve Board.*

Internal finance ratio	UK		US	
	Annual 1960-2001	Quarterly 1965 –2001	Annual 1952-2001	Quarterly 1952-2001
<b>m (sample mean)</b>	98%	98%	88%	88%
<b>s (sample s.d.)</b>	14%	29%	11%	12%
<b>d.f. (sample size)</b>	42	148	50	200
<b>s.e.e. ( <math>\sigma_{\hat{\mu}}</math> )</b>	2.2%	2.3%	1.6%	0.9%
<b>t ratio</b>	-0.74	-0.77	-7.72	-13.47
<b>Prob <math>H_0: \mu = 100\%</math></b>	[0.462]	[0.445]	[0.000]	[0.000]

**Table 5-1 Internal finance ratio sampling distribution**

*Source: National Statistics and US Federal Reserve Board*

## 5.4 Estimating a dynamic model

The above stationarity result is both necessary and sufficient for the conclusion that there exists an anomaly in the absence of equity finance for capital formation. Chapter 4 has emphasised the limited capacity of econometric techniques to distinguish between causal hypotheses, and the closure and aggregation conditions required for valid estimation. However the anomaly itself implies that investment and cashflow must be related by a finance *mechanism* (not necessarily a *constraint*, given the bootstrap hypothesis). The quasi-closure results from the individual firm's budget constraint in a monetary economy. The internal closure condition is the habit or rule that firms do not accumulate financial assets beyond a certain level or proportion that reflects a conventional liquidity policy, nor do they deliberately court insolvency. The external closure conditions are an absence of equity finance<sup>8</sup>, and that the level of borrowing in relation to cashflow fluctuates only within conventional limits. Given these conditions, capital formation must be financed either directly by cashflow or indirectly, by borrowing that must ultimately be repaid from cashflow. The principle of composition or aggregation is legitimately simple addition, since flows of both cashflow and capital formation are measured in terms of nominal money and can properly be combined. The liquidity and borrowing policies will be a function of the structure of production and it must be assumed either that these policies are relatively homogeneous across industries or that the structure of production changes more slowly than the average debt matures. This aggregation will also tend to reduce the variation in the residuals to the stochastic element reflecting shocks and disappointed expectations, once idiosyncratic differences in the borrowing ratio and liquidity policy between firms are averaged out.

Liquid assets and short-term borrowing facilities permit a divergence between investment and cashflow in any given year, and the level of borrowing in relation to cashflow will also vary with the state of confidence. Investment and cashflow need

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<sup>8</sup> There appears to be circularity in citing the absence of a contribution from equity finance as a condition for the use of econometrics, and using econometrics to support the claim that there is no contribution from equity finance. In fact this is a case of simultaneity rather than circularity, in that the closure condition and the correlation are mutually dependent. A contribution from equity finance would destroy the correlation, unless perhaps in turn the contribution followed some other empirically discernible rule.

not be equal at all times, but the anomaly requires a tendency towards equilibrium. Furthermore a cumulative surplus or deficit in one period will be transmitted via the bank balance to the next. This suggests modelling the relationship as an error correction model (ECM) based on the co-integrating relationship between the two level variables. Two approaches are available, depending on the assumptions about causation. First, a single equation model is estimated in this section, assuming that cashflow is strictly exogenous (and a constraint), with investment the dependent variable. Secondly, a vector autoregression (VAR) system can be estimated, allowing for the possibility that investment can influence cashflow, so that both variables are endogenous. This is undertaken in the next section as part of testing the bootstrap hypothesis.

The functional relationship postulated here is mainly one between directly observable variables and avoids invoking a complex chain of causation via intermediate and unobservable variables. It does not directly embody a causal functional hypothesis that seeks to explain aggregate investment in terms of fundamental variables, simply a hypothesis that there exists a relationship between aggregate investment and cashflow that may be one of several mechanisms at work. This does not rule out, for example, the possibility that both investment and cashflow are influenced by a third variable such as output. It is little more than an exercise in accounting, given stability in liquidity and borrowing policies, which follows almost automatically from the basic anomaly and the budget constraint.

We assume that the level of capital formation in terms of nominal money ( $INV$ ) in period  $t$  is a function of nominal cashflow ( $CF$ ) in an earlier period  $t-k$ , the level of output as a ratio to trend ( $GDPV$ ) in period  $t$ , and the movement in the price level ( $PP$ ) between periods  $t$  and  $t-k$ . This can be written

$$INV_t = f(CF_{t-k}, GDPV_t, PP_t / PP_{t-k})$$

The level of output in relation to trend is assumed to act as a multiplier of cashflow, reflecting the pull of output and the pro-cyclical movement in confidence and gearing. This can be expressed as  $GDPV = 1 + c$ , where  $E[c] = 0$ , and  $c$  represents the deviation from trend. The rationale for the time lag  $k$  is the time required for investment to change in reaction to a change in cashflow. This is a combination of the time needed to register a change and alter investment plans (most likely on an

annual budget cycle) as well as the time to execute those plans. Firms are assumed to make their investment plans in real terms, so that the nominal value of investment will change in relation to the nominal value of the cashflow against which it was planned, by the movement in the price level.

This interaction between real and nominal magnitudes is important. A finance mechanism is clearly monetary and therefore needs to be expressed in nominal terms. It is also cumulative, in that a deficit or surplus in one period affects decisions in the next period. On the other hand investment plans, once made, relate to specific physical resources and will be subject to changes in their prices. It does not matter whether the inflation is anticipated or unanticipated. If anticipated, firms will assume that cashflow increases correspondingly to maintain the equilibrium between investment and cashflow in period  $t$ . If inflation is unanticipated, the effect of the unexpected price changes on the nominal value of investment will feed back through the cumulative finance surplus or deficit and error correction process, to reduce the cashflow available in period  $t$  for investment at period  $t+k$ .

The use of nominal variables is a departure from convention. Most empirical studies have used variables deflated by a price index or normalised against a measure of capital stock. There are strong theoretical objections to both these methods. Clearly the role of inflation will be omitted when variables are deflated. Nevertheless some kind of adjustment is always needed in order to avoid the estimation problems of heteroskedasticity. In this case, a log-linear transformation is both theoretically well grounded and eliminates the heteroskedasticity that would generally be found in regression between growing variables over long periods. The postulated error correction mechanism depends on transfers of cash surplus or deficit between periods in nominal rather than proportional terms, so there is an element of approximation in using the logarithmic specification. Over short periods (up to 2 years, as we shall see) this approximation should not lead to material distortion when the cashflow elasticity of investment is close to unity.

Another departure from convention is that investment here includes changes in stocks or inventories, while most studies have focussed purely on fixed assets. It would be inconsistent with the idea of a finance mechanism to exclude inventories unless it was assumed that inventories were fully financed by short-term bank debt. This may indeed be partly the case in the US, as we have seen above.

It should be mentioned at this point that no significant role was found for long or short term nominal or real interest rates in the estimations. Nominal interest rates appear to introduce multicollinearity with the inflation variable, and act as a rough proxy for the latter when introduced in its place, with a perverse positive coefficient.

Returning to the theoretical model let the specific functional form be:

$$INV_t / PP_t = \alpha_0 \cdot CF_{t-k}^{\alpha_1} / PP_{t-k} \cdot GDPV_t^{\alpha_2}$$

If the rate of inflation is constant over the period  $k$ , this can be simplified to:

$$INV_t = \alpha_0 \cdot CF_{t-k}^{\alpha_1} \cdot GDPV_t^{\alpha_2} \cdot (PP_t / PP_{t-1})^k$$

where  $\alpha_1$  and  $\alpha_2$  are the elasticities of investment with respect to cashflow and the stage of the cycle. One would expect to find  $\alpha_0 = \alpha_1 = 1$ . Finally, the equilibrium or co-integrating relationship between investment (endogenous) and cashflow (exogenous) can be expressed as a single log-linear equation:

$$LINV = \beta_0 + \beta_1 LCF + \beta_2 LGDPV + \beta_3 LDPP$$

where  $LDPP = \ln(PP_t / PP_{t-1})$  and one would expect to find  $\beta_0 = 0, \beta_1 = 1, \beta_3 = k$ .

Error correction models based on this theoretical construct were estimated against the annual UK and US data using both single equation and VAR techniques. The key results for the estimations using the single equation model, in each case for both the whole and the first half of the available periods, are summarised in Table 5-2 below, where  $\gamma$  is the error correction co-efficient. The estimates based on the first half were used to construct dynamic forecasts for the second half of the period for each economy, shown in Figure 5-16 and Figure 5-17.

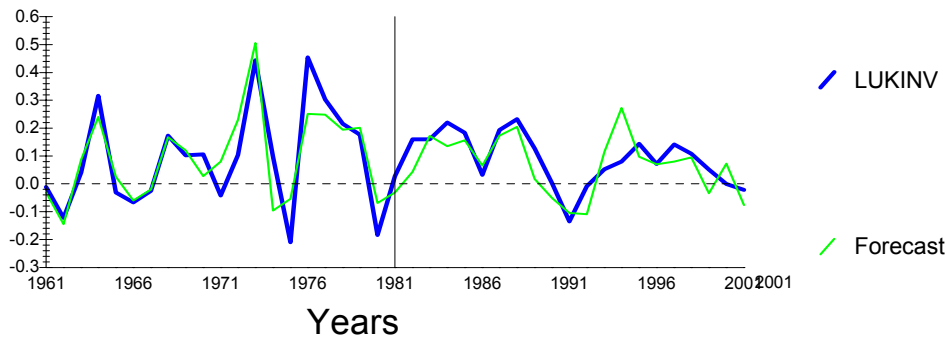
	<i>UK</i>		<i>US</i>	
<i>Start</i>	<b>1961</b>	<b>1961</b>	<b>1953</b>	<b>1953</b>
<i>End</i>	<b>2001</b>	<b>1981</b>	<b>2001</b>	<b>1981</b>
<i>n</i>	<i>41</i>	<i>21</i>	<i>49</i>	<i>29</i>
$\beta_1$	1.02***	0.91***	1.02***	1.02***
$\beta_2$	9.53***	7.92**	5.77***	5.81***
$\beta_3$	1.25*	1.98*	2.80***	2.88*
$\gamma$	-0.46***	-0.62***	-0.58***	-0.63***
$R^2_{(ecm)}$	70%	74%	74%	79%
<i>Serial correlation</i>	[0.337]	[0.091]*	[0.316]	[0.656]
<i>Functional form</i>	[0.770]	[0.650]	[0.924]	[0.109]
<i>Normality</i>	[0.073]*	[0.700]	[0.840]	[0.851]
<i>Heteroskedasticity</i>	[0.249]	[0.393]	[0.984]	[0.424]
<i>Parameter restriction</i>	[0.188]	[0.449]	[0.080]*	[0.058]*
<i>Exogeneity</i>	[0.272]	[0.056]*	[0.244]	[0.724]
$t_\delta$	-7.14	-6.11	-5.91	-5.47
$\tau_{0.95}$	-4.78	-5.20	-4.72	-4.95

Note: \*\*\* significant at  $p < 1\%$ , \*\* at  $p < 5\%$ , \* at  $p < 10\%$ .  $R^2_{(ecm)}$  gives the degree of the disequilibrium variation explained by the model. For the diagnostic tests probability values for the null are shown in [square brackets]. The tests are for serial correlation - Breusch-Godfrey LM test with one period lag; functional form - Ramsey's RESET using squares of fitted values; normality - Jarque-Bera; heteroskedasticity - Koenker-Basset; parameter restriction - Wald test on joint restriction  $\beta_1 = 1, \beta_3 = 1/\gamma$ ; exogeneity - Hausman test of significance of IV residuals.  $t_\delta$  and  $\tau_{0.95}$  are respectively the augmented Engle-Granger (AEG) test statistic and MacKinnon's 95% critical value for a unit root in the residuals.

**Table 5-2 Results of single equation estimations**

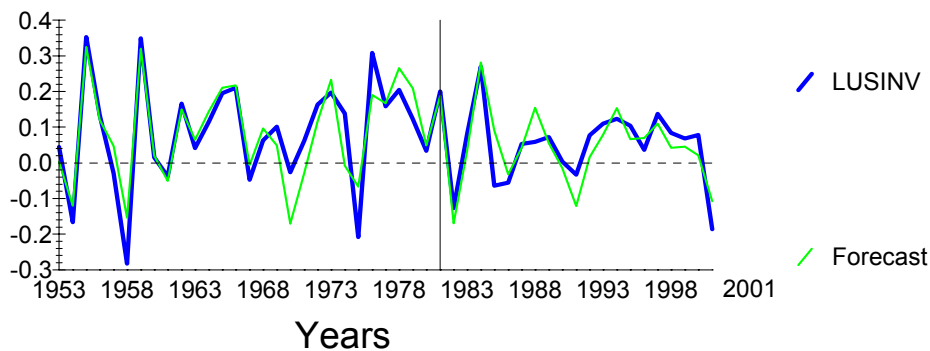


## Dynamic forecasts for the change in LUKINV



**Figure 5-16 Forecasts for UK investment 1982-2001 based on 1961-1981**

## Dynamic forecasts for the change in LUSINV



**Figure 5-17 Forecasts for US investment 1982-2001 based on 1953-1981**

The single equation estimates, which assume cashflow is exogenous, produce plausible values for the co-efficients (those for  $\beta_0$  were insignificantly different from zero in all cases). The estimates of  $\beta_1$  were not significantly different from unity (even in the case of the UK 1961-81). The error correction coefficient  $\gamma$  indicates that disturbances to the equilibrium tend to be corrected with a response time of the order of two years. The error correction model explains over 70% of the disequilibrium variation in all cases. The unrestricted estimates of  $\beta_3$  are more erratic but the joint restrictions  $\beta_1 = 1, \beta_3 = 1/\gamma$  are accepted with 95% confidence in all cases. The theoretical model offers no specific guidance as to the appropriate value of  $\beta_2$ , the elasticity of investment with respect to deviations in output from

trend, but its high value is consistent with strong accelerator effects, still more so in the UK than the US.

The estimates indicate that dropping nearly half the period from the estimation does not materially affect the parameter values, and the US results are remarkably stable. This robustness is reflected in the dynamic forecasts. The main turning points are identified. In both forecasts there is some visual evidence of variations in the lag period in the second period.

The US results provide maximal levels of statistical confidence in the coefficient estimates and the diagnostic tests for serial correlation, functional form, normality and heteroskedasticity of the residuals. The coefficient values are stable for the sub-period, although the confidence threshold on the inflation coefficient falls to 94%. The augmented Engle-Granger (AEG) tests confirm the co-integration, although the choice of zero lags for the full period test is by majority vote of model selection criteria (AIC dissenting). There is no evidence of structural breaks from CUSUM tests (diagram not reported), and the parameter restrictions are accepted by the Wald test. The Hausman test indicates no problem with the lagged dependent variable.

The UK results display greater instability in the coefficients between the full and sub-periods, confirmed by narrow compliance with the CUSUMSQ test (diagram not reported). The inflation coefficient is again accepted with 94% confidence, the residual normality and serial correlation tests are under strain in the full and sub-period respectively, but still within the 95% confidence limit, as is the Hausman test for the sub-period. Despite this greater instability the parameter restrictions are accepted by the Wald test, and the AEG tests reject a unit root in the residuals.

The strength of these results is surprising given the length of the estimation period and the scale of some of the shocks that took place during it, including several UK devaluation crises, the collapse of the Bretton Woods fixed exchange rate system and two major oil crises. Indeed the relationship appears more fragile in the UK for the period 1960-81. The CUSUMSQ test comes under pressure during 1975-1976 (a period of great pressure on corporate liquidity as evidenced by the introduction of stock appreciation tax relief), but remains within the 95% confidence boundaries. It must be remembered that the financial mechanism operates like the suspension of a car. However rough the road and deep the potholes, the spring will remain the same length and tend to revert to its rest position at a rate determined by its natural

properties. Both car-body and road may rise and fall rapidly, the spring merely regulates the gap between them. Although the aggregate behaviour of corporations is hardly as simple as a car-spring, the financial mechanism is a simple common denominator. Corporations also have similar planning and execution cycles and policies about financial liquidity, which are all functions of the structure of production and unlikely to change much even over quite long periods. These and similar factors will govern their response times.

The error correction coefficient  $\gamma$  indicates a time lag broadly consistent with the American survey evidence of Thomas Mayer (cited in Jorgenson, 1971) who arrived at 7 quarters. In this model there is likely to be a delay between changes in cashflow and changes in investment plans reflecting the annual budget cycle. If this averages 2 quarters, and the execution lag between plan and expenditure is 5-7 quarters, the combined lag would be of the order of 2 years.

## **5.5 The bootstrap hypothesis**

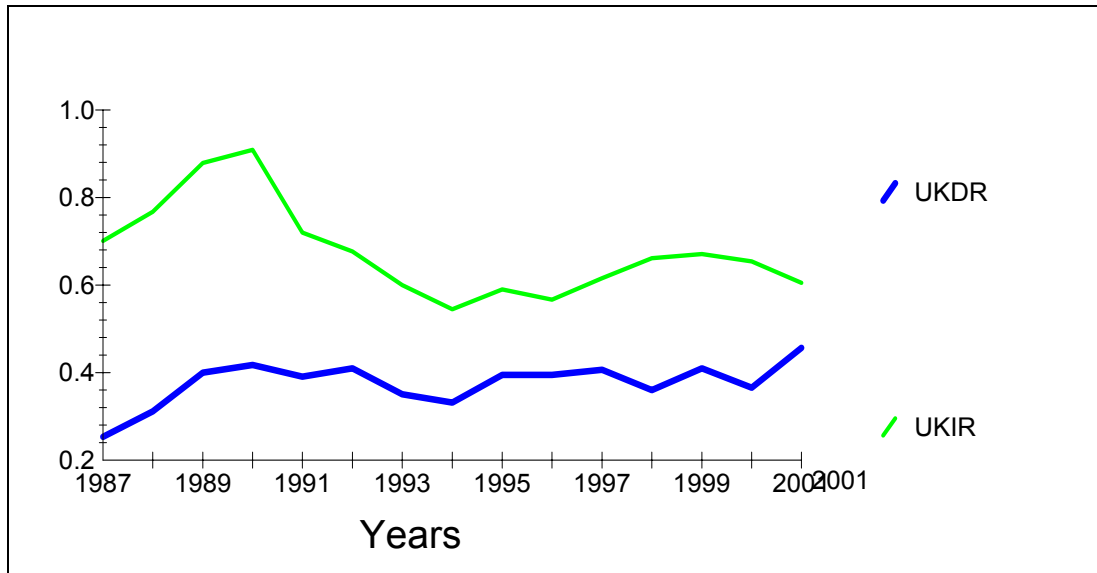
The bootstrap argument is that all profitable investment opportunities can be financed from cashflow and debt, so that any constraint on equity finance is not binding in practice. Under this hypothesis an investment-cashflow correlation can be expected but the causation runs from profitability through investment to cashflow.

The more convincing of two versions of the argument depends on dividends being a residual, so that any cashflow surplus to investment requirements is distributed, and heavy investment demand can be met partly by reducing dividends. Thus the investment-cashflow relationship is preserved. Conversely, if dividends are not residual in this fashion, an investment-cashflow correlation is evidence that the finance constraint is binding. If dividends are fixed, but profitable investment opportunities are insufficient, there will be a surplus of cashflow over investment. The absence of such a surplus indicates investment is limited by finance, not opportunities.

To test for the influence of investment on dividends a simple linear model without lags could be estimated, since if dividends are residual, investment and dividends must offset each other in absolute nominal terms and in the same period:

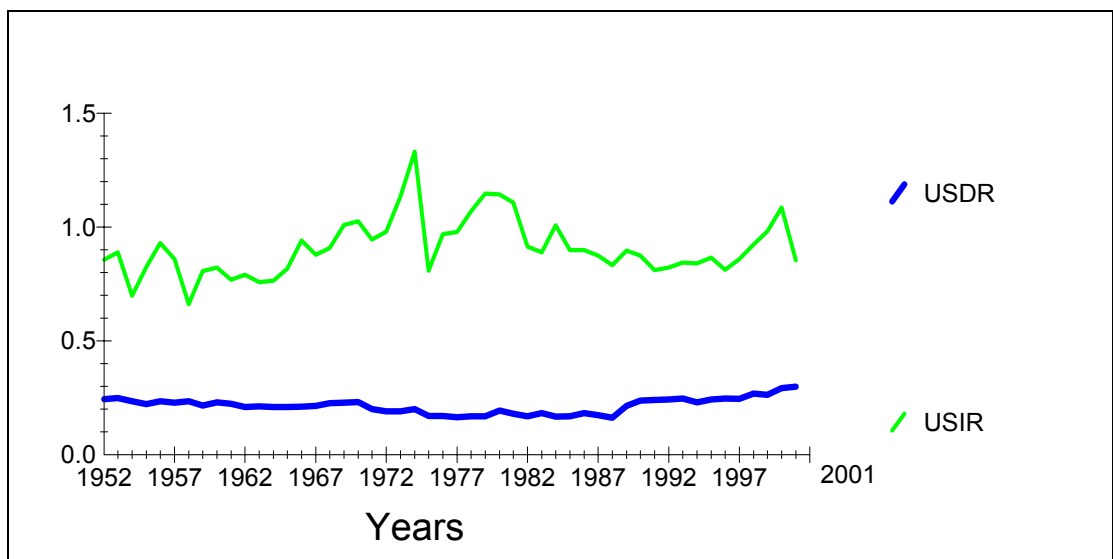
$$DR_t = \beta_0 + \beta_1 IR_t + u_t$$

$DR$  is the ratio of nominal dividends to gross nominal cashflow (cashflow plus dividends) and  $IR$ , the corresponding ratio of nominal investment. The null hypothesis is  $\beta_1 = -1$ .  $IR$  and  $DR$  do not sum to unity because of the role of external finance. Plots of the two sets of ratios are set out in Figure 5-18 and Figure 5-19.



**Figure 5-18 UK dividends and investment**

*Source: National Statistics.*



**Figure 5-19 US dividends and investment**

*Source: US Federal Reserve Board.*

These graphs suggest dividends are independent of investment, or even mildly positively correlated in the UK. Furthermore, as discussed in Appendix 5-B and Appendix 5-C, the two series are not of the same order of integration, so that there is no value in attempting to estimate the investment coefficient.

A second, more extreme, version of the bootstrap hypothesis can still explain the investment-cashflow correlation even if dividends follow their own path. The correlation could in theory arise in a steady state where investment is of equal value in each year, or grows at a steady rate; the assets created each year are used up in each case over the same period, and yield the same pattern of cashflow; the net profit is fully distributed; and there is no gearing constraint requiring the issue of new equity<sup>9</sup>.

This version of the bootstrap hypothesis can be tested by relaxing the assumption that cashflow is exogenous and assuming both investment and cashflow are endogenous. The test is to measure the degree of variation in each variable explained by each of the two resulting error correction models based on the co-integrating vector. If one variable is exogenous so that causation runs in one direction, the degree of variation explained in the causal variable should be low, and high in the case of the determined variable.

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<sup>9</sup> This mechanism is an extension of the axiom that investment is only undertaken in order to generate a gross return at least equal to the outlay. Since cashflow is also expressed gross (before depreciation or capital consumption), and if the net profit is distributed by way of dividend, the gross return from the investment will equal the outlay. If an asset is used up within one year and the net profit is distributed, gross undistributed profit from that investment for the year will equal the investment. If the economic life of the asset is longer, say 5 years, a steady flow of such investments of equal value over a period of at least 5 years can lead to the same result. The outlay in each year will be covered by the return from the investments of the previous 5 years, if that return is distributed uniformly over the asset's life. More generally, if the rate of growth of investment is steady, cashflow will grow at the same steady rate. A change in the growth rate of investment will lead to a new steady state where the growth of saving and investment are equal, provided the conditions are met.

