

**Department of Economics and Marketing  
Discussion Paper No.15**

**A Keynesian Theory  
of Monetary Inflation  
Without Government**

**Dr Paul Dalziel**

**January 1996**

Department of Economics and Marketing  
PO Box 84  
Lincoln University  
CANTERBURY

Telephone No: (64) (3) 325 2811  
Fax No: (64) (3) 325 3847  
e-mail: dalziel@kea.lincoln.ac.nz

ISSN 1173-0854  
ISBN 0-9583485-2-9

## *Abstract*

This paper presents a model of inflation that is generated by an excess supply of credit-money without any money base impulse from government. Instead, inflation turns out to depend on just three variables: the marginal debt-capital ratio of firms, the money-wealth ratio of households and the economy's supply-side growth rate. The model is a standard equilibrium model of the money market presented within a process analysis framework based on the Keynesian investment-saving identity and Keynes's concept of the revolving fund of investment finance. The paper concludes with a discussion of the model's implications for further research and policy development.

*Dr Paul Dalziel is a Senior Lecturer in Economics, Department of Economics and Marketing, Lincoln University, Canterbury, New Zealand.*

*A paper to be presented at The Royal Economic Society Annual Conference, Swansea, April 1-4, 1996.*

# *Contents*

List of Figures	(i)
1. Keynes's Revolving Fund of Investment Finance	5
2. Two Simplifying Assumptions	8
3. A Model of Monetary Inflation	10
4. Conclusion	13
References	15

## *List of Figures*

1.	Private Consumption Deflator	2
2.	Process Analysis of Keynes's Revolving Fund of Investment Finance	6
3.	The Basic Structure of the Theory of Monetary Inflation Without Government	9

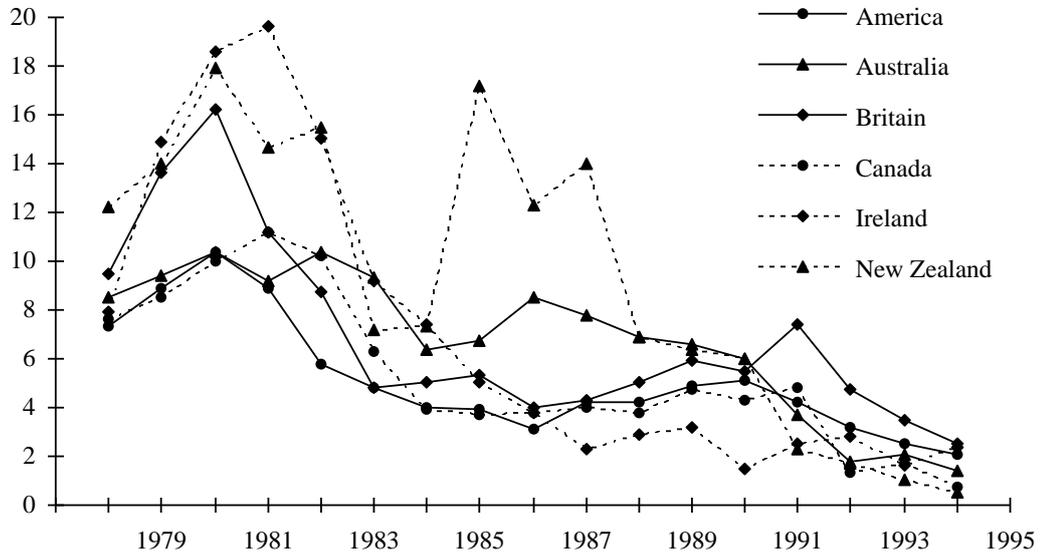
# **A Keynesian Theory of Monetary Inflation Without Government \***

During the last fifteen years, the English-language members of the OECD have slowly squeezed out the high rates of inflation inherited from the previous decade's supply-side shocks and accommodating macroeconomic policies. This is illustrated in Figure 1 below, which shows private consumption deflator inflation rates for America, Australia, Britain, Canada, Ireland and New Zealand for the calendar years 1978 to 1994. In 1980, inflation rates in these six countries had risen to double-digit levels, and were above fifteen per cent in Britain, Ireland and New Zealand. Disinflation was achieved in two steps. In the first step, policymakers introduced tight monetary policies (Britain, Canada, Ireland and the United States) or incomes policies (Australia and New Zealand) to reduce inflation to below 7.5 per cent by 1984. Little further progress was made during the rest of the decade, however, and inflation rates remained between three and seven per cent at the end of the 1980s. More recently, many countries have drawn on the economic literature concerned with credibility and time consistency to give central banks more autonomy from government and a tighter focus on the price stability goal (see, for example, the papers by Charles Goodhart and Alex Cukierman in the policy forum edited by David Greenaway, 1994). This had the desired impact on inflation which, in 1994, measured 2.5 per cent or less in all six countries represented in Figure 1. This move to price stability is a notable