Indeed where investment is financed with debt, it would be normal practice for the debt to be repaid as the matching asset is depreciated, with the interest on the debt being serviced from the net profit. A similar case to the above for a steady-state growth can be made, but subject to the same conditions. In this case each year's investment is financed with debt. The gross return each year is used to repay outstanding debt rather than finance investment. It must be assumed that external equity finance is not required, and that all profitable investment opportunities can be financed from cash balances or by borrowing.

This is done by estimating the first order vector error correction model (VECM):

$$\begin{pmatrix} DLINV_t \\ DLCF_t \end{pmatrix} = -\mathbf{\Pi} \begin{pmatrix} LINV_{t-1} \\ LCF_{t-1} \\ LDPP_{t-1} \end{pmatrix} + \boldsymbol{\psi} LGDPV_t + \mathbf{u}_t$$

where  $\mathbf{\Pi}$  is the 2 x 3 multiplier matrix producing the response to deviations from the long-run equilibrium values based on the previous period's values,  $\boldsymbol{\psi}$  is a coefficient vector and  $\mathbf{u}_t$  is the disturbance vector. The inflation variable  $LDPP$  is included only on the right-hand side because it is exogenous although  $I\sim(1)$  and included in the co-integrating vector. The output variable  $LGDPV$  is  $I\sim(0)$ .

The VECM approach differs from the single equation approach not only in allowing more than one endogenous variable. There can be more than one co-integrating vector (CV) so this has to be estimated separately (Microfit uses the Johansen technique). This is then imposed as a parameter restriction on the vector autoregression, together with any restrictions as to intercept or deterministic trend. The model can also distinguish between endogenous and exogenous  $I\sim(1)$  variables within the ECM, and between those and  $I\sim(0)$  variables outside the ECM. This is relevant in this case since the inflation variable is  $I\sim(1)$  exogenous and the output cycle variable is  $I\sim(0)$ .

The order of the VAR (number of lags) and the investment-cashflow coefficient are both set at 1 as before, the intercept is restricted (included in the CV) and no deterministic trends are assumed. The Johansen maximal eigenvalue and trace tests indicate there is only one CV with 95% confidence (the US estimate for 1954-2001 suggests the possibility of 2 CVs at the 90% level). The restriction of the cashflow coefficient to unity is not rejected except for the UK sub-period 1961-1981.

Table 5-3 gives the estimates for the ECM in which investment is the dependent variable and adjusts in response to disequilibrium. Table 5-4 gives similar estimates for the ECM in which cashflow is the dependent variable and makes the adjustment in response to disequilibrium. These show a consistent picture across the two economies, with the VECM explaining about two-thirds of the disequilibrium variation in investment (similar to the single equation model, if a little lower), and very little of the variation in cashflow. The restriction of the investment/cashflow coefficient to  $\beta_1 = 1$  is only not accepted in the first half of the UK period. The error

correction coefficient  $\gamma$  is again consistent with a time lag in the range between 1 and 2 years. The inflation coefficient is again higher in the US than the UK.

The residual diagnostics for the eight ECM models are satisfactory at the 95% confidence level, with the exception that the normality test is failed in the model for the UK when cashflow is the dependent variable. Since this model explains only 8% of the variation, this is not a significant problem.

The forecasts for the second half of the period, based on the estimates from the first half, are set out in Figure 5-20 and Figure 5-21. The VAR model tends to under-predict the change in investment, compared with the better fit of the single equation model. This is likely to be because the VAR model gives too much causal weight to the investment variable, while the single equation model treats it as purely endogenous.

<i>INVESTMENT ECM</i>	<i>UK</i>		<i>US</i>	
<i>Start</i>	<b>1961</b>	<b>1961</b>	<b>1954</b>	<b>1954</b>
<i>End</i>	<b>2001</b>	<b>1981</b>	<b>2001</b>	<b>1981</b>
<i>n</i>	<i>41</i>	<i>21</i>	<i>48</i>	<i>28</i>
$\beta_1$	1.02**	0.75**	1.00*	1.01**
$\beta_3$	2.24**	4.77**	4.20*	4.10**
$\beta_2$	3.74***	3.40*	4.13***	4.24***
$\gamma$	-0.61***	-0.83***	-0.46***	-0.59***
$R^2_{(ecm)}$	63%	66%	62%	72%
<i>Serial correlation</i>	[0.084]*	[0.118]	[0.189]	[0.401]
<i>Functional form</i>	[0.475]	[0.809]	[0.406]	[0.905]
<i>Normality</i>	[0.072]*	[0.932]	[0.406]	[0.456]
<i>Heteroskedasticity</i>	[0.881]	[0.810]	[0.549]	[0.408]
<i>Parameter restriction</i>	[0.380]	[0.000]***	[0.858]	[0.872]

Note: \*\*\* significant at  $p < 1\%$ , \*\* at  $p < 5\%$ , \* at  $p < 10\%$ . Estimates for  $\beta_1$  and  $\beta_3$  are derived by Johansen technique. ECMs including  $\beta_2$  are estimated subject to over-identifying parameter restriction  $\beta_1 = 1$ .  $R^2_{(ecm)}$  gives the degree of the disequilibrium variation explained by the model. For the diagnostic tests probability values for the null are shown in [square brackets]. The tests are for serial correlation - Breusch-Godfrey LM test with one period lag; functional form - Ramsey's RESET using squares of fitted values; normality - Jarque-Bera; heteroskedasticity - Koenker-Basset; parameter restriction - Wald test on restriction  $\beta_1 = 1$ .

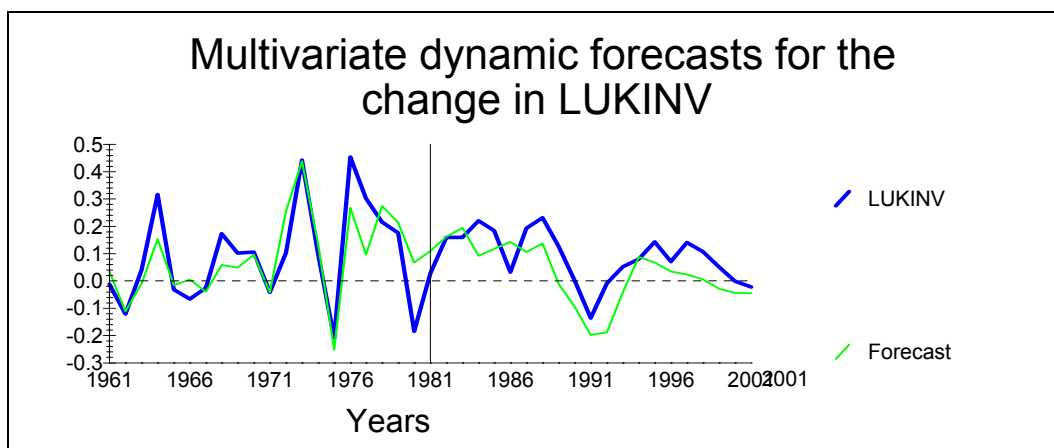
**Table 5-3 Results of VAR estimations - investment ECM**



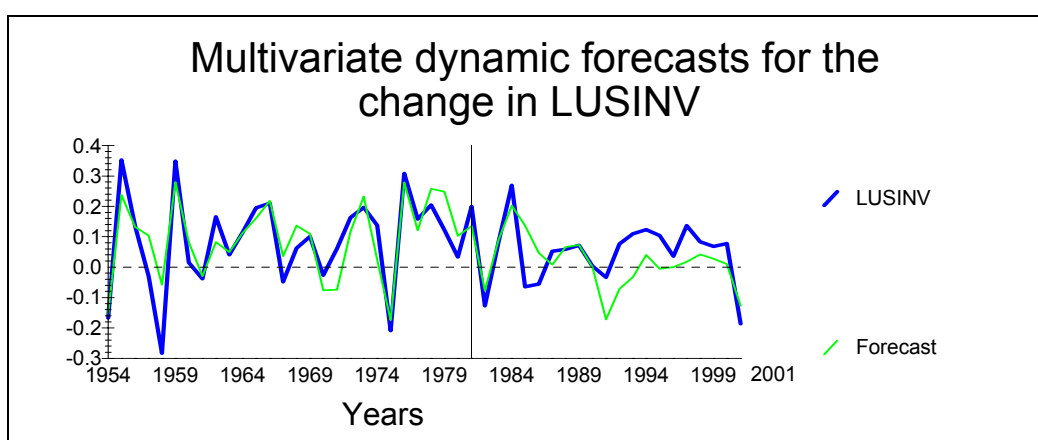
<i>CASHFLOW ECM</i>	<i>UK</i>		<i>US</i>	
<i>Start</i>	<b>1961</b>	<b>1961</b>	<b>1954</b>	<b>1954</b>
<i>End</i>	<b>2001</b>	<b>1981</b>	<b>2001</b>	<b>1981</b>
<i>n</i>	<i>41</i>	<i>21</i>	<i>48</i>	<i>28</i>
$\beta_1$	1.02**	0.75**	1.00*	1.01**
$\beta_3$	2.24**	4.77**	4.20*	4.10**
$\beta_2$	-3.38*	-3.47	-0.67	-0.89
$\gamma$	-0.43***	-0.58**	-0.34***	-.45***
$R^2_{(ecm)}$	8%	4%	2%	0%
<i>Serial correlation</i>	[0.276]	[0.411]	[0.132]	[0.097]*
<i>Functional form</i>	[0.503]	[0.335]	[0.137]	[0.055]*
<i>Normality</i>	[0.024]**	[0.355]	[0.171]	[0.570]
<i>Heteroskedasticity</i>	[0.506]	[0.502]	[0.893]	[0.351]
<i>Parameter restriction</i>	[0.380]	[0.000]***	[0.858]	[0.872]

Note: \*\*\* significant at  $p < 1\%$ , \*\* at  $p < 5\%$ , \* at  $p < 10\%$ . Estimates for  $\beta_1$  and  $\beta_3$  are derived by Johansen technique. ECMs including  $\beta_2$  are estimated subject to over-identifying parameter restriction  $\beta_1 = 1$ .  $R^2_{(ecm)}$  gives the degree of the disequilibrium variation explained by the model. For the diagnostic tests probability values for the null are shown in [square brackets]. The tests are for serial correlation - Breusch-Godfrey LM test with one period lag; functional form - Ramsey's RESET using squares of fitted values; normality - Jarque-Bera; heteroskedasticity - Koenker-Basset; parameter restriction - Wald test on restriction  $\beta_1 = 1$ .

**Table 5-4 Results of VAR estimations - cashflow ECM**



**Figure 5-20 UK VAR forecast based on 1961-81**



**Figure 5-21 US VAR forecast based on 1961-81**

***The problem of interpretation***

As we have seen it is often argued that cashflow is a proxy for marginal  $q$  or output, rendering results such as these spurious as a test for the role of cashflow. In particular, the inclusion of output as an additional variable substantially reduces the cashflow coefficient, and the coefficient on output when substituted for cashflow is also close to unity. As Figure 2-1 in Chapter 2 shows, there is plenty of scope for a short-run influence of output on investment, independent of the stage of the cycle, as a parallel accelerator mechanism.

The problem with this argument is that current output has no place in a model of a finance mechanism as outlined in section 5.4 above, which is a model of the supply of finance for investment. Output may indeed influence investment and any such effect will already have been incorporated in the observed values of investment.

Output may also influence cashflow so that the finance available and required move together. Yet as far as *finance* is concerned, output has no direct role, and to include it in a model of a finance mechanism is a serious error of specification, as evidenced by severe serial correlation (see Appendix 5-C). It is a mistake analogous to including a measure of sales in a balance sheet, even though there are no doubt strong correlations between sales and various elements of a balance sheet. Nominal output is not to be confused with the variable representing the output cycle, which is already part of the model and proxies for the conventional borrowing limit. In that case the stage of the output cycle is assumed to map onto the fluctuation in the borrowing limit, and the latter directly affects the finance available for investment.

The unit co-efficient on output when substituted for cashflow partly reflects the strong correlation between output and cashflow, as well as an accelerator relationship between output and investment, particularly inventories. This collinearity leads in the encompassing model to a substantial drop in the independent variation attributable to each. The drop in the cashflow coefficient in the encompassing model may be accounted for by the dominance of the remaining explained independent variation by the accelerator effects. Inventories are financed in the short-term mainly by cash balances, trade credit or bank credit with a reduced contribution from cashflow.

It can also be argued (as we have seen at some length) that cashflow proxies for marginal  $q$ , so that the observed relationship is really between marginal  $q$  and investment. The  $q$  argument relies on a complex chain of causation from cashflow via average  $q$ , a constant returns to scale production function, marginal  $q$ , quadratic adjustment costs, and so finally to investment. The  $q$  argument must in practice also assume the bootstrap hypothesis in the absence of equity finance. There is no reason *a priori* why this theory should predict a unit cashflow elasticity of investment. By contrast, unit elasticity is a completely natural symptom of a finance constraint, provided that it can be explained how such a constraint can exist under a regime of competitive equity markets.

## 5.6 Summary and conclusions

The main purpose of section 5.3 was to justify the hypothecation premise and allow the inference of an anomalous absence of equity finance for capital formation from the data in the financial accounts presented in the previous section 5.2. For this purpose it was necessary and sufficient to show that the ratio of cashflow to investment (the internal finance ratio) is a stationary variable.

The construction in sections 5.4 and 5.5 of single equation and vector error correction models of a finance mechanism provided additional insight into the dynamic path of investment and tests of the bootstrap counter-hypothesis. The single equation model is particularly robust and well specified over a very long period. The vector model provides strong evidence that the causation runs in one direction only, from cashflow to investment, and this justifies concentration on the results of the single-equation model. That model explains over 70% of the disequilibrium variation over the whole period from 1952 (US) or 1960 (UK) to 2001 and in the first half of the period for each economy. The estimate of the error correction coefficient is consistent with a time lag of the order of 2 years, which is in line both with the empirical literature on adjustment lags and with the *a priori* theoretical model of a finance mechanism.

The combination of evidence of the independence of dividends from investment and the results from the VECM in section 5.5 makes it highly unlikely that the investment-cashflow correlation can be explained by the bootstrap hypothesis. No significant econometric evidence could be found to support it, while the model of a finance mechanism, including evidence of a binding finance constraint in the form of unit cashflow elasticity of investment, is very well supported by the data.

These econometric results reveal in detail the nature of the anomaly observed ‘with the naked eye’ in the simple plot of the internal finance ratio. The model of a finance mechanism is not a causal hypothesis but a direct consequence of that anomaly, given modest behavioural assumptions about the stability of corporate liquidity and borrowing policies: almost an identity, based on the budget constraint. In the absence of equity finance, investment must be financed either directly by cashflow or indirectly, by borrowing that must ultimately be repaid from cashflow.

This relationship between investment and cashflow tells us little about the determinants of investment, only about its finance. For determinants we need to consult the larger Post Keynesian theory of profits. The investment of an *individual* firm may well in part be a function of output and marginal  $q$ . The difference between this exercise and the standard econometric models of aggregate investment is in the scope of the explanation and the realism of the conditions for closure and aggregation. The latter models must make assumptions about aggregate production functions, the objectivity of expectations and their reflection in share prices in their attempt to show that aggregate investment is determined by fundamental parameters. Such assumptions are unnecessary for the more modest empirical task attempted here. The model of a finance mechanism incorporates simple and transparent functional relationships that do not present the problem of interpretation associated with the methodologically more ambitious models.

## **Appendix 5-A Data sources**

### ***United Kingdom***

The aggregate data were drawn from the publicly available time series data website maintained at [www.statistics.gov.uk/statbase](http://www.statistics.gov.uk/statbase) by National Statistics (NS), the UK Government statistical office. The primary series for corporate capital formation (FDBM for fixed assets, DLQX for stocks) and cashflow (NRMG, gross saving after net capital transfers) are taken directly from the Capital Account as shown in Table 3.3.7 of the National Accounts (Blue Book) 2000. Transactions in valuables and non-produced non-financial assets (mainly land) are not material but treated here as financial and therefore left out of account.

Blue Book Tables 3.3.8 and 3.3.9 contain the Financial Account series on flows and stocks of financial assets and liabilities for the private non-financial corporation (PNFC) sector, starting from 1987. These include sales and purchases of shares, loans and securities as well as changes in holdings of currency and deposits with the banking sector. Table 3.3.3 (the primary income account) provides series on interest received (DSZR) and payable (DSZV), and dividends payable (NETZ). From this data, series can be constructed for net inflows to the sector of equity (NEVL-NESH) and debt (NETR+NEUT-NERP) and net interest payable (DSZV-DSZR), normalised by cashflow (NRMG). The capital gearing figure is based on loans and securities issued by the sector (NLBC+NKZA) and the market value of equity (NLBU). The internal finance ratio in Figure 5-15 is calculated as cashflow divided by investment. The external finance ratio shown in Figure 5-2 is calculated as the sum of the net equity and debt inflows divided by physical investment.

The series for PNFC financial investment in Figure 5-6 is the simple sum of NS series NERP (loan) and NESH (equity). The value of UK acquisitions is the sum of NS series DUCM+CBBI+CBCQ. As explained in NS publication “First Release: mergers and acquisitions” (6/8/2002) there may be some double-counting in that DUCM and CBCQ both contain acquisitions made by foreign companies routed through their existing UK subsidiary companies. There does not appear from the chart to be any serious distortion for the present purposes.

The series for UK interest rates is 3 month LIBOR (HSAK) and for real output is UK GDP at constant prices (YBEZ). The UK price index is the Retail Price Index (FRAG).

### *United States*

The time series data were drawn from two sources, the Federal Reserve Board website [www.federalreserve.gov](http://www.federalreserve.gov) for financial series and the US Department of Commerce Bureau of Economic Analysis website [www.bea.gov](http://www.bea.gov) for the remaining national income and price series.

The primary series for corporate investment (USINV, FU105050005) was taken from the Federal Reserve *Flow of Funds Accounts* (FFA) table F.102, being the equivalent of the UK financial account for non-farm non-financial corporations. The same table includes a series for the financial gap (USFG, FU105005305). From these two was derived the cashflow figure (USCF). Data is available from 1952.

FFA Table F.102 also contains the series for flows of net equity (FU103164003) and net debt (FU104104005 + FUFU103169255 + FU103165005). FFA Table B.102 contains series for the balance sheet values of debt (FL104104005) and equity (FL103164003). The quarterly data were arithmetically averaged to give an annual figure. The figure for net interest of the non-financial corporate sector used to calculate the income-gearing ratio is taken from NIPA Table 1.16 line 35.

The interest rate series is the US dollar 3m LIBOR rate taken from release H.15. The series used to construct variations from trend output was taken from Table 1.8 of the National Income and Product Accounts. Line 4 gives the real GDP of the non-farm non-housing business sector (the nearest measure available to that of the non-farm non-financial sector). The price index is taken from Table 7.15, which gives in Line 1 the price index for the output of non-financial corporate business. This again represents a slight mismatch of sectors but is not material.

US series for dividends (FU105020005), capital stock (FL102010005), inventory growth (FU106120005) and non-financial corporate nominal GDP (NIPA 1.16 line 19) are referred to in Appendix 5-C.

## Appendix 5-B Unit root tests

The test for stationarity employed is the augmented Dickey-Fuller test available in Microfit 4.1 (Pesaran and Pesaran, 2001). In this test each variable is regressed on its own lagged values and the coefficient on the value for the previous period is tested against the hypothesis that it equals unity (a unit root). In the differenced version of the regression the coefficient ( $\delta$ ) is tested for a zero value. The augmented version of the test takes account of serial correlation in the regression residuals by adding further lags, although the relevant coefficient and critical  $\tau$  value remain the same. The power of the test diminishes the higher the order of augmentation (number of lags). The critical values differ when the regression includes a trend.

Microfit allows the user to select the number of lags and select the Dickey-Fuller regression with the appropriate lag on the strength of the Schwarz Bayesian Criterion (SBC), Akaike Information Criterion (AIC), and Hannan-Quinn Criterion (HQC) model selection criteria. These criteria give a measure of the power of the regression that takes account of the degrees of freedom, which reduce as the number of lags is increased.

The tests were initially undertaken with three lags. In the UK case, this was reduced to 2 lags when the result for the differenced cashflow variable (DLCF) produced some conflict between model selection criteria (selecting 0 or 2 lags). The model selection criteria were consistent when the tests were run with 2 lags.

In the following table  $p_{\max}$  is the number of lags used in the Dickey-Fuller regressions and  $p_s$  is the order selected on the basis of the model selection criteria. **D/T** indicates whether the regressions tested for difference or trend non-stationarity.  $t_\delta$  is the t statistic of the coefficient  $\delta$  on the lagged variable on the null hypothesis  $H_0:\delta=0$ .  $\tau_{0.95}$  is the critical value for rejection of  $H_0$  at the 95% confidence level. Rejection of  $H_0$  requires that the absolute value of  $t_\delta$  exceed the absolute value of  $\tau_{0.95}$ .



	Period	n	$p_{max}$	$p_s$	D/T	$t_{\delta}$	$\tau_{0.95}$	Unit root?
<b>LUKCF</b>	63-01	39	2	0	T	-1.6451	-3.5279	Yes
<b>DLUKCF</b>	64-01	38	2	2	D	-5.1260	-2.9400	No
<b>LUKINV</b>	63-01	39	2	0	T	-1.6218	-3.5279	Yes
<b>DLUKINV</b>	64-01	38	2	1	D	-5.8068	-2.9400	No
<b>LUKGAP</b>	63-01	39	2	0	D	-3.8678	-2.9378	No
<b>LUSCF</b>	56-01	46	3	0	T	-1.3142	-3.5088	Yes
<b>DLUSCF</b>	57-01	45	3	0	D	-6.4899	-2.9271	No
<b>LUSINV</b>	56-01	46	3	0	T	-2.3910	-3.5088	Yes
<b>DLUSINV</b>	57-01	45	3	1	D	-6.7619	-2.9271	No
<b>LUSGAP</b>	56-01	46	3	0	D	-3.8852	-2.9256	No

**Table 5-5 Unit root tests on investment and cashflow variables**

Taken together, these test results indicate that both the log-level variables (prefix L) are  $I(1)$  and may be co-integrated. The data for both the investment and cashflow log-level variables are non-stationary and the differenced log-level variables (prefix DL) are stationary. The variables for the difference between log cashflow and log investment (LUKGAP and LUSGAP) are stationary. This indicates a valid co-integrating vector with unit cashflow elasticity of investment.

Similar tests for the investment and dividend ratios show the series have different orders of integration and cannot be co-integrated.

	Period	n	$p_{max}$	$p_s$	D/T	$t_{\delta}$	$\tau_{0.95}$	Unit root?
<b>USIR</b>	54-01	48	1	0	D	-3.6773	-2.9228	No
<b>USDR</b>	54-01	48	1	0	D	-0.68984	-2.9228	Yes
<b>UKIR</b>	90-01	12	2	1	D	-2.4863	-3.1485	Yes
<b>UKDR</b>	89-01	13	1	0	D	-3.9850	-3.1223	No

**Table 5-6 Unit root tests for dividend and investment ratios**

## **Appendix 5-C Model selection and specification**

This appendix discusses the alternative model specifications that were considered in arriving at the preferred versions of the single-equation and VAR ECM models. As a general rule detailed results have not been reported unless all the residual diagnostics are satisfactory at the 95% level.

### ***Stationarity and co-integration***

The effect of non-stationarity in economic time-series on regressions is well documented and will not be rehearsed here. The concepts of stationarity and co-integration between two non-stationary series have also been used in this chapter independently of the regression analysis, in order to reach the conclusion that external equity is not used to finance capital formation. The single-equation and vector ECMs both employ co-integrated variables and their estimations are statistically reliable. By contrast, one of each pair of the investment and dividend ratio series is not stationary (see Table 5-6).

### ***Lag structure***

The single equation ECM was estimated using the ARDL approach to co-integration available in Microfit. The choice of an ARDL (1,0) lag structure (with *LINV* the dependent variable) was made after considering lags of up to 3 periods (years). With the UK data, when a 3 period maximum lag was permitted, all the three model selection criteria selected an ARDL (1,3) process. With a 2 period maximum, SBC selected (1,0) while AIC and HQC selected (2,2). A 1 period maximum led to the selection of (1,0) by all three criteria. In the case of the US SBC selected (1,0) irrespective of the maximum lag, although the other criteria varied.

The 2 and 3 period independent lag models were rejected mainly because they estimated  $LCF_{t-2}$  as negative, and were picking up small contributions from an implicit difference term  $DLCF_{t-1}$  or  $DLCF_{t-2}$ . This influence does not fit the theoretical model of a finance mechanism and has been disregarded. The 3 period lag also failed the normality test at the 5% level. The estimates of the UK co-integrating vector ( $LUKINV = \beta_0 + \beta_1 LUKCF$ ) given by each model are very similar, as summarised in Table 5-7.

<i>ARDL</i>	<i>n</i>	$\hat{\beta}_1$	<i>t</i>
(1,0)	41	1.0161	44.7
(2,2)	40	1.0164	31.9
(1,3)	39	1.0276	42.3

**Table 5-7 Effects of different lag structures**

The exogeneity of the lagged dependent variable  $LINV_{t-1}$  was confirmed by a Hausman test for the significance of an additional instrumental variable, in the form of the residuals for period  $t-1$  from a regression of  $LINV$  on the independent variables. For both economies in both periods the Wu-Hausman statistic was not significant at the 95% confidence limit (see Table 5-2). The UK short period result is close to the confidence limit.

In the following sections the discussion of specification relates to the US data for which there is a longer run available. There is no reason to doubt that the same conclusions apply to the UK data given the very similar performance of the preferred model.

#### ***Quarterly vs annual data***

The use of quarterly (199 data points) rather than annual data (49 points) was explored and produced a similar estimate of the cashflow coefficient at 1.03. The model selection criteria again indicated the same AR (1) process despite the shorter data period. The  $R^2$  was substantially lower at 42% reflecting the higher volatility of the quarterly series. The ECM coefficient was also lower at  $-0.37$  implying a shorter adjustment lag of about 3 quarters. On the other hand the estimates failed severely the residual diagnostic tests for serial correlation, normality, and heteroskedasticity. The plot of the residuals gives a visual impression of the significance of large outliers, particularly surrounding the 1970s oil crisis, and of persistence in residuals. The latter may reflect a slower reaction speed to disequilibrium than implied by the ECM coefficient.

It did not appear that there was any material loss of generality from using the annual rather than quarterly data, to offset the gains from losing the short-term volatility and

a better model specification. Given the long runs for both economies, there were sufficient data points in the annual series to give statistically significant results.

### ***Fixed and current assets***

When the investment variable is limited solely to fixed assets, excluding changes in inventories or stocks, the cashflow coefficient remains the same at 1.03 but the ECM coefficient reduces to  $-0.23$ , and the  $R^2$  drops slightly to 69%. The model fails the residual serial correlation and normality tests at the 90% confidence level and the implied adjustment lag is implausibly long for a finance mechanism at over 4 years.

### ***Nominal vs deflated***

Price mechanism theory would reject the use of nominal in favour of real values, although the finance mechanism hypothesis implies the opposite. A standard approach in tests of  $q$  theory is to regress fixed asset investment on variables, all deflated by the value of the capital stock (eg FHP, 1988, Erickson and Whited, 2000). A linear model was set up to estimate a co-integrating vector of the form:

$$USFAK = \beta_0 + \beta_1 USCFK + \beta_2 USGDP$$

such that  $USFAK$  &  $USCFK$  are fixed asset investment and cashflow deflated by the market value of the tangible capital stock  $USCAP$  and  $USGDP$  is real GDP of the sector. This model passes all the residual diagnostic tests and produces a vector  $\beta_1 = 1.01, \beta_2 = 0.0031$  (and  $\beta_0$  insignificant). These values imply long-run elasticities of investment at the mean, for cashflow of 0.94 and for output of 0.15. The ECM coefficient is  $-0.27$  and  $R^2$  is 37%.

Although the estimates are statistically valid and the cashflow elasticity close to unity, the degree of variation explained is low and the implied adjustment lag again too long for a finance mechanism. There is a problem with the linear specification since the variation in output is dominated by long-term growth. Estimating in log-linear form and using the log deviation of output from trend produces a cashflow elasticity of 1.34 and output elasticity of about 11, the ECM coefficient falls to  $-0.16$  and the ECM  $R^2$  rises to 62%. The residuals pass the normality test only at the 99% level.

What is clear from these results is that the neglect of inventory investment and the use of deflated variables are not innocuous and lead to estimates that are not consistent with a finance mechanism. This is unsurprising given the monetary nature of a finance mechanism, and emphasises the need for the model specification to be consistent with theory.

### ***Output and cashflow: the problem of interpretation***

The problem of interpretation is clearly revealed when a log-nominal output variable is added to the preferred regression model either alongside or instead of cashflow. Given the importance of this issue the full results are shown in Table 5-8. In the encompassing model, the cashflow coefficient falls to 0.43 (and its  $t$  statistic from 64 to 2.6), and the output coefficient is 0.61 ( $t = 3.5$ ). If output replaces cashflow the output coefficient is 1.05 ( $t = 85$ ), very close to the 1.02 coefficient on cashflow it replaces. The drop in the  $t$  statistics indicates multicollinearity. In both cases the ECM coefficient  $\gamma$  increases from  $-0.58$  to about  $-0.77$  (the investment lag reduces). Both output models suffer from severe serial correlation [ $p=0.002$ ] and significant intercepts suggesting mis-specification. However the series of non-nested tests in Table 5-9 of models incorporating either cashflow or output rejects both models at the highest levels of confidence, while marginally favouring the output model on the likelihood measure.

This test result encapsulates the problem of interpretation. The cashflow model provides an excellent fit to the data, but the output model performs equally well (if the serial correlation is ignored). Nevertheless both models are rejected as not fully explaining the other. The econometric tests cannot discriminate between them. This is why it is so important to consider the theoretical specification and the conditions for closure and aggregation, as discussed in the main text.

	<i>US</i>	
	<b>encompassing</b>	<b>substituting</b>
<i>Start</i>	<b>1953</b>	<b>1953</b>
<i>End</i>	<b>2001</b>	<b>2001</b>
<i>n</i>	<i>49</i>	<i>49</i>
$\beta_{(cashflow)}$	0.43**	-
$\beta_{(current\ output)}$	0.61***	1.05***
$\beta_{(stage\ of\ cycle)}$	4.10***	4.06***
$\beta_{(inflation)}$	2.14***	1.72***
<i>intercept</i>	2.58***	4.65***
$\gamma$	-0.77***	-0.78***
$R^2_{(ecm)}$	78%	74%
<i>Serial correlation</i>	[0.002]***	[0.000]***
<i>Functional form</i>	[0.370]	[0.061]*
<i>Normality</i>	[0.379]	[0.510]
<i>Heteroskedasticity</i>	[0.226]	[0.189]

Note: \*\*\* significant at  $p < 1\%$ , \*\* at  $p < 5\%$ , \* at  $p < 10\%$ .  $R^2_{(ecm)}$  gives the degree of the disequilibrium variation explained by the model. For the diagnostic tests probability values for the null are shown in [square brackets]. The tests are for serial correlation - Breusch-Godfrey LM test with one period lag; functional form - Ramsey's RESET using squares of fitted values; normality - Jarque-Bera; heteroskedasticity - Koenker-Basset.

**Table 5-8 US models with current output**

	<i>Cashflow against current output</i>	<i>Current output against cashflow</i>
<b>Cox test</b>	[0.000]***	[0.000]***
<b>Cox (adjusted) test</b>	[0.000]***	[0.001]***
<b>Wald test</b>	[0.003]***	[0.004]***
<b>J test</b>	[0.005]***	[0.006]***
<b>JA test</b>	[0.005]***	[0.006]***
<b>Encompassing test</b>	[0.007]***	[0.008]***

Log-likelihood: cashflow model 62.1533 current output model 62.3164  
AIC of cashflow against current output = -0.16311 favours current output model  
SBC of cashflow against current output = -0.16311 favours current output model

**Table 5-9 Non-nested tests of cashflow and output models**

## **Chapter 6 Fundamental uncertainty and the new issue discount**

Chapter 5 has put forward empirical evidence of an absence of equity finance for capital formation. An implication of this anomaly is a stable equilibrium relationship between capital formation and cashflow. The statistical properties of this relationship are consistent with the existence of a general finance constraint, and not with the alternative bootstrap hypothesis that any constraint from an absence of equity finance is not in fact binding. As discussed in Chapter 2, a necessary condition of a general finance constraint in the presence of competitive equity markets is a new equity issue discount, for which US evidence has been cited in Chapter 3.

This aim of this chapter is to propose a novel explanation of the new issue discount that overcomes the weaknesses of existing Post Keynesian and New Keynesian theory, neither of which are consistent with the extensive use of equity finance revealed by the last chapter. The explanation is Post Keynesian in that it is based on the concept of fundamental uncertainty and indeed applies in a novel manner Keynes's own analysis in *The General Theory*. On the other hand, this includes employing standard neoClassical assumptions about management objectives and shared information, and the explanation does not therefore depend, as do other Post Keynesian theories, on differences in those respects. The strength of this hypothesis is accordingly that its conclusions depend solely on the introduction of fundamental uncertainty into an otherwise neoClassical world. The case for Post Keynesian theory then emerges as engaging with, rather than abstracting from, the consequences of fundamental uncertainty.

In brief, the explanation begins by considering the implications of fundamental uncertainty for expectations. Under fundamental uncertainty, expectations can have no objective grounding and are inevitably subjective. Fundamental uncertainty is the root of conventional valuation and liquidity preference, which have no place when expectations have objective grounds. Keynes's analysis of liquidity preference is deployed to explain the emergence of a 'new asset discount' that leads to a new equity issue discount. This case turns out to be the exception recognised by M&M, an exception that proves to be the rule.



Section 6.1 recapitulates the limitations of the New Keynesian explanation of the new issue discount, reviewed in Chapter 2. Next, section 6.2 defines Post Keynesian ‘fundamental uncertainty’ and contrasts it with the ‘ergodic axiom’ underpinning neoClassical stochastic risk and New Keynesian asymmetric information. Section 6.3 argues that M&M Proposition I (cost of capital is independent of financial structure) survives the introduction of fundamental uncertainty but not necessarily Proposition III (marginal and average cost of capital are equal).

Section 6.4 briefly reviews the role of liquidity preference in the analysis of *The General Theory*. Section 6.5 applies Keynes’s concepts differently, defining liquidity more precisely in his own terms, placing more stress on the liquidity of assets other than money, and allowing for the long-term differences in liquidity preference between managers and investors and in liquidity between existing and new industrial assets. From this follows the concept of a new asset discount based on liquidity preference. The argument is drawn together in section 6.6 by linking the new asset discount to the new issue discount. The verbal argument is expressed in a formal model in section 6.7, which illustrates the key features within the limits of mathematical techniques. Finally in section 6.8, the formal model is calibrated against the existing empirical evidence of a new issue discount cited in Chapter 3, and found to be consistent in principle. This is a preliminary to the empirical tests of this hypothesis by a different method in Chapter 7.

## **6.1 Beyond the New Keynesian theory of the new issue discount**

The New Keynesian theory of capital structure commands wide acceptance and its application of AI is claimed as one example of a “new paradigm” in economics (Stiglitz, 2002). Nevertheless, as already noted in Chapter 1, its explanation of the new issue discount has three main weaknesses, recapitulated as follows.

First and foremost, the empirical observation that UK industrial companies raise up to 50% of their gross inflow of funds from equity issues suggests two conclusions. The first is that AI effects are unimportant for large companies with ready access to equity markets, so that neoClassical theory remains appropriate at least in their cases. Secondly, given that such new issues do take place, companies are as likely to be raising equity finance for capital formation as for acquisitions.

The second weakness is the implausibility that the relevant asymmetry of information relates to the assets-in-place rather than the investment opportunity. New issues always require a prospectus with details of the firm's current situation and prospects. Managers are under a legal obligation to make full disclosure, and may be required to compensate investors for any misrepresentation. The prospectus provides the market with a great deal of information on which to assess the value of the assets-in-place. By contrast the value of an investment opportunity depends heavily on future outcomes and is always a matter of judgement, on which managers and investors may be expected to differ. There is a great deal more room for dispute over the latter than the former.

The third weakness is the subtle extension of the concept of information to include internal as well as external knowledge. This may be a theoretical response to both the previous point and the wider question of whether differences in information about external empirical observations are in practice of economic significance. Differences in the skills and experience of managers and investors are indisputable. Yet this extension severely blunts the edge of the AI concept. If information inside the heads of managers is included, there is always an asymmetry of information, and the full information alternative is merely hypothetical. If, as indeed Kant tells us, external information is never objective but always requires interpretation in the mind of the observer, what becomes of the objective probability distributions of which knowledge is shared although outcomes are still unrevealed?

New Keynesian theory looks implausible on the first two grounds, and the attempt to increase its relevance by including differences in information internal to agents is theoretically inconsistent, and leads to tautology and untestability. In the absence of a convincing alternative, the existence of competitive securities markets favours the neoClassical financial invariance theorem, and the explanation of any new issue discount must accordingly be sought among the tax and 'free cashflow' agency costs of a reduction in gearing. The field lies open for the advance of a more convincing explanation based on fundamental uncertainty rather than asymmetric information.

## **6.2 Fundamental uncertainty vs asymmetric information**

Fundamental uncertainty is an established concept with a specific meaning in Post Keynesian thought. It is sharply distinguished from the neoClassical or New

Keynesian concept of uncertainty. ‘Fundamental’ means foundational, irreducible, and impervious to further analysis. In particular, fundamental uncertainty cannot be reduced to a probability distribution with known, or knowable, properties of mean, variance, etc. Keynes himself best illustrates the point:

“By uncertain knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject in this sense to uncertainty...Or, again, the expectation of life is only slightly uncertain. Even the weather is only moderately uncertain. The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest 20 years hence, or the obsolescence of a new invention, or the position of private wealth owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know.” (1937A:113)

Paul Davidson links the concept of fundamental uncertainty to the ‘ergodic axiom’, accepted by leading neoClassical theorists such as Samuelson, Lucas and Sargent (Davidson, 1996:479) as the basis of Price Mechanism models. Ergodicity, which was touched upon in Chapter 4 as a necessary attribute of a closed system, is a property of stochastic processes such that estimates based on time-series and cross-section data tend to converge as the number of observations increases. It is the statistical equivalent of determinacy in an otherwise closed system subject to random variation. In economics, ergodicity implies that the future can in principle be deduced from observations of the past and the present. There is no real difference between past, present and future, which are all co-determined. As Davidson puts it, in this system, “time is [merely] a device that prevents everything happening at once” (Davidson, 1996:480).

Conversely, a non-ergodic system involves fundamental uncertainty, since there is no objective method of calculating the future from the past and present. While agents must form expectations about the probability of future events, and may make a rational assessment of the limited information available to them, their expectations are subjective and have no reliable basis in past or present frequency distributions. Furthermore, a Darwinian process of natural selection by competition will not produce an efficient outcome, in the sense of rewarding those with more accurate and punishing those with less accurate expectations, since there is no underlying objective distribution on which to converge.

The empirical prevalence of non-stationary time-series realisations is sufficient proof for Davidson, as a matter of statistical theory, that the economy is not in fact

an ergodic system. He argues that non-ergodicity explains the existence of money-denominated contracts and the non-neutrality of money, and undermines the Price Mechanism idea of a tendency towards full employment equilibrium. It is not clear whether the possibility of co-integrated relationships affects this conclusion.

In seeking to develop a positive alternative theory based on fundamental uncertainty, he draws upon Shackle's concept of the crucial decision, which changes history and reality, often to an extent unforeseen. He points out that the main role of Schumpeter's entrepreneur is to make such decisions under fundamental uncertainty. Ironically, the hero of capitalism is redundant in an ergodic system. This point will be developed further below.

Non-ergodicity also implies the irreversibility of much investment and indeed of most production decisions. The real options literature has recognised the empirical importance of irreversibility and has devised a theoretical method of valuing real options based on synthetic portfolios and arbitrage reminiscent of the M&M theorem (Dixit and Pindyck, 1994). This literature employs quantitative probability distributions in order to arrive at analytical solutions by the use of sophisticated mathematics, although even modestly complex problems require numerical solution.

A full critique of real options theory is beyond the scope of this work. Its relevance here is as an example of how investment decisions can be rationalised, by a more sophisticated successor to discounted cashflow analysis. Although this is valuable, one suspects that real options theory requires the tacit assumption of ergodicity, although the claim cannot be developed further here. On the other hand, irreversibility may not be consistent with ergodicity under perfect competition. As Glickman (1998) argues and was explained in Appendix 2-A, ergodicity makes insolvency irrational in the absence of moral hazard. Provided finance is available even sunk costs must yield their expected return in the long run, so there is never any need for a forced sale. For the present purposes, real options theory, like the theory of capital structure, abstracts from the question in hand. Real options affect the demand for investment, but have no implications for investment finance or capital structure.

The difference between Post Keynesian and New Keynesian views of 'the information problem' should now be clear. New Keynesian thought maintains the neoClassical ergodic axiom required for objective probability distributions.

Managers and investors share knowledge of these distributions, but managers have inside information about the outcomes. Without such asymmetry the New Keynesian model reverts to the neoClassical full information model.

By contrast Post Keynesian thought is based on our complete lack of information about the future. We have only expectations to guide us, but in many cases, particularly of long-term investment, expectations have no reliable basis in past or present experience. This is *fundamental* uncertainty.

### **6.3 Fundamental uncertainty and the M&M invariance theorem**

Post Keynesian authors often assert that the M&M theorem depends on the ergodic axiom and is incompatible with fundamental uncertainty (*cf* Glickman, 1998:251, 2001:221). Myron Gordon also criticises the M&M assumptions about management objectives, the path-dependency of investment opportunities, the neutrality of dividend policy, and the ability of investors to substitute personal for corporate debt (Gordon, 1997:83-87).

The concern of this thesis is to reconcile the empirical evidence of a general finance constraint with the active use of equity markets by explaining the new issue discount on the assumption that equity markets are competitive. Gordon's critiques of management objectives and path-dependency call that assumption into question, which is a question of fact. If equity markets are not competitive, earlier Post Keynesian explanations of the new issue discount based on inelastic demand for shares will suffice. On the other hand, Post Keynesian theory is strengthened if it does not depend on a failure of competition in this area.

The non-neutrality of dividend policy does not seriously undermine Proposition I (see Chapter 2). On Gordon's final point, the argument of this thesis does not depend on the degree of competition in the debt market, so that the assumption of perfect securities markets (debt as well as equity) is innocuous. The assumption of competitive equity markets means that any finance constraints in the debt market do not affect investment. Unequal access to debt by firms and investors cannot drive a significant wedge between the average and marginal cost of capital. The assumption of perfect securities markets simply allows us to abstract from financial structure and address the relationship between investment and finance as though all firms had ready access to equity finance and issued no debt. This is indeed the method of

Keynes in *The General Theory*. The objective is to show that even on the terms most favourable to the neoClassical case, a general finance constraint will arise when fundamental uncertainty is introduced. The argument does not depend on a denial of the basic insight of Proposition I.

However, as suggested in Chapter 2, the M&M financial invariance theorem elides the distinction between risk proper and liquidity risk. This elision makes no difference to the question whether the return required by investors to hold a given set of assets (including an allowance for both types of risk) is independent of financial structure. However if investors perceive a higher liquidity risk on new assets than on existing assets, investors may require a higher return to hold the new assets relative to the existing assets, even if they hold the same actuarial expectation of return as do managers. In other words, the marginal cost may exceed the average cost of capital. This demonstrates incidentally the advantage of Keynes's method of including the risk premium in the marginal efficiency (an asset concept) rather than the cost of capital (a firm concept), since it is easier to think in terms of differences in marginal efficiency between assets.

On this basis M&M Proposition III does implicitly assume objective expectations since it makes no allowance for a difference in liquidity risk between existing and new assets. The following sections show how such a difference can arise.

#### **6.4 Fundamental uncertainty and liquidity preference in Keynes**

For Keynes the main economic implication of fundamental uncertainty is liquidity preference. Liquidity is "the power of disposal over an asset" (*GT*:226), the ability to reverse (to a greater or less extent) a decision to invest in a financial or physical asset. Liquidity offers a degree of security to balance the fear of future loss arising from changes in the state of long term expectation. Liquidity allows investors to cut their losses if their expectations have to be revised. Specific emphasis on liquidity is unnecessary in an ergodic world without such revisions, where all assets can be traded at values that reflect the statistical mean and modest diversification protects against the idiosyncratic risk of a specific asset. The significance of liquidity depends on fundamental uncertainty and the possibility of unanticipated change in expectations.

Keynes recognises that liquidity is not an attribute of money alone. In his celebrated discussions of stock and bond markets (*The General Theory*, Chapters 12 & 13) the tendency towards speculation reflects liquidity. On the other hand, for the longer-term reasons set out in Chapter 17 of *The General Theory* he considers that the effects of liquidity preference will manifest themselves in a dominant role for the money rate of interest. ‘Liquidity preference’ has therefore acquired a restricted meaning, related specifically to the speculative demand for money. The following sections will attempt to re-interpret the importance of liquidity preference and relate it to the new issue discount. Before doing so, we need to identify the specific assumptions of Keynes’s theory of “the inducement to invest” (the title of Book IV of *The General Theory*) and accordingly the points of departure.

Keynes starts from an acceptance of the basic implication of perfect competition, that the marginal efficiency of capital will equal the rate of interest in equilibrium under conditions of perfect certainty. In the first paragraph of Book IV he defines the *prospective yield* that together with the supply price or replacement cost defines the marginal efficiency of an asset (*GT*:135). The prospective yield is the series of income expected in each future period in a given state of long term expectation (not, as Shackle points out (1974: 36), the ratio between the income and the supply price).

The argument of Chapter 12 identifies *confidence* and *convention* as the two key sources of instability in the state of long term expectation upon which prospective yields are based, under conditions of fundamental uncertainty. To some extent Keynes conflates the two and this is reflected in a tacit assumption, that the distinction between shares in firms and capital goods can safely be ignored. This is a deliberate preference (*GT*:151, fn.1), by which Keynes appears to anticipate and accept Proposition I of the M&M theorem. However the discussion of Chapter 12 makes it clear that confidence and convention are different aspects of fundamental uncertainty and may have separate implications for managers (*qua* entrepreneurs) and investors. Keynes abstracts from this distinction by asserting that “classes of enterprise which are not readily marketable ...are rapidly declining in importance” (*GT*, 151, fn2).

The degree of *confidence* is the weight we attach to our expectations (*GT*:148) and is distinct from, although related to, the conventional basis of valuation. Related to the degree of confidence is the entrepreneur or borrower’s risk that needs to be

overcome by the inducement of an extra margin between the marginal efficiency of capital and the rate of interest (*GT*:144). The neoClassical interpretation of this is the premium included in M&M's cost of capital for a given class of risk. The double counting of this risk by lenders to which Keynes refers does not apply to equity finance, since the lender's risk does "not exist if the borrower and lender [are] the same person". On the other hand, Keynes later on distinguishes between "risk proper" and liquidity risk, a distinction "corresponding to the difference between the best estimates we can make of probabilities and the confidence with which we make them" (*GT*:240). In addition during this part of his discussion Keynes anticipates agency and asymmetric information theory when he suggests that moral hazard may lead lenders of risky debt to charge a premium.

Both Keynes himself and his commentators have highlighted the instability of conventional valuation and its implications for fluctuations in investment. The willingness of investors to hold industrial shares partly reflects the liquidity of the shares and Keynes notes the tendency for liquid markets to become speculative. The conventional valuation of bonds plays a dominant role in his theory of fluctuations in the risk-free rate of interest and is directly linked to the speculative motive through the assumption of inelastic long-term interest rate expectations. This emphasis has been responsible for the narrow interpretation of liquidity preference as preference for immediate cash rather than for a wider range of liquid assets. This interpretation has been questioned by Gordon (1997) and challenged as a theory of the rate of interest, initially by Tobin (1958), in whose account uncertainty is reduced to stochastic risk.

The neoClassical rejection of Keynes's theory of investment stems from the substitution of objective expectations for fundamental uncertainty. There is room in neoClassical theory for uncertainty about prospective yield, but if this uncertainty can be reduced to an objective probability distribution and compensated by a risk premium, the expected aggregate return on capital will equal the risk-free rate of interest. The need for a liquidity premium disappears if we abstract from unanticipated changes in expectations.

From a neoClassical perspective, the short term speculative fluctuations of stock and bond markets may have practical importance, but are analytically intractable and economically unsustainable. If expectations have objective grounds (*ie* if



expectations are ultimately ‘rational’ in the sense of the Rational Expectations Hypothesis) it can be argued that competition (including speculation) will ultimately ensure that those grounds are reflected in share prices and interest rate expectations. This leaves no independent aggregate role for financial or monetary factors.

Rather than upon speculation, Keynes bases his long-term argument for an interest rate floor upon the precautionary motive for liquidity preference concerned with confidence and the desire for security (*eg* the preference for land in a primitive economy where the costs of holding money exceed its liquidity premium). When Tobin asks, “why should anyone hold the non-interest bearing obligations of the government instead of its interest-bearing obligations?” (Tobin, 1958:65) in the absence of speculative motives (inelastic interest rate expectations), his answer too depends upon the precautionary motive. However Tobin interprets liquidity preference as aversion to risk, being the variance of expected return, rather than aversion to changes in the state of expectation. The transition to the assumption of an ergodic system is complete.

There are three aspects of Keynes’s theory of liquidity preference, which represent points of departure for a fresh interpretation. The first is his lack of emphasis on the liquidity premium on assets other than money. Second is his abstraction from the distinction between managers and investors. Third is his greater emphasis on the instability caused by fluctuations in the state of confidence driven or amplified by speculation, than upon differences between managers and investors in the level of confidence. The next sections develop these three points.

## **6.5 Another interpretation of liquidity preference**

Keynes for the most part abstracts from the liquidity premium on assets other than money on the strength of his argument in Chapter 17 that the money-rate of interest “knocks out” the production of other assets and becomes the binding constraint on investment. However in Chapter 17 he recognises that any asset can in principle attract a liquidity premium and the difference is a matter of degree (*GT*:226).

It is helpful to define liquidity more precisely in Keynes’s own terms, something Shackle considers to be missing from Chapter 17 (Shackle, 1974:63). Let liquidity be the degree to which the value of an asset, measured in any given standard, is independent of changes in the state of long-term expectation. The liquidity premium

is then the margin required between the marginal efficiencies of the asset and the standard in order to overcome preference for the standard. The size of this margin will depend upon the difference in the degree of confidence with which investors view the prospective yields of the asset and the standard respectively

This definition of liquidity makes no direct reference to the transferability of assets and the connection with the ‘liquidity’ of markets is indirect, and even obscure. As Keynes explains (*GT:240*) liquidity is partly a function of the degree to which an asset can be used in the production of different consumables, so that a change in prospective yield based on production in one line can be met by switching to another line. The prospective yield on the second line is lower than originally expected from the first, but higher than now expected from the first after the change in expectations. Keynes also refers to the importance of the stability of the value of the consumables produced. Stability in this context means independence from changes in the state of long-term expectation. The third element of his definition is the ‘turnover factor’, the period over which the asset can be converted to cash through production. The shorter the period, the less the impact of a change in the state of long-term expectation.

The ‘liquidity’ of markets is for Keynes a separate and rather different concept<sup>10</sup>. Indeed it is an illusion which depends on the maintenance of the conventional basis of valuation. The point is illustrated when Keynes states “that each individual investor flatters himself that his commitment is ‘liquid’ (though this cannot be true for all investors collectively)” (*GT:160*). Since Keynes in general treats assets and shares as equivalent, this does not refer to the effect of incorporation in dividing claims to the ownership of physical assets into standard shares, transferable with low transaction costs: a necessary condition for an organised investment market. The point is that the individual investor can only sell his shares at their current value if all other investors maintain the convention on which their value is based. If all (or indeed too many) investors were to lose confidence in that convention and seek to sell, they would not find buyers at that price. The valuation has no objective basis,

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<sup>10</sup> It is significant that throughout his discussion of organised investment markets from pages 153-160 in Chapter 12 Keynes puts the words ‘liquid’ or ‘liquidity’ in inverted commas on no less than five occasions.

because it depends on expectations of the prospective yield, as well as the premium required for liquidity risk in the marginal efficiency of capital.

Keynes's overall argument can now be restated in these terms. The current value of bonds in terms of money is not independent of changes in the state of long-term expectation about the future course of interest rates over the life of the bond. There is therefore a risk of loss if the investor needs to sell the bond prior to its redemption date and expectations of interest rates have changed. Money is the standard of value, because its value in terms of consumption goods is the most independent of such changes in expectations. The marginal efficiency of bonds in terms of money is the rate of interest. Since the marginal efficiency of money in terms of money (its 'own rate of interest') is zero (assuming no yield or carrying costs), the rate of interest is a direct measure of the premium required to overcome liquidity preference over a corresponding period<sup>11</sup>. The marginal efficiency of a new asset must in turn exceed the interest rate by a margin sufficient to compensate both for 'risk proper', and for any liquidity risk of the asset relative to bonds.

In Keynes's short-term analysis, the rate of interest cannot fall below the level at which no investor is confident that a further reduction in the rate will be sustained. In the long term, (although Keynes does not state this explicitly) a minimum rate of interest or liquidity premium can be based only on the fear that a change in the state of long-term expectation will lead bond issuers to default on their obligations. *Pace* Tobin, it is entirely reasonable to have greater confidence in the short-term value of a government's currency than in its long-term credit. A liquidity preference for land or gold over money may emerge if there is insufficient confidence in the currency itself as a standard of value. The fact that this may occur, even if the market for land is not 'liquid' in the conventional sense, helps to make sense of Keynes's reference to its importance in medieval times.

The central argument of this thesis can now be expressed compactly in terms of this definition of liquidity as two propositions.

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<sup>11</sup> The price of parting "with immediate command [over future consumption] for a specified or indefinite period, leaving it to future market conditions to determine on what terms he can, if necessary, convert deferred command over specific goods into immediate command over goods in general" (*GT*:166).

- A. an adverse change in the state of long-term expectation is likely to impose a greater loss upon the reversal of investment in a new industrial asset than of an existing industrial asset;
- B. the new asset will accordingly be valued at a discount to the existing asset in proportion to the scale of the above effect and the strength of the preference of investors for the existing assets as a standard of value.

These propositions depend on the conventional valuation of industrial shares under fundamental uncertainty. In order to demonstrate them, we assume with Keynes that investors value the underlying assets and their prospective yields directly and that capital structure has no influence (no asymmetric information, no divergence of objectives between managers and investors). We also assume that investors expect the market to follow the convention that the value of a particular firm as a whole is a function of the current level and expected growth of its accounting earnings<sup>12</sup>. Expected growth is heavily influenced by the trend of current earnings based on past performance. This relationship is usually expressed as the price-earnings or P/E ratio, and is perhaps the most widely accepted basis for comparing valuations of different companies. We assume investors apply the same P/E ratio to all sources of income owned by the same firm.

It is helpful to discuss valuations in terms of  $q$ , the ratio of the shadow value of an investment opportunity to its supply price, rather than in terms of marginal efficiency. The two measures are closely related, since  $q$  is the ratio of the present value of the prospective yield (discounted at an appropriate rate) to the supply price of an asset. Keynes appears to have preferred marginal efficiency because it is independent of the discount rate, although marginal efficiency has its own problems of non-uniqueness (the same prospective yield can have two or more marginal efficiencies, all of which reduce its present value to zero). For our purposes we are interested in the relative valuation of new in terms of existing assets, so that it is appropriate to use as the discount rate for the calculation of  $q$  the implicit rate required by investors to hold the existing assets. This rate is M&M's 'cost of capital'

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<sup>12</sup> Gordon (1997) would argue that dividends are more important, but the emphasis here is on *current* earnings, which may derive their significance from being an indicator of ability to pay dividends.

(Keynes's rate of interest plus a premium both for 'risk proper' and the liquidity risk associated with the existing assets), so that in equilibrium at the margin  $q = 1$ . If  $q$  is calculated at the 'pure' rate of interest,  $q$  will exceed unity by an amount corresponding to the risk premium.

We assume that managers and investors hold the same best estimate of the prospective yield and we define following Keynes the 'actuarial' value of an asset in relation to its supply price, in the absence of fundamental uncertainty and liquidity preference, as  $q_a$ . Let  $q_c$  be the 'conventional' value of the asset in relation to its supply price, which is a function of its current earnings and the P/E ratio. We assume the market value equals the conventional value, and is what the investor can obtain for the asset at short notice. The actuarial value can be realised only (a) if the investor holds the asset for its full life, or (b) when the prospective yield from the asset has been reflected in current earnings. M&M normally assume  $q_a = q_c$ , since they express the yield of an asset as a perpetual annuity (as does Keynes in Chapter 17), so that its prospective annual yield equals its current earnings and the P/E ratio is the inverse of the cost of capital. This assumes away the problem in hand.

The investor is concerned about the possibility of a change in expectations during the period before the actuarial value is reflected in the conventional value. If  $q_a > q_c$  and expectations change so that  $q_a$  falls to  $q_a' \mid q_a > q_a' > q_c$  (where this expression means  $q_a'$  has the property that it falls between  $q_a$  and  $q_c$ ) the investor cannot realise  $q_a'$  but only  $q_c$ . The anticipated cost of cutting losses and reversing the investment decision ( $q_a - q_c$ ) will be greater than the loss of actuarial value ( $q_a - q_a'$ ). The investor will face a loss equal to the difference ( $q_a' - q_c$ ). If  $q_a = q_c$  and expectations change so that  $q_a$  falls to  $q_a'$  and  $q_c$  falls to  $q_c' \mid q_a' = q_c'$ , the investor will suffer loss but only to the extent of the loss of actuarial value ( $q_a - q_a' = q_c - q_c'$ ). There is no additional loss on account of a lack of liquidity ( $q_a' - q_c = 0$ ). This is Proposition A. It follows directly that given a choice between two assets  $X \mid q_a = q_c$  and  $Y \mid q_a > q_c$ , with equal actuarial values but different conventional values, the investor will prefer X on grounds of liquidity. This preference will be reflected in a discount of Y relative to X, the size of the discount being a function of the size of the potential loss ( $q_a' - q_c$ ) and the *weight* placed upon that potential loss by the investor. This is Proposition B. The discount is a direct corollary of Keynes's liquidity premium  $l$  (strictly, the difference between the two liquidity premia applicable to X and Y),

although in this different formulation it is better expressed as a discount (say  $\theta$ ) to the actuarial value  $q_a$ .

In the formal expression of the model set out in section 6.7,  $\theta$  is treated as an *exogenous* parameter. It cannot be over-emphasised that this does not imply either that the discount is constant or that its behaviour can be reduced to a cardinal function of other variables. As will now be argued, it is simply the difference between the increase in the market value of the firm at the time of an investment decision, and the increase in market value that managers believe will result once the benefit of the investment is reflected in current earnings. This may vary from asset to asset, from firm to firm, and from time to time.

It remains to be shown why X and Y should correspond to the existing and new industrial assets in Proposition A. Is there any systematic tendency for the actuarial and conventional valuations of new industrial assets to diverge more than do those of existing industrial assets? It is useful first to consider the main exceptions, the acquisition of another business and the purchase of premises. The acquisition of another business represents existing assets similar to the firm's own assets, and more importantly, the prospect of a stream of future revenue. The conventional valuation ratio placed on the target's revenue will either be the same as for the firm's existing revenue, or differ by a determinate multiple reflecting any differences in the nature of the business and sector ratings. Any changes in the conventional valuation will tend to affect equally the value of both the firm's existing and newly acquired assets.

The purchase of premises generates an immediate net income yield in the form of rental, whether by saving existing outlay or generating new revenue. The valuation of such property is conventional, usually expressed in terms of rental yield or years-purchase. There is no reason to expect major divergence between the effects of a change in the state of long-term expectation on the conventional valuations of an industrial property and of the firm's existing assets.

By contrast, an ordinary industrial asset does not directly generate a rental but represents simply a production cost (fixed assets differing only in being consumed over more than one accounting period) whose value is realised only through sales of finished goods or services. The realisation of this value depends on the asset being employed in combination with the other resources of a 'going concern'. A financial

investor can place no conventional value on the asset in isolation. An industrial investment decision, whether or not it involves fixed assets, may involve greater uncertainty but otherwise is no different in kind, only in degree, from any other major production decision. It is of the same kind as the decisions to employ a new key person, to appoint a major new contractor, to adopt a new product design, or to organise production by a new method. It is hard to envisage the stock market placing a value on a training course for a human resources manager.

This analysis leads to an important distinction between cost-reducing and sales-generating investment. Much investment is made to reduce the costs associated with delivering an existing stream of sales. Such opportunities arise from the growth of demand and from technological change, and include bringing in-house work previously contracted out, or replacing existing technology. Alternatively, investment is also made in order to generate or capture sales, particularly although not exclusively relevant when product markets are not perfectly competitive. This includes product innovation, with its related direct and equipment costs, but also advertising and distribution costs, and investment in new inventories. The polar example is the start-up of a new business, where a period of trading losses may be a necessary investment before a profitable level of sales can be reached.

Fundamental uncertainty applies to both kinds of investment, but as a tentative generalisation it would appear that cost-reducing investment has the advantage of creating an immediately visible increase in the stream of net revenue of the business as a whole, provided the new technique itself is well-proven. Sales-generating investment is an altogether more doubtful proposition. Even in a perfectly competitive Marshallian product market there is scope for misjudgement of consumer preferences and the rate of matching innovation by competitors, and major innovations in product or process always have unpredictable results. This is a particular problem if there is any significant 'gestation' period between the investment and resulting sales revenue.

In terms of the earlier analysis the actuarial and conventional valuations of cost-reducing investment will tend to be close together. As with property, the net revenue from such investments is quickly reflected in the conventional valuation of the firm's shares. In the case of sales-generating investment, a divergence between the two valuations is to be expected during the gestation period, which in some cases

may be several years. This analysis suggests that the reference to new industrial assets in Proposition A must be construed as referring in general only to sales-generating investments. It remains to be shown why such a ‘new asset discount’ would result in a new issue discount, since the investment decision should affect the value of the existing shares, however the new asset is financed. To this task we now turn.

## **6.6 The new asset discount and the new issue discount**

Keynes consciously avoided relating the investment decision to the form of finance, preferring to conduct his argument solely in terms of the marginal efficiency of the asset and the ‘pure’ rate of interest. The difficulty he faced is that the relevant differences in liquidity relate to the assets, not to the manner of their finance. If new assets are valued at a discount to old assets for the reasons set out in the previous section this merely increases the marginal efficiency required to induce investment in the new asset. In terms of market value, the value of the firm increases (or decreases) as  $q_c$  is greater or less than unity. This does not in itself create a new issue discount.

To make the link between the new asset and new issue discounts requires us to drop Keynes’s abstraction from the difference between managers and investors. Keynes clearly wished to conduct his argument at as high a level of abstraction as possible, but he was conscious of this distinction and indeed recognised it as the hallmark of the development of organised investment markets. Only if the difference is fully recognised can a distinction be made between the marginal and average cost of capital.

Unlike managerial theory and the agency model, which place their emphasis on a divergence of objectives, the point here is a difference in confidence, in the weight placed upon the potential loss arising from a change in the state of long-term expectation. In the terms used above, managers have a lower  $\theta$  than external investors for a given potential loss ( $q_c - q_a'$ ). This difference can be understood in terms of the defining characteristic of the entrepreneur:

“Enterprise only pretends to itself to be mainly actuated by the statements in its own prospectus, however candid and sincere. Only a little more than an expedition to the South Pole, is it based on an exact calculation of benefits to come. Thus if the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a



mathematical expectation, enterprise will fade and die; - though fears of loss may have a basis no more reasonable than hopes of profit had before.” (Keynes, *GT*:162)

Schumpeter notes that the entrepreneur “has no function of a special kind ... simply does not exist” within the ergodic system of general equilibrium<sup>13</sup> (Schumpeter, 1934:76). The distinctive characteristic of the entrepreneurial decision is that:

“everything depends upon intuition, the capacity of seeing things in a way which afterwards proves to be true, even though it cannot be established at the moment, and of grasping the essential fact, disregarding the inessential, even though one can give no account of the principles by which this is done.” (1934:85)

The defining role of the entrepreneur is to create “new combinations” (1934:65), to initiate a process of creative destruction (*cf* 1934:252-255), making decisions which are crucial in Shackle’s sense and literally change the world. To adapt Keynes’s phrase, the entrepreneur acts today to create the future. This difference in “animal spirits” can explain a difference in confidence between managers and investors even on the strong assumption that both share the same actuarial valuation of the investment opportunity.

The nature of the confidence that investors have in turn to place in managers under fundamental uncertainty sheds a different light on the agency problem. Schumpeter recognises that the entrepreneurial function, while distinct, is inevitably combined with other roles such as that of manager or investor (Schumpeter, 1934:77). An illuminating modern example of this overlap is the venture capitalist (VC) firm. Much of the finance and effort of such firms is directed towards acquisitions and financial restructuring such as leveraged buy-outs, but a certain proportion is directed towards capital formation, particularly by innovative firms. In both cases the VC firm usually brings specialist knowledge of particular industries, which helps it judge proposals from an industrial perspective. Perhaps more important, VC firms often take a majority share either on their own or in concert with similar firms, allowing them to exercise control at a strategic level, and in particular to change the executive managers if necessary.

This perspective leads to a different interpretation of the agency problem. The success of a new investment depends not only upon making a correct judgement of

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<sup>13</sup> Schumpeter does not refer explicitly to ergodicity or general equilibrium but to the ‘circular flow’ of routine transactions within an established configuration of production and exchange.

the inevitably incomplete information available at the time of the initial decision. Success depends also on making the correct decisions in response to new, often unexpected, information as it comes in. Considerable time may elapse before the new investment generates the required return, whether in ploughing, sowing, weeding and feeding, harvest, storage or marketing, to use an agricultural metaphor.

Where the entrepreneur is an agent, not only must the agent have confidence in his own judgement and competence in the face of fundamental uncertainty, the principal in turn must have confidence in the agent. It is reasonable for the principal to be sceptical of the agent's initial judgement, necessarily based heavily on intuition, not because the agent is duplicitous or incompetent but because he or she is fallible. There is also room for scepticism since the "animal spirits and spontaneous optimism" that drive an entrepreneur to make an investment may lead to over-confidence. Finally the determination of an entrepreneur to overcome obstacles, and more generally the head of steam that may build up behind a project, may lead to over-commitment. Managers may fail to recognise the full significance of bad news and to cut their losses when necessary, without any question of bad faith. The VC firm is in a better position than most financial investors both to assess an entrepreneur's judgement and to ensure corrective action is taken when necessary.

The argument for a new issue discount hinges on the *difference* in confidence between managers and investors. It does not require that managers ignore liquidity risk altogether. Indeed, this analysis formalises Kalecki's "principle of increasing risk" and the liquidity element of Keynes's "borrower's risk" as an explanation of a limit to gearing in terms of confidence in the current state of long-term expectation. It also makes clear that investment in financial (including property) assets and in cost-reducing assets will often be financed by debt, since managers perceive the liquidity risk as low in these cases.

Turning to equity, we can now explain a differential new issue discount, which applies to the finance of capital formation but not to the use of equity to acquire financial and property assets, and existing industrial assets. Nor indeed will such a discount apply to the refinance of existing debt with equity, given the assumption of no asymmetric information, so that the issue is not a signal of bad news.

The bulk of industrial capital formation is undertaken by large corporations, whose managers control the business and investment decisions and financial investors own

most of the shares. Fundamental uncertainty, through conventional valuation and liquidity preference, leads investors to discount the value of new assets that do not generate an immediate income yield, relative to the value of the existing assets represented by the value of the firm's shares. This discount is a function of the potential loss from a change in the state of long-term expectation and the weight placed upon that loss. It corresponds directly to the liquidity element of the premium for lender's risk in *The General Theory*, subject that the premium is relative to the cost of capital rather than the rate of interest. Managers and investors place different weights on this liquidity risk, managers usually a lower weight based on the optimistic spirit required of entrepreneurs. This difference does not reflect a divergence of objectives or asymmetric information: managers are assumed to act in the interests of existing investors, and both are assumed to share the same actuarial valuation of the new asset given the current state of long-term expectation.

In these circumstances, a decision by managers to invest in a new industrial asset is reflected in a fall in the share price, which may be a fall in absolute or relative terms. An absolute fall means an objective fall in the share price expressed in nominal money terms. A relative fall means a fall relative to the management valuation, which cannot be observed directly. Faced with this potential fall in the share price, the managers' decision to invest will depend upon the availability of financial slack. The availability of internal finance allows managers to invest, confident that the share price will rebound, once the temporary discount is eliminated. Existing investors will eventually derive the full benefit of the new asset. On the other hand, if internal finance is not available, a new issue has to be made at the discounted share price, resulting in a permanent dilution, whether in absolute or relative terms. If managers act in the interests of existing investors, this will be avoided. Investment opportunities that would be profitable at the average cost of capital implicit in the market value of the company's existing assets ( $q_a > 1$ ) may be passed up. Exceptionally profitable opportunities, that do not produce absolute dilution, face a wedge between the marginal and average cost of capital in the form of relative dilution, which rises with the profitability of the opportunity. This extra cost puts a premium on financial slack, and provides another reason for delaying investment where possible, in addition to the value of any real option.

At this point we have returned full circle to M&M's acknowledgement of the possibility of a temporary divergence of view between managers and investors, when protesting that financial invariance does not mean financial irrelevance. They note that the market places "very heavy weight on current and recent past earnings when forming expectations as to future returns" (M&M, 1958:292) and reach a similar conclusion to the present one, as to the value of financial slack. Their argument is couched in terms of what we have called relative rather than absolute dilution: "[the issue] price may fail to capitalize the new venture" (M&M, 1958:292). In the footnote, they concede that relative dilution may lead existing investors to pass up a profitable opportunity but suggest this would only happen in small or new firms (M&M, 1958:292, fn 52).

M&M appear to assume that managers and investors always agree that the new asset will yield *at least* the average cost of capital, so that the question of absolute dilution does not arise. Yet, if a divergence of view is possible at all, it need not be limited only to the degree by which the return on the new asset *exceeds* the average cost of capital. There is no reason why it should not lead to investors placing a negative present value on the new asset and marking down the share price.

M&M do not make explicit why this 'imperfection' is likely to be of significance only for small or new firms. A plausible explanation is that such firms are associated both with high returns and limited availability of information. This leaves room for considerable scepticism on the part of investors about the high returns predicted by managers, in other words a divergence of actuarial valuations. Two consequences follow from the relative size of the new asset and the question of control. If the cost of the new asset is large compared with the assets-in-place, the relative dilution may transfer most of the 'quasi-rent' to the new investors. The existing investors, for example founding entrepreneurs, may require a far greater return than the average cost of capital for their firm's risk class to compensate for their undiversified risk and for their innovation. Secondly, if the cost of the new asset is relatively large, relative dilution may require the sale of so large a share of the equity that voting control passes from the existing owners. On both these counts, the investment opportunity may not be worth the trouble.

These two concerns do not apply to large corporations, suggesting that the assumption of an elastic supply of equity remains generally appropriate. If the

problem of a confidence differential were relevant only to exceptionally profitable projects and small firms it would indeed be of secondary importance. Yet this conclusion neglects the possibility of absolute dilution arising from liquidity preference. Assets which offer profitable but *unexceptional* returns may be particularly vulnerable to absolute dilution since it requires only a low degree of investor scepticism to tip the balance.

In these circumstances M&M's ranking of the exception and the rule is reversed. Exceptionally profitable opportunities that cannot be postponed because of the threat of competition may justify a new equity issue, as observed by Meyer and Kuh. New issues to finance more normal opportunities will result in absolute or relative dilution, and therefore be avoided if managers act in the interests of investors.

This conclusion relies solely on fundamental uncertainty. If the assumptions of perfect competition in securities markets and shared information are relaxed, it is to be expected that the new issue discount will be still greater. Furthermore, the bias against the use of new issues for capital formation may itself become a convention embodied in the practices of the investment banks that control the new issue process.

## 6.7 A formal model

The above ideas can be embodied in a formal model that allows the degree of absolute and relative dilution to be expressed in terms of parameters. The advantage of using the model is that it highlights clearly the importance of relative dilution when absolute dilution is not a problem.

Let  $V_o$  be the value of the original shares that corresponds to the value of the assets-in-place,  $A$ . Let  $I$  denote both the value of the new equity issue and the cost of the new asset or investment opportunity. Let  $q$  be the actuarial value of an investment opportunity with unit cost and  $\theta$  the liquidity discount which investors apply to it ( $0 \leq \theta \leq 1$ ). Managers and investors place the same value on the assets-in-place. We assume for simplicity but without loss of generality that managers apply no liquidity discount.

Let  $V^A$  be the market value of the company when the new issue is made. Then

$$V^A = A + (1 - \theta)qI = V_o^A + I$$

where  $V_o^A$  represents the market value of the old shares. From this follows an expression for  $\delta_A$ , being the addition to the supply price of the issue from the absolute dilution of the old share value,

$$\delta_A = \frac{V_o - V_o^A}{I} = \frac{A - [A + I(q(1 - \theta) - 1)]}{I} = 1 - q(1 - \theta)$$

This expression shows why in the neoClassical case where  $\theta = 0, q = 1$  an issue creates no absolute dilution ( $\delta_A = 0$ ). Furthermore, the size of the issue ( $I$ ) does not enter the formula. Therefore any dilution (or appreciation, because of the profitability of the new asset) is constant as a proportion of size and implies a downward (or upward) sloping linear relationship between the share price and the size of issue, other things being equal.

When  $\theta = 0$ ,  $V^A = V^{\max}$  so that

$$V^{\max} = A + qI = V_o^{\max} + I$$

The value placed by managers on the old shares after the issue, which initially exceeds their market value  $V_o^A$  because managers apply no new asset discount, is  $V_o^R = V^{\max} \left( \frac{V_o^A}{V^A} \right)$ . This value is less than  $V_o^{\max}$  because it takes account of the reduced proportion of the value of the firm represented by the old shares, after the issue at the diluted market value.

From this follows<sup>14</sup> an expression for  $\delta_R$ , the relative dilution cost perceived by managers, being the addition to the supply price of the issue arising from the loss of existing shareholder value relative to the case where  $\theta = 0$ :

$$\delta_R = \frac{\theta}{(1 - \theta + \omega)}, \text{ where } \omega = \frac{A}{qI}$$

This relative dilution cost is also the value of financial slack, the saving arising from having sufficient cash available to finance the new asset without recourse to a new issue. Differentiating these expressions for  $\delta_A$  and  $\delta_R$  with respect to  $q, \theta$  and  $I$  produces the following partial derivatives

$$\frac{\partial \delta_A}{\partial q} = -(1 - \theta) \leq 0$$

$$\frac{\partial \delta_A}{\partial \theta} = q \geq 1$$

$$\frac{\partial \delta_R}{\partial q} = \frac{\omega \theta}{q(1 - \theta + \omega)^2} \geq 0, \quad \frac{\partial^2 \delta_R}{\partial q^2} = \frac{-2\omega \theta (1 - \theta)}{q^2 (1 - \theta + \omega)^3} \leq 0$$

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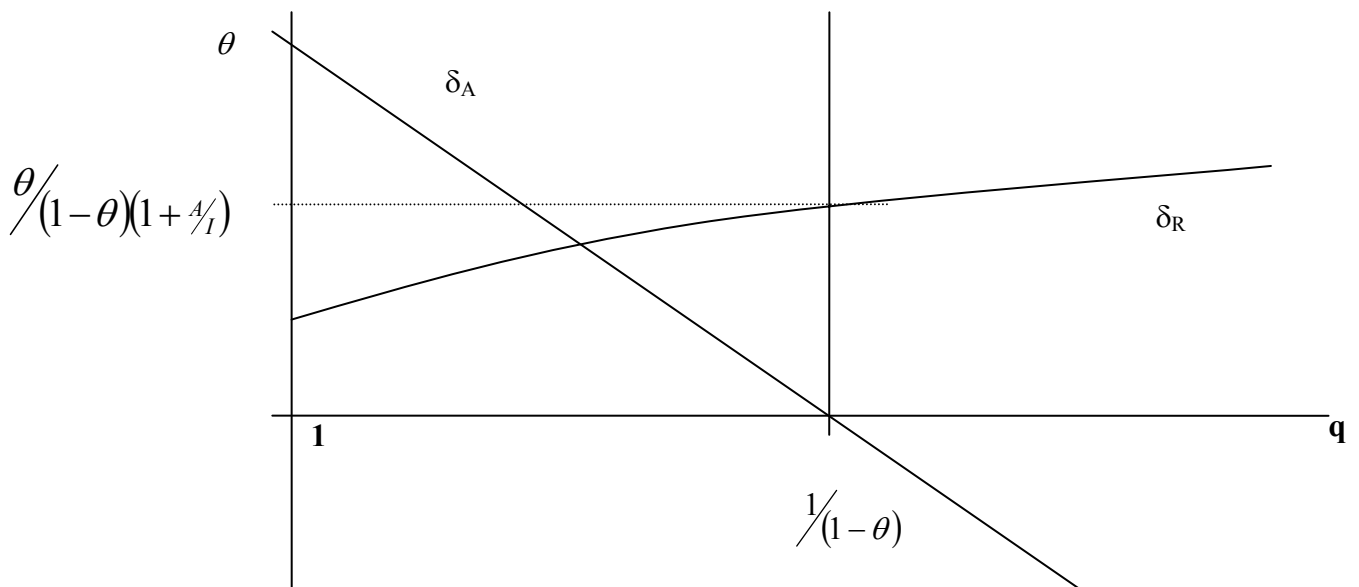
$$\begin{aligned} \delta_R &= \frac{V_o^{\max} - V_o^R}{I} = \frac{V_o^{\max} - V^{\max} \left( \frac{V_o^A}{V^A} \right)}{I} = \frac{V_o^{\max} - I - V^{\max} \left( \frac{V_o^A}{V^A} \right)}{I} \\ &= \frac{V^{\max} \left( 1 - \frac{V_o^A}{V^A} \right)}{I} - 1 = \frac{V^{\max}}{V^A} \left( \frac{V^A - V_o^A}{I} \right) - 1 = \frac{V^{\max}}{V^A} - 1 \\ &= \frac{A + qI}{A + qI(1 - \theta)} - 1 = \frac{\theta}{\frac{A}{qI} + (1 - \theta)} \end{aligned}$$

$$\frac{\partial \delta_R}{\partial \theta} = \frac{(1 + \omega)}{(1 - \theta + \omega)^2} > 0$$

$$\frac{\partial \delta_R}{\partial I} = \frac{\omega \theta}{I(1 - \theta + \omega)^2} \geq 0$$

These expressions confirm the intuitions that absolute dilution ( $\delta_A$ ) is directly proportional to the discount investors apply to the value of new assets ( $\theta$ ), and inversely proportional to their profitability ( $q$ ). Relative dilution ( $\delta_R$ ) is a non-linear increasing function in both these parameters and also in the size of the issue ( $I$ ). The qualitative relationships between dilution and the profitability of the new asset are shown in the following diagram.

Absolute dilution ( $\delta_A$ ) falls from  $\theta$  to zero as the profitability of the new asset increases from  $q = 1$  to reach the threshold value  $\frac{1}{1 - \theta}$ . However at this point relative dilution ( $\delta_R$ ) has reached the value  $\frac{\theta}{(1 - \theta)(1 + \frac{A}{I})}$ , providing a continuing disincentive for the issue.



**Figure 6-1 Absolute and relative dilution against shadow value**



## 6.8 Calibrating the model

Quantitative estimates of the parameters can be derived from the data in Asquith and Mullins (1986) subject to the major caveat that this requires aggregating  $\theta$  across issues and assets. The mean primary issue was 12.5% of the original share value, and the mean observed absolute dilution cost ( $\delta_A$ ) for industrial issues was 31%. These figures are consistent with a value for  $\theta$  of 50% and for  $q$  of 1.38, and imply a figure for  $\delta_R$  of 8%. This value of  $q$  implies a plausible IRR (internal rate of return) of 20% for an investment with a level payback over 5 years, given a discount rate of 6%. These values of  $\delta_R$  and  $q$  mean a loss to the old investors of 21% of the net present value of the investment opportunity. However the value of  $\delta_R$  is insensitive to changes in  $q$ , within a plausible range for the latter, so that this loss is relatively fixed and becomes less important as  $q$  rises above the absolute dilution threshold. A value for  $q$  of 2.0 (corresponding to an IRR of 40% on the above basis) sees the loss reducing as a proportion from 21% to 11%. This suggests new issues may be in the interests of old investors when investment opportunities are exceptionally profitable and may evaporate if the firm waits to accumulate sufficient cashflow to finance them.

For utilities the mean observed  $\delta_A$  was 12%, implying a lower value for  $\theta$  of 36% and for  $\delta_R$  of 6%, assuming the same value of  $q$  for both industrial and utility issues. A lower value of  $q$  for utilities implies a still lower value of  $\theta$ . This lower new asset discount may reflect the greater assurance of returns on new assets in regulated industries, consistent with the hypothesis that the discount reflects fundamental uncertainty.

All these quantitative results, while not inconsistent with the proposed explanation, reflect some bold assumptions and must accordingly be treated with caution. However this explanation illuminates directly the differential between the discounts of industrial and utility issues, which for Asquith and Mullins is something of a puzzle (1986:83). On the other hand this theory does not explain the far greater discount (mean 78%) associated with the sales of existing shares by insiders in registered secondary offers. Asymmetric information (or the perception that it exists) may yet be relevant in these cases, since (unlike primary offers) such sales convey a signal only of the decision to sell, with no offset by a new investment opportunity.

## **Chapter 7 Empirical evidence from individual new issues**

Chapter 5 put forward macroeconomic evidence consistent with a general finance constraint on investment based on the anomaly of an absence of equity finance for capital formation. Chapter 6 has advanced a theory of a differential new equity issue discount that would explain this anomaly under a regime of competitive equity markets. This explanation implies that new issues are deterred by the absolute or relative dilution that would be imposed on existing investors if the issues took place.

This chapter sets out to test this explanation against the empirical evidence. It is not always possible to estimate the theoretical parameters of the alleged dilution empirically, since an event deterred cannot be observed. It is clear from Asquith and Mullins (1986) that dilution does take place when new issues are in fact made to finance capital formation. On the other hand we are mainly interested in the case where the finance constraint is not relieved. The hypothesis is therefore put in the indirect form, that when a new issue takes place, it will be used to finance acquisitions or other assets to which the new issue discount does not apply, rather than capital formation. As explained in Chapter 4, this is an example of the retrodictive method, working back from individual instances of new equity issues to check for the trigger conditions or events required if the mechanism operates as postulated. If the investigation throws up counter-examples, these may either discredit the hypothesis or throw light on other mechanisms and tendencies at work.

The dataset for this study is the published annual reports and accounts filed by 217 UK companies with Companies House for the five accounting periods from 1997 to 2001. The investigation proceeds in three stages. The first quantitative test filters out about half the sample, by using the cash flow statements to establish that the equity issue could not have been used to finance capital formation. The second stage is a detailed quantitative analysis of the application of the proceeds of 69 new issues over £5m revealed by the notes to the accounts. The third stage is a more qualitative study of 35 cases where the possibility that the issue was made to finance capital formation cannot be ruled out by the first two stages.

The third stage reveals a number of mechanisms at work alongside the one under test. 75% of the issues are accounted for by ‘bubble’ stocks, Initial Public Offerings (IPOs) or trade investors. Only six issues in 1999 were made as seasoned equity

offerings to financial investors in order to finance irreversible investment in physical capital because of exceptional opportunities. A further three companies which raised equity for other purposes in 1999, but for capital formation in other years, are also included as further examples.

## **7.1 The sample**

The sample is defined as 217 new equity issues in excess of £1m made during 1999 by independent industrial companies listed on the London Stock Exchange. The sample was drawn from the FAME CD-ROM database (issued March 2003) compiled by Jordans from UK Companies House data. The sample represents the entire population for the year of 243 companies with the exception of 16 registered in Ireland (which did not have the cashflow data), together with six mis-allocated financial services companies, three in liquidation and one listed only in 2002.

Each company published a 5-year run of cashflow statements, including 2 years either side of the issue, which was used to address the possibility that a new issue related to past or future capital formation. 1999 was selected as the first year for which such a series is available (see below).

The definition of 'industrial' excludes agriculture, forestry, hotels & restaurants, real estate, rental of machinery and other equipment, and financial intermediaries. The hypothesis cannot be rejected by evidence of new issues made to acquire existing capital assets (including land) or financial assets, with which it is fully consistent.

All companies were listed on the London Stock Exchange and were ultimate holding companies throughout the 5-year period straddling the issue. This criterion eliminates issues made by subsidiaries and joint ventures of other companies, and usually indicates that the issues were made to financial investors (but see below).

The convention adopted by Jordans for dealing with companies' different financial accounting periods is that firms with an accounting period between 30 April and 31 March are allocated to the calendar year in which the accounting period begins. Where the year-end is 31 December, the Jordans year and the accounting period coincide. An accounting period ending 31 March 1999 is allocated to 1998. This is not a problem for this study because the main quantitative tests are based on the data

for the individual firms, not the aggregate total. Where reference is made to the accounts the year relates to the actual financial year-end and not the Jordans year.

A full reconciliation of the sample is set out in Table 7-1. The categories are explained in the following sections.

## 7.2 The cashflow data

This study has only become possible since the introduction of the revised edition of Financial Reporting Standard FRS1 in 1996, which took effect for accounting periods ending on or after 23 March 1997. This required for the first time the separation of the acquisition and disposal of businesses from that of fixed capital goods. Prior to then, both were aggregated as 'investing activities' which is all that is required by International Accounting Standard IAS7.

Table	Jordans database 1999 > £1m	243
7.7	Excluded: Ireland	(16)
7.7	Excluded: financial services	(6)
7.7	Excluded: liquidation	(3)
7.7	Excluded: listed 2002	(1)
		<u>217</u>
7.6	Stage 1	<u>105</u>
	Stage 2	<u>112</u>
		<u>217</u>
	Issue < £5m	43
	Issue > £5m	69
		<u>112</u>
7.8	Options only	12
7.9	Acquisitions	42
	Operating finance	35
	less included in 8.9	(20)
		<u>69</u>
7.10	bubble stocks	20
	other IPOs	2
	trade/VC investor	4
7.2	equity raised in 1999	6
7.2	equity raised in other years	3
		<u>35</u>

**Table 7-1 Analysis of sample**

The Jordans database includes the main headings of the standard cashflow statement as follows:

Net cash inflow from operating activities

Returns on investment and servicing of finance

Taxation paid

Capital expenditure and financial investment

Acquisitions and disposals

Equity dividends paid

= Net cash inflow before use of liquid resources and financing

Within financing, the cash contribution from new equity issues is disclosed separately.

The availability of this accounting data and in particular the split between expenditure on acquisitions and fixed capital goods is indispensable for a conclusive test of the hypothesis. However there are two points of departure in the accounting headings from the economic concepts. First the definition of cashflow from operating activities includes movements in net trade credit (the balance between debtors and prepayments on the one hand, and creditors and accruals on the other) and in stocks or inventories. Trade credit is not, and stock building is, part of capital formation. Provided changes in the balance of trade credit are not material, this difference in treatment is eliminated when capital expenditure is deducted from cashflow from operating activities, along with returns on investment/servicing of finance, taxation and equity dividends, to give a measure of 'net cashflow' for the present purposes. This differs from the 'cashflow' used throughout this dissertation by the deduction of capital expenditure. The net cashflow measure is a key criterion for the following investigation.

Capital expenditure does not correspond to fixed capital formation since the accounting treatment includes the acquisition of existing physical assets. Similarly, accounting losses may represent economic capital formation such as R&D and human resources. However, a positive net cashflow (as defined) is conclusive evidence that any capital formation in the accounting period, whether tangible or intangible, capitalised or not, has been financed by operating cashflow or the disposal of existing assets, and not by the equity issue. This forms part of the test in the first stage of investigation.

The second difference between the headings in the cashflow statements and the economic variables is in identifying the contribution of equity issues. The cashflow statements show only the cash contribution. A more comprehensive measure is the increase in the share capital and share premium reserve account between the two balance sheets in each year. It is true that capital formation is likely to be financed only from cash issues (our main interest here), but the wider measure includes the detection of new issues made as paper consideration to finance acquisitions. This helps to establish those events that trigger new issues, as well as those that do not.

### **7.3 The first stage tests**

For each company the net cashflow, net acquisition expenditure and equity issued were calculated for each year, and then summed for the full 5-year period. A positive net cashflow for the full period allows the conclusion that the equity issue in the central year (1999) cannot have related to the finance of capital formation, either in the year of issue or in the 2 years before or after.

Where the 5-year net cashflow is negative, a further simple test is possible to eliminate the possibility that the equity issue was used to finance capital formation. If the cumulative value of net acquisitions exceeded the sum of the equity issues and the increase in long-term debt over the 5-year period, this is conclusive evidence that the equity was not available to finance capital formation. The change over the 5-year period in long term debt outstanding can be calculated from the opening and closing balance sheets.

This is a conservative test, since it assumes that any increase in long term debt is related to the finance of acquisitions, although in practice it is as likely to have been raised to finance capital expenditure. Conversely, it is reasonable in those cases where 5-year net cashflow was negative to offset the equity issues against the net value of acquisitions (net of disposals and the increase in long-term debt) since acquisitions are discretionary. It does not seem likely that a company would issue equity to finance a net cashflow deficit and then choose to increase the deficit by making an acquisition. On the other hand it might well choose to finance an acquisition partly by means of a new issue because of a net cashflow deficit.

On the strength of these two simple criteria, it is possible to exclude 105 issues from the finance of capital formation. These are listed in Table 7-6 of Appendix 7-A. This leaves 112 issues (52% of the original 217) for examination in the second stage.

It may be objected that this test neglects the possibility that equity issues financed a net cashflow deficit in one or more years, which was offset by surpluses during the rest of the 5-year period. It is true that if the test is limited to companies that were in surplus in every year, 59/105 fail to be caught by the filter. The implicit assumption behind the test is that companies will not use permanent capital to finance short-term deficits unless their solvency is in question, which is a separate reason for a new issue additional to the finance of capital formation. Companies with cashflow deficits over the full 5-year period are only filtered out if the new equity was wholly absorbed by acquisition expenditure, so that the equity could not have been used to finance a net cashflow deficit in any year. In all the other cases, the companies generated a net cash surplus over the 5-year period, so that any annual deficits could be financed either from cash balances or by short-term borrowing.

#### **7.4 The second stage tests**

The next step is to consider those companies with negative net cashflow that made new equity issues that were not wholly absorbed by net acquisition expenditure. It is not possible to determine from the cashflow statements whether the equity was applied to capital expenditure or acquisitions. The equity could have been applied to acquisitions since the first test may have assumed wrongly that the increase in long-term debt was used for acquisitions. The new issues may also have taken place for reasons unrelated to capital formation, as we shall see.

The question can be settled only by an inspection of the detailed published financial statements, which was the most time-consuming element of this research. Financial statements were obtained for all 69 companies that made issues in excess of £5m, the majority as hard copies, and a few from web-sites, a total of nearly 350 annual statements. In all but one or two cases it was possible to obtain the full 5-year record and those omissions did not affect the results. The assumption is that the omission of the remaining 43 smaller issues does not bias the conclusions. Our main interest is aggregate investment: these 69 companies accounted for £46.4bn of the

calculated equity finance in 1999 (£3.3bn excluding Vodafone) and the remainder for £118m.

On the strength of a detailed analysis of this data, the issues made by the 69 companies were placed in three categories: 'options, etc', 'business acquisitions' and 'operating finance'. Although a company was selected because it made a new equity issue over £1m in 1999, it might have more than one issue in the same year or during the 5-year period, and an issue might fall into more than one category.

All companies made issues upon the exercise of options and similar transactions. As well as executive share option schemes, this category includes employee share option and profit-sharing schemes. It also includes the exercise of options and warrants granted in connection with loan or preference share finance. 12 companies issued equity only in connection with options.

Issues in connection with business acquisitions includes both vendor consideration (paper for paper), placings or rights issues made directly to finance the specific acquisitions, and in a few cases, issues stated explicitly as made to finance past or future acquisitions which are corroborated in the financial statements. 22 companies issued equity only in connection with acquisitions and options.

The final category is the residual (35 cases) where the possibility that equity was issued to finance capital formation cannot be excluded on the basis of the raw data. 15 companies raised equity solely for operating purposes and options. In the other 20 cases the finance raised for operating purposes was part of a larger package involving a business acquisition.

Table 7-8 and Table 7-9 in Appendix 7-A list in descending order by size of issue respectively the companies that issued equity only upon the exercise of options, and those that made issues also to finance acquisitions (though not operations). The rationale for these categories is that the first two, options and acquisitions, clearly do not relate to capital formation. The value of an option is in the potential profit on its exercise, accompanied as it usually is by the immediate sale of the acquired shares.



It is regarded as a form of additional remuneration, whether to employee or creditor, rather than a source of finance<sup>15</sup>.

The use of new equity issues to finance business acquisitions is consistent with both the hypothesis under review and the neoClassical model, so cannot discriminate between them. This brings us to the third stage of the investigation, which requires a more qualitative assessment of the circumstances of each new issue.

## **7.5 The third stage: individual case studies**

The 20 of 35 issues related to operating finance labelled as ‘bubble’ stocks are listed in Table 7-10 in Appendix 7-A. The defining characteristic of these firms is that they had significant negative gross cashflow (before interest, which in most cases was a receipt, since borrowings were low or non-existent), in the year of issue and subsequently. Often they explicitly depended on further issues of equity to remain in business. They were found in or closely related to the biotechnology & pharmaceutical and TMT (‘technology, media and telecommunications’) sectors, which experienced extreme changes in valuation ratios between 1997 and 2000. Their combined net cashflow deficit for the 5 years 1997-2001 was some £900m out of a total of £4.4bn for the 36 firms.

The ‘bubble’ stocks shed no light on the hypothesis because it is likely that investors were heavily influenced by speculative considerations, as indeed were managers (9/20 were Initial Public Offerings). Seven of the remaining 11 were bio-pharma firms in which investors provided R&D finance that would normally come from the cashflow of large pharmaceutical firms. The collapse of the bubble has lead most of these firms to revert to deals with such trade investors. The median number employed by these ‘bubble’ firms in 1999 was only 157 and none exceeded 500.

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<sup>15</sup> Even in the case of convertible loans or preference shares, the downside value of the security (if the option is not exercised) does not depend on the valuation of the new asset. Convertible securities may indeed be an attempt to overcome the problem of the new issue discount, but they bring with them the obligations of debt. They will not usually be attractive to companies, except perhaps where there is a mismatch between borrowing capacity as measured by collateral and by ability to service debt, and the option strike price is sufficiently high.

There were two cases of IPOs other than by ‘bubble’ firms, Kingston Communications (telecommunications) and The Peacock Group (retail). These also shed no light on the hypothesis since the value of a listing to the existing shareholders, in terms of the marketability of their holdings, outweighs any dilutive effect of the associated equity issue.

Four other firms received investment from trade investors including VC firms. Premier Oil and JKC Oil & Gas both received support from oil companies, and in the latter case, the State of Ukraine. Laura Ashley was rescued from insolvency by Malayan United Industries. Colt Telecom, which accounted for about 50% of the 5-year net cashflow deficit of all 35 companies (£2.1bn) and of the equity issued, is a venture capital start-up controlled and backed by the largest US mutual fund group, Fidelity Investments, together with other institutional investors. The decisions to issue and subscribe equity in these cases were made from the perspective of managers rather than normal external financial investors.

This leaves nine cases where equity has been issued by way of seasoned equity offering to finance capital formation in apparent contradiction of the hypothesis under test. In fact, only six of these cases relate to issues made in 1999. The remainder raised equity for other purposes in 1999, but for capital formation at other times during the period 1997-2001. The method of evaluation is a qualitative individual case study. The companies and their basic data are listed in Table 7-2.

Cumulative over 5 years:	New equity	Long term debt increase	Net (acquisitions) /disposals	Net cashflow	FTSE sector	staff
AMEY plc	144,484	130,360	(114,051)	(26,827)	support	5,629
BIG YELLOW GROUP plc	78,501	19,938	(28)	(73,230)	support	56
FILTRONIC plc	126,276	114,760	(75,204)	(136,099)	hardware	2,900
FITNESS FIRST plc	97,991	99,623	(20,613)	(147,055)	leisure	1,138
GOLDSHIELD GROUP plc	21,456	2,675	(10,729)	(8,332)	pharma	223
HIT ENTERTAINMENT plc	216,042	210	(177,577)	(33,177)	media	70
HOLMES PLACE plc	86,421	116,987	(22,272)	(163,066)	leisure	1,616
MICE GROUP plc	16,494	26,498	18,647	(21,173)	support	704
TRAFFICMASTER plc	68,490	10,550	(11,372)	(67,263)	transport	146
	856,155	521,601	(413,199)	(676,222)		

**Table 7-2 Summary of cases in third stage**

### *Amey plc*

Listed under support services, Amey (with 5,629 employees at the time of the issue, 1999:42) is engaged in major capital projects in the public and private sectors, including rail and other transport infrastructure such as the London Underground. In the year ended 31 December 1999, Amey issued £102m in equity (1999:48) which corresponded to the £102m cost of acquiring IT Counsel Ltd and Comax Holdings Ltd (1999:46). A rights issue specifically to finance the Comax acquisition raised £67m before costs of £2m. Paper consideration amounted to £23m, included £2m deferred in shares. A Qualifying Employee Share Trust (QUEST) took up £11m, of which £8m came from the company (1999:51).

This is clearly a case of business acquisition. However Amey also made issues in 2000 and 2001. The 2001 issues totalled £18m (2001:58) of which £12.5m was consideration for acquisition of MNN Holdings Ltd (2001:51), £5.2m came from the company as a QUEST contribution and the balance was employee options. In 2000, an interest in a joint venture BCN Data Systems Ltd was acquired for £15m, funded from the £42m net proceeds of a placing (2000:20). Shares were issued for £6m to QUESTs and by way of employee options (2000:47).

The 2001 issue again related to an acquisition. However the 2000 issue raised £27m for operating finance, equal to the 5-year net cashflow deficit. The reason given by the finance director was “to augment general working capital in anticipation of further PFI contracts” (2000:20). The full significance of this became clear in the 2001 accounts, when the accounting policies were changed to reflect new standards on cost and income recognition on PFI (Private Finance Initiative) contracts, reducing profit before tax by £31m. Together with further accounting changes to recognise pension deficits, the effect of new standards was to reduce shareholders’ funds by £46m (2001:60). The company had a credit line of £200m (2001:27), net assets (after the issue) of £130m including goodwill of £180m (2001:41), and so a deficit of net tangible assets of £50m. It is reasonable to conclude that the 2000 placing was made in response to the change in accounting standards in order to protect the company’s solvency and meet the requirements of its lenders (2001:27).

### ***The Big Yellow Group***

Listed under support services, this company was established in 1999 to introduce the US concept of consumer-friendly self-storage of furniture and office archives to the UK. It employed 79 (2002:30) in the year ended 31 March 2002, when it raised £23m (net) by way of placing and open offer in May 2001 subsequent to an IPO in May 2000 which raised £44m (net). The start-up had been funded by an American investment institution (Prudential, 2000:1). Its initial strategic target was to establish a network of 50 stores. By the year ended 31 March 2003 it had opened 32 stores (2003:2), achieved a positive gross cashflow (2003:27), declared its first dividend and repurchased 14% of its equity (2003:5). Its funding strategy switched from equity to debt in 2002 (2002:12) in line with the growth of cashflow and freehold collateral (2002:5). The Chairman stated “should we wish to expand at a rate faster than that sustainable by our cashflow or a comfortable level of gearing ... further stores could be developed in partnership with third parties” (2003:5)

The placing valued the company at a reasonable £137m, about 1.8 times shareholders’ funds (2002:23,36), and did not reflect bubble conditions. The business is best considered a specialised property developer and investment company, with the ultimate source of its revenue being the rental of space.

### ***Filtronic***

Listed under information technology hardware, the company designs and manufactures microwave components for mobile telecommunications. It employed 2,900 in the year ended 31 May 2000, when it raised £75m by a rights issue to fund capital expenditure. In the previous year it had issued £44m in equity in connection with three acquisitions (Sage, LK & Litton) and the exercise of options, and in 2001 it issued a further £3.1m to fund another acquisition (Sigtek).

This is not a bubble stock, with a gross cashflow of £19m and profit before tax of £12.5m in 1999 and regular dividend. On the other hand, the share price undoubtedly benefited from the technology boom. The rights issue price of 730p (2000:5) itself valued the company at £526m against shareholders’ funds of £146m, representing an after-tax p/e ratio of 60 on the 1999. The market price at the time was in the region 1500-2000p (source: London Stock Exchange 5-year chart).

The proceeds were used to acquire and recommission a large-scale semiconductor manufacturing plant at Newton Aycliffe. The high-technology plant had been built by Fujitsu to manufacture computer memory and was closed at the end of February 1999. This appears to have been an opportunity to acquire specialised plant at a bargain price although the timing was not of the company's choosing. As at 31 May 1999 the company was fully geared at 103%, and so was not in a position to fund the purchase and related capital expenditure from cashflow or additional debt.

The issue appears to have been prompted by a combination of this exceptional opportunity and the high share price. The company's executive chairman is its founder, a substantial shareholder and an engineer.

### ***Fitness First plc***

Listed under leisure, the company operates some 300 health and fitness clubs in the UK and across the world, and employed 1,138 at the time of the 1999 issue (1999:23), although this had risen to 7,240 by 2002 (2002:31). On 31 July 1999 the company raised £41m by a placing and open offer at 570p "in order to finance the growth of the business through the acquisition and development of further clubs" (1999:33). It made a further placing on 25 February 2000 to raise £25m at 1200p and a third on 31 January 2002 raised £75m at 412p.

These funds were used for capital expenditure, mainly on short leasehold premises and specialised equipment with poor collateral value, although bank facilities played a role. A summary of the financial data is set out in Table 7-3.

The bankers will have taken a positive view of the freehold property component, the strongly positive gross cashflow of the business and the ability of individual clubs to continue trading and be sold as going concerns even if the group becomes insolvent. There are some indications that the 2002 placing was somewhat distressed, given the high level of existing debt, forward capital expenditure commitments of £17m (2001:48), and the relatively low level of the share price. Out of the total of £335m capital spend for the 4 years ended 31 October 2002, £71m was funded by gross cashflow (after meeting other needs), £123m by bank debt and £141m (gross) by new issues.

The main case for the earlier equity issues appears to have been the extraordinary rate of growth of sales and profits, the latter rising six-fold from under £3m to £18m

in just 3 years between 1998 and 2001. However the 2000 placing valued the company at £550m, an equally extraordinary prospective after-tax p/e ratio of 44. Unfortunately for investors this was not sustained as the share price fell to 96p at the end of 2002, and the company announced its intention of seeking a buyer on 20 November 2002, possibly a management or institutional buy-out (2002:3). It is hard not to conclude that there was a speculative element in the 1999 & 2000 issues on the part of investors as well as, perhaps, the company.

£'000s 31 October	1998	1999	2000	2001	2002
<b>Sales</b>					
continuing operations	13,406	27,161	49,725	114,675	210,989
(annual growth %)		103%	83%	131%	84%
acquisitions	-	-	15,542	18,384	13,231
<b>total sales</b>	<b>13,406</b>	<b>27,161</b>	<b>65,267</b>	<b>133,059</b>	<b>224,220</b>
(annual growth %)		103%	140%	104%	69%
<b>Profit before tax</b>	<b>2,753</b>	<b>6,109</b>	<b>11,320</b>	<b>18,094</b>	<b>18,502</b>
(annual growth %)		122%	85%	60%	2%
<b>Cash flow statement</b>					
Operating activities	7,355	12,139	22,193	42,940	43,983
Net debt service	(145)	(701)	(190)	(2,650)	(5,094)
Taxation paid	45	-	(257)	(1,896)	(3,139)
Equity dividends	-	-	-	-	-
Capital expenditure	(20,436)	(27,529)	(51,733)	(119,627)	(135,623)
<b>Net cashflow</b>	<b>(13,181)</b>	<b>(16,091)</b>	<b>(29,987)</b>	<b>(81,233)</b>	<b>(99,873)</b>
Acquisitions	(10,413)	(9)	(4,785)	(5,406)	(6,286)
<b>Cash inflow/(requirement)</b>	<b>(23,594)</b>	<b>(16,100)</b>	<b>(34,772)</b>	<b>(86,639)</b>	<b>(106,159)</b>
<b>Max share price</b>		7.20	14.25	6.63	4.88
<b>Min share price</b>		2.06	6.84	3.73	0.96
<b>year end price</b>		6.84	11.50	4.30	0.96
<b>Freehold &amp; long lease</b>	<b>17,749</b>	<b>30,431</b>	<b>47,119</b>	<b>72,869</b>	<b>86,070</b>
Short leasehold	16,098	28,897	60,390	133,057	212,466
Fitness equipment	2,650	3,603	13,078	29,446	49,438
	<b>36,497</b>	<b>62,931</b>	<b>120,587</b>	<b>235,372</b>	<b>347,974</b>
<b>Gross bank debt</b>	<b>17,994</b>	<b>1,037</b>	<b>20,273</b>	<b>104,075</b>	<b>140,702</b>
Undrawn		55,000	45,000	81,439	57,427
		<b>56,037</b>	<b>65,273</b>	<b>185,514</b>	<b>198,129</b>

**Table 7-3 Fitness First plc**

***Goldshield Group plc***

Listed under pharmaceuticals & biotech, this company (employing 223, 1999:7) is engaged in pharmaceutical and healthcare products. In the year ended 31 March 1999 it made its stock market debut with an initial public offering raising £5.2m for

the company plus a further £7.4m for existing shareholders (1999:36). In the year ended 31 March 2000 it raised a further £15.7m through a placing and open offer (2000:4). These issues were not linked to specific business acquisitions but were part of a strategy of growth by acquisition and by investment in marketing, sales and product development (1999:4).

The cashflow statement shows a substantial negative net cashflow of £23m before acquisition expenditure of £2.3m for the two years ended 31 March 2000, financed partly by equity issues of £21m (2000:25). Yet the chairman refers to a total spend of “£39.1m in a series of acquisitions, part already paid and part deferred” (2000:4). His use of the term acquisition indicates a difference between the accounting treatment and the commercial perception. The balance of £36.8m relates to the acquisition of licences for established pharmaceutical products including from major companies SmithKline Beecham, Proctor & Gamble and Novartis. Since these licences represent streams of established income their acquisition is very similar in commercial and economic terms to a business acquisition. Indeed the one business acquisition (of Regina Health, known for royal jelly) is valued mainly for its product brand, and the consideration almost entirely represented goodwill (2000:36). In common with businesses, product licences can be transferable, making investment in them potentially reversible.

### ***Hit Entertainment plc***

Listed under media & entertainment, the company produces and distributes pre-school television programmes such as “Bob the Builder”. In the year ended 31 July 1999 it employed 70 (1999:27) and raised £21.5m (net) in two placings on 13 October and 14 July, the latter valuing the company at £175m (1999:34). It had raised £8.1m (net) by a previous placing in August 1997. The proceeds were used to produce programmes, the cost of which was capitalised and stood on the balance sheet as at 31 July 2000 at £37m.

The placings were made to enable the business to take advantage of some exceptional opportunities to acquire and exploit publication rights for the company’s own account through its well-established distribution network for other copyright holders’ material. The placings proved justified by the increase in the company’s

pretax profits from £1m in 1997 to £4.5m in 2000, although the prospective after-tax p/e ratio of the final placing was a very high 56.

In 2001 the company acquired Lyrick for £196m (2001:41) funded almost entirely by equity, £113m in paper and £69m by shares issued for cash.

### ***Holmes Place plc***

Listed under leisure, the company operates health clubs in the UK and across Europe, and employed 1,616 (1999: 31) at the time of the 1999 issue, although this had risen to 3,048 by the end of 2001 (2001:30). The company appears in most respects to be a smaller version of Fitness First (see above), and its financing has followed a similar pattern. A summary of its cashflow statements is set out as Table 7-4.

£'000's 31 December	1997	1998	1999	2000	2001
Cash flow statement					
Operating activities	8,307	10,656	17,062	19,605	35,434
Net debt service	(522)	(387)	(1,845)	(4,439)	(6,655)
Taxation paid	(1,030)	(1,023)	(1,822)	(1,378)	(923)
Equity dividends	(478)	(3,047)	(2,649)	(3,459)	(4,851)
Capital expenditure	(7,293)	(33,764)	(39,775)	(62,685)	(76,105)
Net cashflow	(1,016)	(27,565)	(29,029)	(52,356)	(53,100)
Acquisitions	(800)	(13,373)	(8,099)	-	-
Cash inflow/(requirement)	(1,816)	(40,938)	(37,128)	(52,356)	(53,100)

**Table 7-4 Holmes Place plc**

The company made a series of placings between 1997 and 2000 totalling £86m which together with bank finance of £167m funded the opening of most of the 69 clubs operated in UK and Europe by the end of 2002. The company's cashflow exhibited the same pattern of extremely rapid growth from 1997 to 2001 as Fitness First. The company was the subject of a management buy-out offer on 22 May 2003. The offer announcement states that the company had, in similar fashion to Fitness First, sought a trade buyer and had abortive negotiations prior to the present offer. The reason for the offer was prospective insolvency: a downturn in trading had led to the withdrawal of bank support, plus there were further contracted capital expenditure commitments of £73m. The offer states "The Board has also given consideration to pursuing alternative sources of funding including finance to be raised by the issue of new shares, and concluded that the probability of raising an



appropriate amount, on terms acceptable to existing Holmes Place shareholders, is low” (2003:13).

The experience of the two companies (Holmes Place and Fitness First) suggests that the window of opportunity given by the combination of speculative market conditions with extremely rapid growth had closed. The share price had fallen from in excess of 300p throughout 1999 to a low of 20p in March 2003, before the buy-out offer of 25p. The company’s underlying cashflow remained strong in absolute terms, as evidenced by the willingness of institutional investors to fund the buy-out.

### ***Mice Group plc***

Listed under support services, this company undertakes major exhibitions (*eg* trade shows, the Millennium Dome) employing 704 (1999:27). In the year ended 31 December 1999 the company made a rights issue for £9.2m (net) “to ensure ... sufficient working capital to carry out [an] increasing number of large contracts ... fund acquisitions ... [and] improve and enlarge the institutional base and shareholding” (1999:2). It also made a number of issues between 1998 and 2002 as consideration for a series of acquisitions, and by way of employee options and profit sharing. A summary of the detailed figures from the financial statements for each year is set out in Table 7-5.

The net cashflow deficit before acquisitions for the two years ended 31 December 2000 was £10m, which can be accounted for solely by fixed capital expenditure. Expenditure on business acquisitions for the two years was a further £7.2m. There is evidence of liquidity pressure in 1999, since the gross cashflow from operating activities, previously strongly positive, swung into deficit. During 1998 net current assets had fallen sharply from £1.7m to £0.2m and net bank debt was £7.4m, compared with a cash surplus the previous year. The increase in bank debt was considerably greater than could be accounted for by the purchase of mortgageable freehold property.

The maintenance of solvency must have been an important issue for the company because of the highly seasonal nature of the business and its dependence on large contracts. The 1998 and 1999 reports both refer to making “every effort to reduce the bias towards business in the second half of the year” (1998:5, 1999:5). The 2002 report expands on this by stating “During January and February the Group

traditionally makes an operating loss, as it does during July and August, due to the seasonality of the markets in which it operates” (2002:11). This is illustrated graphically by the results for the 14 months to 2002 (the company changed its year-end from 31 December to 28 February), which show a loss before tax of £9.8m compared with a pro-forma profit for the 12 months to 31 December 2001 of £6.3m. After allowing for differences in accounting treatment between the two statements (2002:11-12), this means a comparable loss of some £3.4m in the two months. It may also be relevant that the accounting period was changed to bring into account an unusual acquisition on 15 January 2002 (Expocentric). This allowed the company to acquire £30m in cash in exchange for an issue of shares, although the target had lost £28m over the last two years (2002:57).

£'000s	1997	1998	1999	2000	2001	2002 (14 months)
Sales						
continuing operations		33,097	50,179	81,110	90,516	
(annual growth %)			52%	62%	12%	
acquisitions		6,690	13,204	4,276		
total sales	<u>26,283</u>	<u>39,787</u>	<u>63,383</u>	<u>85,386</u>	<u>90,516</u>	
(annual growth %)		51%	59%	35%	6%	
Profit before tax	1,704	2,558	4,215	5,057	6,260	(9,803)
(annual growth %)		50%	65%	20%	24%	
Cash flow statement						
Operating activities	3,209	3,658	(75)	5,068		7,323
Net debt service	(167)	(588)	(682)	(1,099)		(1,583)
Taxation paid	(401)	(662)	(912)	(1,161)		(769)
Equity dividends	(295)	(433)	(599)	(913)		(968)
Capital expenditure	(802)	(2,547)	(4,736)	(5,280)		(15,759)
Net cashflow	<u>1,544</u>	<u>(572)</u>	<u>(7,004)</u>	<u>(3,385)</u>		<u>(11,756)</u>
Acquisitions	(331)	(4,019)	(4,444)	(2,776)		30,217
Cash inflow/(requirement)	<u>1,213</u>	<u>(4,591)</u>	<u>(11,448)</u>	<u>(6,161)</u>		<u>18,461</u>
Freehold property	124	2,077	5,423	5,203		18,175
Net current assets	1,723	197	6,977	4,393		15,189
Bank debt less cash	(1,948)	7,423	6,848	12,035		(1,047)

**Table 7-5 Mice Group plc**

It is not possible to determine from the published reports and accounts whether the liquidity pressure in 1998 and 1999 was unanticipated, leading to a rights issue simply to protect solvency. Given the very rapid growth of the company’s sales (51% in 1998 and 59% in 1999, as much from continuing operations as new acquisitions), the funding gap may have been planned. The rights issue was also

justified by the three-fold growth in profit before tax, from £1.7m in 1997 to £5.1m in 2000. The company's chairman is its founder and a substantial shareholder and expresses his ambition for the company "to become a substantial global corporation" (2002:7).

### *Trafficmaster plc*

Listed under transport, this company employed 146 (1999:33) in providing traffic information services across the UK and Europe using mobile telecommunications technology. In the year ended 31 December 1999 it raised £66m by way of placing and open offer (1999:37) to fund the costs of expansion of its traffic sensor network from the UK into Europe. This amount compared with shareholders funds of £24m at 31 December 1998 (1999:28). Although the company does not meet our definition of a 'bubble' company, having a positive gross cashflow of £5.7m in the year of issue, the placing was clearly influenced by stockmarket conditions. The placing share price of £7 valued the company at £881m, an astronomical current after-tax p/e ratio of 331.

The explicit case for the issue was an exceptional opportunity. Future growth is expected to come from the inclusion of on-board navigation as standard equipment on production cars. Given the economies of scale in car manufacture, a pre-condition for this is the provision of Europe wide traffic information coverage. Without the share issue the company did not have the cashflow to develop the required infrastructure quickly enough. However by 12 March 2003 the Chairman admitted, "the anticipated general rise in demand for traffic information products has failed to materialise", and on 9 May 2003 he announced his intention to retire.

This is a clear case of equity finance for capital formation, the company warning from the outset that there would be a long start-up period that would depress revenue (1999:7). Indeed an attempt to boost short-term revenue by selling a subsidiary product (Fleetstar) proved unsuccessful and expensive (2001:2). By the end of 2001 the shares traded at 50p, valuing the company at £63m, less than shareholders fund of £79m (2001:22).

## 7.6 Conclusions

The most striking result of this study is the complete absence of large companies using planned equity issues to finance capital formation. Only Amey is a truly publicly held company with more than 5,000 employees and its issue was reactive rather than planned.

The underlying theoretical hypothesis about the nature of the new issue mechanism emerges intact from the study. It is not the only factor at work. The example of Amey demonstrates the role of shocks to solvency. Several examples involve investment that appears fairly reversible and with a large proportion in existing physical or financial assets (Goldshield's pharmaceutical product licenses, and the property-based businesses of Big Yellow, Fitness First and Holmes Place).

Equity financed new irreversible capital formation in only four cases (Filtronic, Hit Entertainment, Mice & Trafficmaster). These all have in common exceptional investment opportunities. In the cases of Mice and Filtronic, the presence and ambition of founders as controlling executives must also be considered significant. The influence of the TMT bubble on the share prices of both Filtronic and Trafficmaster provided an additional incentive to take up the time-limited investment opportunities. None of these cases calls into serious question the hypothesis that under normal circumstances the use of new issues to finance industrial capital formation is deterred by the prospect of dilution.

Since Filtronic's issue was accounted for in 2000, this means that only three issues out of 217 in 1999 were used for the purpose of financing capital formation. These three issues amounted to £98m (0.2%) out of the £52.3bn value of equity issues calculated from the Jordans database (which understates the total equity issued). The hypothecation premise required for the interpretation of the aggregate data as evidence of a finance mechanism is certainly confirmed.

## **Appendix 7-A Data on individual companies**

The following tables contain the data from the annual accounts of the sample companies, mostly extracted from the Jordans database. Figures are in £'000s unless otherwise stated, and show the sums of the defined variables for the 5 years straddling the benchmark issue. The Jordans database uses the convention that cash expenditure is treated as a negative receipt. Net expenditure is shown as negative (in brackets), so that the acquisitions column is for the most part negative. The companies are ranked in descending order of equity issued.

Net cashflow is a composite of the Jordans cashflow statement data headings, being the sum of net cash inflow from operating activities, net returns on investment and servicing of finance, taxation paid, net capital expenditure and financial investment, and equity dividends paid. The net acquisition figure is taken directly from the database. The figures for equity issued and increases in long term debt are composites of the Jordans balance sheet data headings. For each year equity issued is calculated as the combined increase in share capital and share premium account. The increase in long term debt is the balance of long term debt outstanding at the end of the fifth year less the balance outstanding at the beginning of the first year. The details of the acquisitions in Table 7-9 are drawn from the full annual reports.

**Table 7-6 issues filtered out after Stage 1**

Company Name	5 yr equity issued	5 yr long term debt increase	5 yr acquisitions	5 yr net cashflow
SHIRE PHARMACEUTICALS GROUP plc	3,185,606	1,705	13,545	181,627
BP P.L.C.	2,959,000	5,081,000	(446,000)	3,306,000
PEARSON plc	2,386,700	2,060,200	(4,550,700)	609,600
UNILEVER plc	1,105,000	6,679,000	(11,101,000)	(187,000)
SABMILLER plc	1,025,876	913,065	(1,334,057)	140,291
TRINITY MIRROR plc	885,931	478,842	(489,450)	199,846
LOGICACMG plc	721,991	100	(369,905)	110,968
BRITISH AMERICAN TOBACCO plc	612,500	4,642,000	(1,338,000)	2,565,000
SPIRENT plc	596,725	134,517	(696,000)	11,000
ALLIANCE UNICHEM plc	523,200	554,300	(736,300)	176,100
REUTERS GROUP plc	447,000	342,000	(400,000)	594,000
THE SAGE GROUP plc.	440,303	207,565	(868,389)	244,788
WPP GROUP plc.	429,400	1,060,700	(1,397,200)	423,700
EMAP plc	399,600	219,400	(785,400)	270,400
BAE SYSTEMS plc	369,000	1,428,000	(3,187,000)	1,140,000
WASTE RECYCLING GROUP plc	328,330	177,319	(335,927)	12,568
ENODIS plc	288,100	383,300	(285,100)	155,900
BRITISH AIRWAYS plc	243,500	2,771,000	(233,000)	1,913,000
FIRSTGROUP plc	243,200	530,500	(530,800)	243,900
HMV GROUP plc	226,279	437,006	(794,371)	32,247
EUROTUNNEL P L C	209,242	3,252,787	0	284,611
AGGREGATE INDUSTRIES plc	181,300	411,600	(291,300)	158,800
SMITHS GROUP plc	179,500	866,500	(161,100)	276,700
AEGIS GROUP plc	164,500	106,300	(377,800)	126,700
LONDON BRIDGE SOFTWARE HOLDINGS plc	158,271	1,591	(90,719)	4,770
DANKA BUSINESS SYSTEMS plc	157,996	(456,066)	285,477	10,490
CADBURY SCHWEPPEES plc	145,500	602,000	(1,583,000)	1,165,000
ROLLS-ROYCE plc	142,000	725,000	(511,000)	46,000
BPB plc	121,400	284,900	(509,800)	223,900
JARVIS plc	119,711	104,343	(137,913)	6,313
HENLYS GROUP plc	111,507	231,905	(330,942)	2,825
MEGGITT plc	105,322	155,746	(298,892)	112,316
HAYS plc	103,900	292,100	(456,500)	297,200
INTERSERVE plc	101,839	41,885	(130,600)	28,900
TAYLOR NELSON SOFRES plc	99,789	215,400	(349,957)	52,687
SYNSTAR plc	97,607	0	(86,707)	2,803
R P S GROUP plc	81,021	0	(35,827)	6,979
HOMESTYLE GROUP plc	76,781	11,872	(141,246)	35,767
RECKITT BENCKISER plc	76,700	(171,200)	(59,800)	441,900
ARM HOLDINGS plc	73,112	0	(5,695)	61,372
COOKSON GROUP plc	72,900	659,600	(609,500)	88,400
COBHAM plc	71,600	59,000	(275,200)	45,500
CAPITAL RADIO plc	70,657	7,500	(119,727)	41,235
COMPUTACENTER plc	70,078	(45,929)	(11,772)	41,502
AMERSHAM plc	69,400	74,400	(37,600)	293,100
RIO TINTO plc	68,500	368,000	(2,735,000)	1,321,000
SHANKS GROUP plc	63,529	258,849	(313,792)	48,862
CENTRICA plc	63,500	568,000	(2,457,000)	2,036,000
ICAP plc	59,872	0	20,460	9,420
MORSE plc	59,374	(9,000)	(29,007)	75,069
SERCO GROUP plc	59,259	59,268	(134,199)	15,380
MISYS plc	54,008	(94)	(286,011)	362,141
KEWILL SYSTEMS plc	53,577	(15)	(38,141)	7,538

**Table 7-6 issues filtered out after Stage 1 (continued)**

Company Name	5 yr equity issued	5 yr long term debt increase	5 yr acquisitions	5 yr net cashflow
EXEL plc	53,300	270,900	(56,800)	78,800
BRITANNIC GROUP plc	52,500	0	(240,000)	102,000
TRAVIS PERKINS plc	51,219	100,000	(330,225)	200,529
TOREX plc	51,186	58,798	(94,151)	12,914
ANITE GROUP plc	49,115	4,849	19,524	9,871
TAYLOR & FRANCIS GROUP plc	48,812	16,514	(135,263)	47,471
FIRST TECHNOLOGY plc	45,828	28,300	(110,295)	42,978
BUNZL plc	40,900	190,000	(407,800)	210,400
EIDOS plc	38,314	(425)	(49,899)	7,385
SHERWOOD INTERNATIONAL plc	36,146	(429)	(9,528)	6,247
DIAGONAL plc	35,226	(605)	(16,221)	14,149
WILMINGTON GROUP plc	35,164	0	(33,945)	3,120
ELECTROCOMPONENTS plc	33,400	51,900	(250,900)	105,200
STAFFWARE plc	30,519	60	(1,604)	1,809
JOHNSON MATTHEY plc	30,100	104,100	191,100	4,700
THE BIG FOOD GROUP plc	27,700	(22,800)	(43,600)	129,900
BLOOMSBURY PUBLISHING plc	27,672	(2,250)	(15,700)	8,240
TATE & LYLE plc	25,100	(304,900)	39,600	132,300
ACAL plc	24,809	14,801	(25,674)	13,663
THE GAME GROUP plc	24,370	1,258	(39,989)	55,705
MITIE GROUP plc	23,032	(6,150)	(5,435)	23,480
SPRING GROUP plc	22,614	(615)	(81,541)	(13,348)
HEADLAM GROUP plc	22,139	(2,164)	(44,797)	64,920
FKI plc	21,657	374,778	(560,391)	300,120
NATIONAL EXPRESS GROUP plc	21,642	363,689	(236,700)	3,100
MICROGEN plc	17,674	0	11,147	2,493
VT GROUP plc	17,630	53,902	(133,003)	25,636
THE GO-AHEAD GROUP plc	16,028	91,243	(89,478)	30,961
WS ATKINS plc	16,028	38,156	(75,958)	(35,822)
H.R.OWEN plc	15,783	(3,266)	(8,561)	7,202
BELL GROUP plc	15,471	5,977	(19,053)	5,754
SIGNET GROUP plc	15,436	91,561	(107,500)	158,862
WYNDEHAM PRESS GROUP plc	13,520	20,201	(13,034)	23,562
ST IVES plc	13,266	(916)	(100,640)	118,281
THE MAIDEN GROUP plc	13,239	11,949	(43,162)	5,242
SOUTH STAFFORDSHIRE GROUP plc	13,107	(4,353)	(36,918)	11,729
IMI plc	12,500	141,500	(397,800)	264,100
DELTRON ELECTRONICS plc	11,143	12,262	(24,979)	4,694
ALEXON GROUP plc	11,067	22	(47,177)	58,444
BRITISH VITA plc	10,300	97,300	(177,400)	85,800
WEIR GROUP plc (THE)	10,125	146,075	(190,130)	125,301
STANLEY LEISURE plc	9,929	148,768	(117,535)	4,211
PENNA CONSULTING plc	8,401	3,380	(6,892)	12,210
BESPAK plc	8,315	(1,931)	3,645	1,371
THE MAYFLOWER CORPORATION plc	7,000	193,500	(283,400)	125,900
GASKELL plc	6,608	6,947	(11,516)	7,027
RADSTONE TECHNOLOGY plc	6,030	2,471	(5,178)	198
TOAD plc	5,385	3,797	(11,647)	(5,072)
ULTRA ELECTRONICS HOLDINGS plc	3,832	32,873	(73,285)	33,329
GLOBAL NATURAL ENERGY plc	3,831	(75)	0	12,938
ALBA plc	3,814	117	(12,051)	(19,653)
FRENCH CONNECTION GROUP plc	3,069	88	(8,600)	2,457

**Table 7-7 Companies excluded from sample**

<b>Ireland</b>	<b>Financial</b>
AIB Capital Markets	ASW Holdings
Ardagh	Brit Insurance Holdings
Barlo Group	Goshawk Insurance Holdings
CRH	Hardy Underwriting Group
DCC	Prudential
Fyffes	Sirius Financial Solutions
Grafton Group	
Heiton Group	<b>Presumed insolvent</b>
Icon	Sportsworld Media Group
Independent News & Media	SVB Holdings
Irish Continental Group	The Health Clinic
Kerry Group	
Kingspan Group	<b>Unlisted in period</b>
Ryanair Holdings	Venture Production
Skillsoft	
United Drug	

**Table 7-8 Stage 2 companies with equity issues limited to options**

Company Name	5 yr equity issued	5 yr long term debt increase	5 yr acquisitions	5 yr net cashflow
TESCO plc	814,000	2,153,000	(785,000)	(2,175,000)
J SAINSBURY PLC	348,000	460,000	704,000	(534,000)
BAA plc	183,000	1,388,000	(438,000)	(98,000)
KINGFISHER PLC	167,000	496,700	(306,400)	(488,700)
CARLTON COMMUNICATIONS plc	97,300	617,500	(403,000)	(260,700)
UNITED BUSINESS MEDIA plc	87,600	(162,100)	1,961,400	(322,900)
BOC GROUP PLC(THE)	76,700	252,500	301,600	(481,900)
RMC GROUP P L C	42,300	698,800	(712,300)	(134,200)
SSL INTERNATIONAL plc	27,573	213,983	(159,829)	(112,479)
BBA GROUP PLC	19,300	298,900	(215,200)	(93,000)
SEVERN TRENT plc	14,900	1,078,400	(686,200)	(759,800)
AEA TECHNOLOGY PLC	11,100	11,800	32,800	(39,500)



**Table 7-9 Stage 2 with equity issues limited to acquisitions & options**

Company Name	5 yr equity issued	5 yr long term debt increase	5 yr acquisitions	5 yr net cashflow	Equity issued to finance acquisitions in period	Target(s)
VODAFONE GROUP plc	56,109,000	12,061,100	17,524,800	(14,096,900)	£56bn	AirTouch, Mannesman, Airtel, Swisscom, Eircell, Japan Telecom
CABLE AND WIRELESS plc	4,537,500	323,000	8,999,000	(6,731,000)	£4.1bn	US Internet, Optus, DataCo
BRITISH SKY BROADCASTING GROUP plc	1,784,500	1,091,465	(695,500)	(562,400)	£1.7bn	KirchPayTV, BiB, SIG
TELEWEST COMMUNICATIONS plc	1,397,950	4,132,620	(832,033)	(2,177,992)	£1.3bn	Cable London, General & Birmingham Cable
ASTRAZENECA plc	288,000	(53,000)	1,126,000	(180,000)	£129m	Astra
PSION plc	243,500	4,901	(107,080)	(23)	£234.5m	Teklogix
NSB RETAIL SYSTEMS plc	193,981	656	(176,450)	(5,054)	£192m	USI, RTC, STS
PILKINGTON plc	164,000	54,000	53,000	(344,000)	£118m	minority interests
CELLTECH GROUP plc	122,200	35,300	47,300	(15,600)	£85m	Chiroscience, Medeva, Cistron
APPLIED OPTICAL TECHNOLOGIES plc	73,232	(905)	(37,105)	(12,035)	£55m	OpSec
CHIME COMMUNICATIONS plc	63,648	(299)	(45,390)	(23,008)	£52m	13 acquisitions in total with paper
ENNSTONE plc	61,792	35,623	(49,620)	(18,438)	£62m	Bruntcliffe, Burford, NBM, Blockley & Breedon
UMECO plc	52,988	19,390	(72,156)	(9,450)	£53m	ABCOA, Richmond Aircraft
QA plc	49,765	(799)	45,493	(15,516)	£50m	Knowledge Centre, Pontis, Cap Gemini, GA
AXIS-SHIELD plc	47,972	(10)	(25,926)	(11,244)	£37m	Medinor, Nycomed
ORBIS plc	38,056	(3,878)	(24,687)	(6,690)	£36m	Sitex, HiSecurity, Fernlee. Security Closures, Expo
SDL PLC	36,894	(41)	(19,306)	(1,401)	£27m	International, Aslan, ATR, Sykes, Transparent
ENTERTAINMENT RIGHTS plc	35,270	3,348	(4,879)	(16,123)	£35m	Siriol, Boom Boom, Carrington, Link, Woodland
MYTRAVEL GROUP plc	27,700	320,396	(229,700)	(339,800)	£15m	Direct Holidays, Panorama, FTi, Hotetur Club
BLACKS LEISURE GROUP plc	24,343	14,944	(25,996)	(4,762)	£22.5m	Outdoor Group
GWR GROUP plc	9,504	67,829	(58,866)	(17,772)	£96m	DMG Radio
YORKSHIRE GROUP plc	5,259	22,211	(4,386)	(16,341)	£5.3m	CK Witco

## **Notes to Table 7-9**

Astrazeneca: issue reflects par value only of shares issued on merger. Market value was approximately £20bn.

British Sky Broadcasting Group: excludes £378m paper issued from merger reserve.

Chime Communications: 1997 equity issued includes in addition a £10m trade investment by WPP to acquire 29.9%.

GWR Group: the Jordans record of equity issued relates in this case only to options. The share premium on the £96m paper consideration for the acquisition is written off directly to merger reserve and does not register.

MyTravel: excludes £79m raised for acquisition of Direct.

Telewest: excludes all paper acquisition of Flextech in 2001 for £2.3bn

Vodafone Group: Even £56bn understates the equity raised for these acquisitions, which included a further £97bn of paper issued in respect of Mannesman & Airtel from merger reserve.

**Table 7-10 Stage 3: 'Bubble' stocks**

	New equity	Long term debt increase	Net (acquisitions)/ disposals	Net cashflow	FTSE sector	staff	Gross cashflow 1999	Gross cashflow 2000	Gross cashflow 2001
BALTIMORE TECHNOLOGIES PLC	206,457	114	1,612	(154,233)	software	480	(18,310)	(48,984)	(69,955)
REDSTONE PLC	174,307	2,811	(69,860)	(81,820)	telecoms	130	(12,417)	(19,810)	(11,299)
SKYEPHARMA PLC	161,235	62,419	(105,832)	(65,848)	biopharma	279	(15,139)	(9,312)	5,909
ARC INTERNATIONAL PLC	151,316	2	(2,981)	(41,516)	hardware	179	(4,536)	(14,299)	(27,304)
NXT PLC	80,691	1,390	2,814	(38,386)	electronics	226	(6,591)	(10,770)	(12,979)
MEDISYS PLC	76,801	9,702	(30,150)	(51,830)	health	253	(6,274)	(2,076)	(4,571)
ECKOH TECHNOLOGIES PLC	73,713	57	(18,411)	(38,711)	media	237	(7,463)	(20,052)	(9,203)
CENES PHARMACEUTICALS PLC	57,819	8,902	5,682	(72,983)	biopharma	86	(8,245)	(17,760)	(25,498)
PHARMAGENE PLC	49,680	0	2	(16,610)	biopharma	57	(3,578)	(3,767)	(5,983)
EYRETEL PLC	49,055	(134)	0	(17,444)	support	281	(2,190)	(7,901)	(2,560)
VERNALIS GROUP PLC	43,611	393	897	(79,390)	biopharma	134	(17,381)	(22,658)	(8,395)
ACAMBIS PLC	43,574	14,299	(1,468)	(57,205)	biopharma	125	(10,330)	(9,207)	(7,959)
SCIPHER PLC	37,896	6,648	(2,725)	(40,840)	hardware	267	(8,279)	(12,265)	(10,315)
ANTISOMA PLC	36,629	0	(7)	(27,066)	biopharma	25	(6,383)	(7,151)	(6,962)
XENOVA GROUP PLC	35,390	9	17,505	(50,808)	biopharma	54	(11,101)	(9,354)	(3,836)
PROTHERICS PLC	25,477	477	5,823	(28,503)	biopharma	187	(12,664)	(5,988)	(1,635)
VOCALIS GROUP PLC	18,874	38	0	(14,420)	software	73	(5,067)	(3,417)	(3,862)
EASYSscreen PLC	14,986	0	163	(14,792)	software	26	(4,332)	(7,123)	(2,864)
SR PHARMA PLC	13,379	0	0	(9,800)	biopharma	17	(1,173)	(3,351)	(3,134)
ULTRASIS PLC	5,805	104	(572)	(8,192)	software	63	(2,064)	(3,380)	(4,251)
	<u>1,356,695</u>	<u>107,231</u>	<u>(197,508)</u>	<u>(910,397)</u>		<u>3,179</u>			

## Chapter 8 Conclusions

This research has led to three main sets of conclusions, a mixture of the empirical and theoretical that reflects a Critical Realist approach to methodology.

First, this dissertation has demonstrated the absence of a material contribution from external equity to the finance of industrial capital formation over a period of up to 50 years, using the aggregate sector data for the UK and US. Econometric techniques have been employed to test not causal hypotheses but alternative interpretations of the anomaly. In particular the ideas that equity finance is invisible in aggregate data (the hypothecation argument), or unnecessary (the bootstrap hypothesis) have found no empirical support. The relationship between investment and cashflow is well described by a simple model of a finance mechanism, in which internal cashflow supplies the finance for capital formation.

The second set of conclusions provides the theory to explain the anomaly. The finance mechanism that describes the pattern in the aggregate data requires a constraint on equity finance based on a new issue discount, as accepted by Post Keynesian authors following Kalecki. The problem is to reconcile such a new issue discount with the extensive use of equity finance for business acquisitions, other than as a special case of a market imperfection (admitted by M&M). There is no basis in present Post Keynesian or New Keynesian theory for a differential new issue discount which depends on how the issue is used. The contribution here has been to show how such a differential new issue discount can be understood in terms of Keynes's analysis of the investment decision in *The General Theory*. Fundamental uncertainty and its consequence, liquidity preference, prove to be at the root of the problem. In particular the new issue discount has here been interpreted as reflecting the liquidity element of lender's risk. This is a long-term phenomenon based on the precautionary rather than speculative motive for liquidity preference. This provides an alternative to Keynes's own long-term analysis of a floor to the rate of interest, as well as to his own emphasis on the short-term volatility of financial markets. As such it also provides an alternative basis for the Post Keynesian model of investment finance, showing how a long-term differential new issue discount does not necessarily require either imperfect competition (as Kalecki and Wood each

argued independently) or temporarily divergent expectations (M&M), and that fundamental uncertainty is sufficient.

The third set of conclusions relates to the empirical study of new issues by UK industrial companies in 1999. This is an example, in Critical Realist terms, of the retrodictive test of the hypothesis that the finance mechanism identified in the first set of conclusions can be explained by the theory of a differential new issue discount proposed in the second. This study, based on both quantitative and qualitative evidence, found evidence of other mechanisms at work alongside the one under test. These included the ‘bubble stocks’ together with a few examples of other IPOs and trade investment. Only a very few cases could be found of seasoned equity offerings to financial investors in order to finance capital formation. Five cases could be related to a solvency shock or to the acquisition of physical and intellectual property. The four ‘pure’ cases revealed exceptional investment opportunities, combined in some cases either with the presence of founders as controlling executives or an inflated share price. None of these cases calls the hypothesis seriously into question. The firm-level study also provides independent corroboration of the econometric evidence against the hypothecation argument.

What then are the implications of this thesis for economic theory, for public policy, and for the direction and methodology of future research?

## **8.1 Implications for theory**

Keynes insisted that his principal criticism of Price Mechanism theory was its abstraction from fundamental uncertainty (Keynes, 1937A:122). Mainstream economic theory since 1958 and the articles by Modigliani and Miller and Tobin has reasserted this abstraction. With the reduction of fundamental uncertainty to actuarial risk, the essential insight of *The General Theory* is lost, as Davidson has argued for many years. Yet, other Post Keynesian authors have differed from Keynes in concentrating more on the assumptions about managerial objectives and the degree of competition.

This thesis implies that the new issue discount acknowledged by M&M as an exception is in fact the rule. M&M’s interpretation merges together a divergence of actuarial expectations between managers and investors, which may indeed be temporary, with a more profound divergence of confidence based on liquidity

preference. The latter is the very essence of the difference between the entrepreneur and the portfolio investor. But without fundamental uncertainty, as both Schumpeter and Shackle recognise, the entrepreneur is redundant.

The long-term nature of the differential new issue discount re-establishes the case for following Robinson in her response to *The General Theory* by developing Kalecki's theory of investment and its finance as the foundation of a theory of employment based on aggregate demand. The neoClassical abstraction from institutions and history depends for its legitimacy first and foremost on its abstraction from fundamental uncertainty and therefore historical time.

This thesis has thrown fresh light on Keynes's own analysis and made the treatment of fundamental uncertainty and liquidity preference more tractable. It has supplied the clearer definition of liquidity that Shackle sought. It has argued that the Post Keynesian critique of the M&M theorem should be based not so much on the abstraction from financial structure (which Keynes also accepted) as on the neglect of liquidity preference. On the other hand, it has argued for the emphasis to be placed on the liquidity risk attaching to assets and the precautionary motive, rather than, as in *The General Theory*, on the liquidity risk of bonds and the speculative motive. It also suggests that Keynes's abstraction from the difference between managers and investors, corresponding to his abstraction from the difference between assets and shares, obscured the link between liquidity risk and the new issue discount. This may indeed be a 'missing link' between Keynes and Kalecki.

The approach of this thesis differs markedly from theories based on the conflict of interest between principal and agent or on asymmetric information. Those schools of thought may help to explain why certain institutions such as corporate governance and vendor warranties develop in response to the problems they raise. Asymmetric information (or its perception) and mistrust may indeed be part of the explanation of the discount faced by secondary equity offerings. However, the agency model cannot shed light on the lack of equity finance for capital formation, and the asymmetric information model is not consistent with the extensive use of equity finance by large companies. There also appears to be more scope for managers and investors to differ in their valuation of new assets, rather than existing assets about which managers are legally obliged to make full disclosure to investors at the time of

a new issue. The empirical evidence presented here suggests these theories suffer as much as neoClassical theory by their abstraction from fundamental uncertainty.

## **8.2 Implications for policy**

The implications of this thesis for policy stem mainly from its underpinning of the Post Keynesian position. In common with *The General Theory* and Post Keynesian theory as a whole, it allows for the possibility (and indeed likelihood) of involuntary unemployment as the result of a deficiency of aggregate demand, rather than of obstacles to competition or of asymmetric information.

The principal policy conclusion of Price Mechanism theory is that changes in relative prices, unless blocked by market imperfections, will lead automatically to full employment equilibrium. New Keynesian differs from neoClassical theory only in arguing that the imperfections that prevent changes in relative prices, and so the adjustment to full employment equilibrium, may be inevitable and can only be overcome by positive intervention. The emphasis of New Keynesian theory remains on the need to adjust relative prices if full employment equilibrium is to be achieved. By contrast Post Keynesian theory does not assume that changes in relative prices are capable of bringing about full employment equilibrium.

In the Post Keynesian model the only remedy for involuntary unemployment is an increase in aggregate real demand, not a reduction in the cost of labour or the flexibility of labour markets. In an economy without foreign or public sectors, where consumption depends on current income, and income depends on investment, the constraint of investment by cashflow identified by this thesis can limit aggregate real demand and employment. Since according to Kalecki's analysis in such an economy cashflow is determined by investment, the level of employment may be in equilibrium (in Keynes's sense of a state from which there is no automatic tendency to depart) below full employment. Investment opportunities that might be profitable at full employment and the current average cost of capital may not be profitable given the low level of aggregate demand. Even if they are profitable, they will not be undertaken unless they can be financed from cashflow or debt, so that the low level of investment and cashflow continues.

This static analysis should be seen as instantaneous and is misleading if the dynamic and cyclical nature of the system is ignored. Following Minsky's interpretation of

Keynes, the absence of a Price Mechanism equilibrium leads to chronic fluctuation as the norm, as the system switches between expansion and contraction. Variations in confidence and the conventionally acceptable borrowing limit accentuate the forces making for expansion and contraction. This thesis contributes to a cyclical analysis by suggesting two tendencies that may move a closed private economy away from a given level of employment. The first is innovation that creates new investment opportunities that can be financed from debt or cashflow. Cost-reducing investment in process innovation is the more likely candidate, although if new products are sufficiently profitable they may start a virtuous circle of higher cashflow and investment without the need to borrow, thus overcoming the limit on borrowing capacity. The second tendency is investment in new capital goods of a transferable nature, of which the main example is the construction of residential and commercial buildings. Such investment is highly sensitive to fluctuations in confidence. None of this suggests that as a result employment will rise to, and stabilise at, the full employment level. Investment may once again subside, or the demands from construction and technical innovation rise so high that the demand for labour exceeds the (local) supply. There are no automatic stabilisers in Post Keynesian theory to play the role ascribed to relative prices by Price Mechanism theory.

In this context, measures to reduce involuntary unemployment by reducing the real or nominal cost of labour or by increasing labour market flexibility appear misguided and self-defeating. Post Keynesian theory generally leads to the prescription of some form of social intervention as a necessary condition of full employment, of which examples are debt-financed public expenditure, managed trade and a minimum wage. It is also associated with the view that the stock market (although not so much the bond market) exists to serve investors, not industry, for which this thesis provides further evidence. This thesis reveals the full significance, in terms of employment, of specialist financial institutions that provide equity or quasi-equity finance other than through the stock exchange. We have seen that large listed companies cannot be assumed to use equity finance to take advantage of all investment opportunities that would be profitable in full employment equilibrium, and few small companies offer the exceptional opportunities required by VC firms. Small proprietorial firms are unable, and the various forms of social enterprise are



also unwilling even when they are able, to offer a credible and attractive claim to residual profits in the form of an issue of listed company equity shares. Such social enterprises include co-operatives and mutuals, microcredit organisations for the self-employed, and 'fair trade' organisations that manage and finance international trade in order to create labour income. The level of production by such firms is generally constrained by a lack of equity finance, not so much for long-term capital formation, as for the needs of current production and inventories including the contingencies arising from fundamental uncertainty. In this context, specialist financial institutions are not simply 'gap fillers' overcoming market imperfections for particular firms, that may be considered desirable on grounds such as competition and innovation. Such financial institutions can also permit an increase in aggregate production and employment and thus a reduction in involuntary unemployment. Indeed they may play a crucial role in allowing 'labour to hire capital' and firms to make decisions to produce and create income from employment and profits, that would otherwise be foregone for lack of aggregate demand.

The theory and empirical evidence provided here is also relevant to a number of policy debates which can only be indicated here. Examples include the relative contributions of portfolio investment and foreign direct investment (FDI) to capital formation; capital market liberalisation by emerging and transition economies; the taxation of dividends and share transfers; and the implications of funded pensions for capital formation and financial fragility.

### **8.3 Implications for research**

This thesis has demonstrated the usefulness of a Critical Realist approach to methodology, the limitations of the deductive method in the testing of hypotheses in an open system and the appropriateness of econometric analysis in a subordinate role of confirming the detailed nature of anomalies rather than testing hypotheses.

Critical Realism is not strongly prescriptive of research methods and has been described as methodologically weak. Its distinctive feature is its ontology and the insight that gives in the framing and testing of scientific hypotheses. This perspective illuminates the generally acknowledged failure of econometric models of investment, whether in prediction or in discrimination between competing theories. Critical Realism implies that the closure and aggregation conditions for

valid estimation are seldom met in an open system, particularly for complex models involving intermediate and unobservable variables and functions, such as capital and the production function. The empirical failure is therefore unsurprising.

The problem of interpretation arises on those occasions when regular relationships between empirical variables are in fact observed and can in principle be explained by more than one mechanism. Critical Realist ontology leads to the perception of such regularities not as products of direct causal relationships but as symptoms of underlying mechanisms at work. The observation of a functional relationship between variables does not mean that the value of one or any variable is empirically determinable in a 'fundamental' sense, since the relationship is part of a larger process, which includes countervailing mechanisms that cannot be expected to give rise to empirical event regularities. The Post Keynesian theory of profits is such an example, in which the finance mechanism is one of several. This thesis has demonstrated a role for econometric analysis in circumstances where conventions and institutional behaviour give rise to local quasi-closures and valid functional relationships. A properly specified econometric model can describe the anomaly in detail and allow some interpretations to be rejected, in this case the hypothecation and bootstrap arguments. However the main importance from a Critical Realist perspective of such empirical regularity derives from its anomalous character, in this case, the existence of an investment-cashflow correlation in the context of competitive equity markets.

In circumstances where two conflicting theories and model specifications predict the same regression result, such as in the hypothetical example where output and cashflow are perfectly correlated, econometric methods cannot discriminate between them. In practice the literature discounts the finance constraint hypothesis, not on statistical grounds but because it is 'implausible' given competitive equity markets. This thesis has demonstrated the value of theory creation by empirically grounded retrodution when confronted by an anomaly. Empirical work is theory-laden, and empirical puzzles can sometimes only be resolved by new theory.

Critical Realist methodology recognises that it is often not possible to express economic hypotheses as a functional relationship between empirical variables, so that such hypotheses cannot be tested by econometric methods. The mechanism of a differential new issue discount facing an individual firm was illustrated as a formal

model in terms of its main theoretical parameters marginal  $q$  and  $\theta$ , the new asset discount which itself is a combination of the liquidity risk and the weight placed upon that risk by investors. Yet there is no reason to expect that the functional relationship is stable or can legitimately be aggregated across issues, firms or time. The dependent variables, the degree of absolute or relative dilution, cannot be observed empirically precisely insofar as they deter new issues, and neither can the parameters  $q$  and  $\theta$ . To test this hypothesis in an open system requires a different approach that tests merely logical, rather than functional, relationships. The study of individual share issues is an example of the use of retrodictive logical tests of both quantitative and qualitative data to arrive at a firm conclusion about a hypothesis, a method that nevertheless allows the influence of important countervailing factors to emerge. The combination of these methods appears to have resolved the problem of interpretation and found strong evidence of one mechanism at least, through which finance plays an integral role in the process of capital formation.

Secondly, this thesis makes the case for a renewal of theoretical macroeconomic research in the Post Keynesian tradition. Critical Realist philosophy cautions against the search for ‘general theories’ of which Price Mechanism theory as a whole is an example, and real options theory may be a further attempt. Despite the title of his book, Keynes was “more attached ... to the fundamental ideas ... than to the particular forms” (Keynes, 1937A:111). However if the purpose of theoretical research is to shed light on the actual behaviour of the economy, much useful work can be done.

In the context of investment theory, there is a need to pick up the trail again at the 1958 detour prompted by M&M and Tobin. Future theoretical research should follow the example of Meyer and Kuh in placing a premium on data over theory. This thesis suggests both Post Keynesian and New Keynesian theory have been the weaker for basing their challenge to neoClassical thought on the assumptions about managerial objectives and the competitiveness of securities markets. It has shown that the key point of departure from Price Mechanism theory is not in these areas but in the introduction of fundamental uncertainty, as maintained by Keynes (1937A:122).

On the empirical side this thesis suggests a number of avenues for further work. It is clear that the studies of individual firm data could be extended to other countries,

particularly the US, and over time. Progress will come in particular from finding and investigating examples where new issues have been made to finance capital formation. The fact that the US internal finance ratio is below 100%, even though the cashflow elasticity of investment is unity, bears further investigation, since it has only been possible here to conjecture that it reflects 'permanent' mortgage and inventory finance. The theory does not explain the heavy discount faced by secondary offerings, although it is quite consistent with the operation of a separate mechanism in those cases based on asymmetric information. There is also a case for testing the theory by a detailed survey of the decision-making processes of investment banks. It is not clear how the deterrent effects of potential dilution can otherwise be directly observed.

## Chapter 9 Summary

This thesis offers an explanation of the empirical relationship between investment and finance, particularly internal cashflow, in terms of the effects of fundamental uncertainty on investment and finance decisions under competitive conditions.

In particular it aims to reconcile the Post Keynesian theory of investment finance based on Kalecki with the analysis of liquidity preference by Keynes in *The General Theory*. Kalecki's work has been the foundation of the Post Keynesian response to the shortcomings of the Marshallian framework of *The General Theory* for a theory of aggregate investment rather than of the investment decision by an individual firm. On the other hand Post Keynesian theory depends heavily on the assumption of imperfect competition, and this is not plausible in the context of financial markets. It is common ground that for finance to constrain aggregate investment requires a new equity issue discount, and Post Keynesian theory attributes this to imperfect competition and inelastic demand in the market for shares. NeoClassical theory accepts the possibility of such a discount only as an imperfection, reflecting a temporary divergence of views between managers and investors. The resolution of the paradox lies in understanding the new issue discount as a reflection not of imperfect competition but of liquidity preference, and specifically of the element of lender's risk that relates to liquidity.

Liquidity preference is the result of fundamental uncertainty: something from which Price Mechanism theory has managed to abstract. Underlying both neoClassical and New Keynesian thought is the assumption of an ergodic system, which provides an objective basis for our inevitably subjective but rational expectations of the future. This ergodic system enables us to substitute expectations for certainty, to model reality as if the futures and insurance markets required for Walrasian general equilibrium do in fact exist. When expectations are objective, liquidity preference in the sense of *The General Theory* has no role to play.

Why is fundamental uncertainty so important? Other approaches to investment finance have stressed agency problems, asymmetric information or imperfect competition. It is partly a matter of judgement, although the empirical evidence does not favour these other approaches. While these approaches may help to explain the financial markets' preoccupations with corporate governance, disclosure, warranties,

regulation and market conduct, etc, these are ultimately variations on the theme of competition. An institutional approach is invariably challenged to explain why institutions emerge, and policy prescriptions based on failures of competition are ultimately judged against an implicit assumption that perfect competition leads to optimality. This thesis adopts the method of Keynes in accepting competition (in the workman-like sense of Marshall rather than Walras) as a necessary part of the terms of engagement with neoClassical thought, and demonstrating how competition is overshadowed by a deeper principle yet, that we exist in historical time.

The study of the relationship between investment and finance raises major questions of methodology. An extensive literature of econometric models of aggregate investment has proved controversial and beset by the problem of identifying causality. One interpretation attributes this lack of conclusiveness to specification problems and measurement error. A methodological canon has developed, prescribing that models must first be specified in terms of individual optimisation, calibrated using independent data, and then used to make predictions. This deductivist method has been extensively criticised from a Critical Realist perspective for its neglect or unrealistic treatment of the necessary intrinsic and extrinsic closure and aggregation conditions for its validity. Price Mechanism models depend on abstraction from non-market institutions and fundamental uncertainty and upon the concepts of a production function, a value measure of desired capital stock, and the representative firm. Without closure the deductive method cannot be expected to generate reliable conclusions in an open system characterised by human agency. Related to this are the limitations of econometric analysis in the testing of and discrimination between hypotheses. Under the above canon a hypothesis cannot be tested if it cannot be expressed in functional form.

An alternative to continuing a dogged search for the right specification is offered by the Critical Realist approach to methodology, which suggests research in open systems should begin by identifying rough empirical patterns that are anomalous or surprising. These ‘anomalies’ offer an opportunity for inference similar to the controlled experiment, with a crucial difference. The process of explanation works backward (hence *retro*-duction) by seeking to discover the mechanism behind the anomaly, rather than forward (*de*-duction) by seeking to trigger the mechanism and generate the anomaly. An explanatory hypothesis can then be tested by ‘*retro*-

dictive' reasoning (the reverse of *pre*-dictive), again moving backwards from the empirical outcome rather than forward to a prediction. This means that where the outcome in question is found in another set of data, evidence is sought of the initial trigger events or conditions required if the hypothetical mechanism were to have brought about the observed outcome. This evidence need not be in terms of functional relationships and may include qualitative as well as quantitative data.

This thesis has shown that econometric analysis can be useful in the subordinate role of exploring and confirming the nature of an anomaly, as opposed to testing causal hypotheses. In such a case the existence of the anomaly is not in serious question, being observable 'by the naked eye', as it were. The role of econometric analysis is to reveal by closer inspection the detail of the anomaly and that it is not an 'optical illusion'. The theoretical model of the anomaly must be specified with careful attention to the realism of its premises and the conditions for closure and aggregation.

This methodology has informed the structure of this investigation, starting with an assessment of the evidence of an anomaly in the absence of equity finance for aggregate industrial capital formation. This leads by retrodution, using the tools of *The General Theory*, to a theoretical explanation of the anomaly in terms of a differential new issue discount. Finally, the hypothesis derived from this explanation, which is not based on a functional relationship, is tested by a retrodictive study of the conditions associated with new issues.

The literature contains several reports of the close empirical relationship between investment and cashflow, over a 40-year period from Meyer and Kuh (1957) to Corbett and Jenkinson (1997). The evidence of a conventional limit to gearing based on borrower's risk is also extensive and reported most recently in Glickman (2001). Several studies of the issue discount on seasoned equity offerings have been resolved in Asquith and Mullins (1986).

This research begins by reviewing the aggregate data for the UK & US industrial sectors over the period 1952-2001, confirming the difference between gross and net measures of the contribution of external equity finance to capital formation, and its apparent relation to acquisition expenditure. The evidence favours the Post/New Keynesian interpretation of the gearing ratio over the neoClassical/agency models, since the ratio appears to be the residual of a flow process rather than of stock

equilibrium. The evidence of a mainly negative net contribution from external equity to capital formation favours a Post Keynesian interpretation, but is apparently contradicted by the evidence from the gross measures, which supports the neoClassical view that there is no obvious deterrent to the use of equity finance by large firms.

To explain the anomaly in Post Keynesian terms requires the existence of a differential new issue discount, which applies to capital formation but not acquisitions. If this exists, the relationship between investment and cashflow (anomalous because large firms clearly do use equity markets extensively) can be understood as a finance mechanism, with investment constrained by the absence of equity finance. There are two alternative explanations, the 'hypothecation argument' (that the use of equity is invisible in aggregate net measures) and the 'bootstrap hypothesis' (that equity finance is unnecessary). Econometric analysis proves useful in addressing these counter-arguments.

The hypothecation argument is that the acquisition of long-term financial assets cannot be offset solely against external finance. Since these are aggregate data, they may include firms that use positive net cashflow to acquire long-term financial assets of all kinds and not only other businesses. Conversely some firms may make heavier use of external finance for capital formation than the aggregates suggest. The apparent lack of equity finance on a net measure is simply an optical illusion.

The evidence both from inspection of the charts and from unit root tests indicates that the internal finance ratio (cashflow over investment) is a stationary series, indicating an equilibrium co-integrated relationship between the two variables. The study of individual new issues found only 0.2% of the gross equity raised by way of UK seasoned equity offering in 1999 was used to finance capital formation. Together these present a strong empirical case against the hypothecation argument.

The bootstrap argument accepts that investment and cashflow are related by a finance mechanism, but not that this implies a finance constraint. The argument is that all profitable investment opportunities can be financed from cashflow and debt, so that any constraint on equity finance is not binding in practice. Under this hypothesis an investment-cashflow correlation can be expected but the causation runs from investment to cashflow. This is a more difficult challenge to answer, and



requires the specification of a model of the finance mechanism and the use of a vector error correction model (VECM) to test for the direction of causality.

In considering the model specification, the Critical Realist critique must be taken into account. The conditions for closure and aggregation are met by a finance mechanism, based on the individual firm's cumulative budget constraint and the stability on average across firms of liquidity and borrowing policies. This requires that the variables be specified in nominal terms, that investment includes inventory changes and that cashflow is measured after the payment of dividends. Nevertheless the finance mechanism is only one of several expected to be operative from a Post Keynesian perspective, as summarised in Figure 2-1 in Chapter 2. The finance mechanism relating investment and cashflow is one of medium-term equilibrium, from which fluctuations are to be expected both because of shocks to cashflow and short-term cyclical confidence and accelerator effects on gearing. There is also a long-term strategic relationship running from output (through investment) to cashflow.

The nature of the relationship between investment and cashflow favours the use of an error correction model (ECM) based on a co-integrating vector. This model was estimated in both single equation and vector form with strong and robust results from the single equation model. The variation in cashflow explains 70% of the variation in the ECM after allowance is made for the confidence cycle. The period of the implicit lag between investment decisions and execution is plausible. The VECM allows too much influence to investment but firmly rejects the bootstrap hypothesis that the variation in investment determines the variation in cashflow.

These exercises in econometric modelling tell us that the anomaly is genuine and implies a relationship between investment and cashflow in terms of a finance mechanism. Such a mechanism is to be expected in the absence of equity finance since capital formation must be financed either directly by cashflow or indirectly by borrowing that must ultimately be repaid from cashflow. There is no evidence at either the aggregate or firm level to indicate that equity finance plays a hidden role (the hypothecation argument). The bootstrap argument looks implausible on the grounds of the unit cashflow elasticity of investment and the VECM results, as well as on the evidence that dividend policy is independent of investment. This suggests the finance mechanism does also reflect a binding finance constraint.

This relationship between investment and cashflow tells us little about the determinants of investment, only about its finance. For determinants we need to consult the larger Post Keynesian theory of profits. The investment of an *individual* firm may well in part be a function of output and marginal  $q$ . The difference between this exercise and the standard econometric models of aggregate investment is in the realism of the conditions for closure and aggregation. The latter models rely on a complex functional ‘black box’ to link aggregate investment to the fundamental parameters. The black box is unnecessary for the more modest empirical task attempted here, or at least its internal workings are for the most part observable and beyond major dispute. The model of a finance mechanism incorporates simple and transparent functional relationships that do not present the problem of interpretation associated with the methodologically more ambitious models. The observed finance constraint can be reconciled with competitive equity markets only by a differential new issue discount, and the next stage of this investigation is to explain the empirical anomaly using the tools of *The General Theory*.

Keynes’s implicit definition of liquidity is the degree to which the value of an asset, measured in any given standard, is independent of changes in the state of long-term expectation. This affects the anticipated cost of reversing an investment decision. The importance of organised investment markets lies not in the transferability of shares, since Keynes assumes all assets trade in perfect markets. The ‘liquidity’ of markets depends on the maintenance of the conventional basis of valuation long enough for the individual investor to reverse a decision.

This definition of liquidity and the systematic divergences between, on the one hand the ‘actuarial’ and conventional valuations of a new industrial asset, and on the other hand, the confidence of managers and investors, lead to two propositions:

- A. New assets present a greater liquidity risk than existing assets;
- B. Investors place greater weight on this liquidity risk than managers, leading to a ‘new asset discount’ relative to existing assets.

This new asset discount will be reflected in either absolute or relative permanent dilution of existing investors if new equity is issued to finance the new asset. In cases where issues have taken place (such as the Asquith and Mullins study, 1986) the degree of dilution is consistent with plausible values of the parameters of a

simple model. On the other hand if managers act in the interests of investors new issues will be avoided unless the investment opportunity is exceptional. The new asset discount does not apply to acquisitions of existing industrial or financial assets where there is little or no divergence between the actuarial and conventional valuations.

This new asset discount corresponds to the premium for liquidity risk required by lenders in *The General Theory*. Although not 'double counted' in the case of equity finance it supplements any liquidity premium considered necessary by managers alone. While Keynes emphasised variations in this premium as sources of cyclical fluctuation in the marginal efficiency of capital necessary to induce investment, this treatment explains the differential new issue discount as a long-term phenomenon.

This analysis also indicates the extent to which the M&M financial invariance theorem is compatible with fundamental uncertainty. Proposition I, that the valuation of existing assets is unaffected by gearing, given perfect capital markets, remains valid. However Proposition III (that the average and marginal cost of capital are equal) does not, and part of the problem is that the shift from Keynes's asset-related concept of marginal efficiency to the firm-related cost of capital elides the distinction between actuarial and liquidity risk. In this context, the new issue discount acknowledged by M&M as an exception becomes the rule. Their exception is based on a divergence in actuarial valuations between managers and investors, which may arise when firms are small or new and investors are sceptical that returns will be as high as managers predict. By contrast, the liquidity premium is a permanent factor for all firms and for unexceptional investment opportunities.

Having established a theoretical case for a differential new issue discount as the source of the equity finance anomaly and of the apparent constraint of aggregate investment by finance, the third part of the research examines the evidence for a differential new issue discount at firm level. The hypothesis under test is that new issues are made to finance acquisitions of existing and financial assets but not capital formation. The hypothesis is not in functional form, since new issues deterred cannot be directly observed, theory offers no functional relationship between the observable variables, and because it is possible that other mechanisms are at work. The test is therefore retrodictive in nature, working back from instances of new issues to check for the necessary trigger conditions or events.

The dataset is the published annual reports and accounts filed by all 217 UK companies that made new issues in excess of £1m in 1999. The investigation proceeds in three stages. The first quantitative test filters out about half the sample, by using the cash flow statements to establish that the equity issue could not have been used to finance capital formation. The second stage is a detailed quantitative analysis of the application of the proceeds of 69 new issues over £5m revealed by the notes to the accounts. The third stage is a more qualitative study of 35 cases where the possibility that the issue was made to finance capital formation cannot be ruled out by the first two stages.

The third stage reveals a number of mechanisms at work alongside the one under test. 75% of the issues are accounted for by ‘bubble’ stocks, Initial Public Offerings (IPOs) or trade investors. Only nine issues were made as seasoned equity offerings to financial investors. Of these, one issue was related to a solvency shock and four related to the acquisition of assets based on intellectual or physical property with low liquidity risk. This leaves four issues (three in 1999) to finance irreversible capital formation, all of which are associated with exceptional investment opportunities. The most striking result is the complete absence of companies with over 5,000 employees using planned equity issues to finance capital formation.

In conclusion, this research finds empirical evidence of an anomaly in the use of equity finance, which indicates that aggregate investment is constrained by finance. Secondly, it offers a theoretical explanation of this anomaly in terms of a differential new issue discount based on liquidity preference, using the tools of *The General Theory*. Thirdly, the results of a detailed firm level study of new issues support this explanation.

Hyman Minsky famously stated that *The General Theory* without uncertainty was like “Hamlet without the Prince”. The whole of the future, not only that which lies beyond the grave, is “a bourne from which no traveller returns” to tell his tale of what lies there. As Fernando Cardim de Carvalho has recently argued (2003), Hamlet’s problem was the lack of animal spirits to decide between ominous and imponderable courses of action, even whether “to be, or not to be”.

Economics without fundamental uncertainty provides limited insight into the true nature of money and the determinants of investment, employment and growth. Yet although by its nature fundamental uncertainty is impervious to direct analysis, we

can detect its consequences in the behaviour of individuals and institutions. This thesis has followed Keynes in identifying liquidity preference as one of the most significant economic expressions of fundamental uncertainty. Through a fresh interpretation of his analysis in *The General Theory* it has proved possible to explain the differential new issue discount essential to the Post Keynesian theory of investment finance. Thus Keynes and Kalecki can be reconciled, not by assuming a failure of competition in the financial arena where the market reigns supreme, but by recognising the particular forms of the institutions of capitalism, as we know it, to be a necessary response to fundamental uncertainty.

The neoClassical attachment to competition as the key to understanding the economics of a free society is well founded in most respects. Yet all free enterprise societies are situated in space and time, and our ignorance of the future is an empirical reality even more beyond dispute than the power of free enterprise. Competition cannot be 'perfect' until every person has a genuine chance to compete. As Kalecki feared, the full employment that is a necessary condition of such freedom appears to be a recipe for instability under the present institutions of global capitalism, even if it might perhaps not have been so for a medieval market town economy of yeomen and artisans. If this can be recognised rather than ignored, we may begin to make progress again.

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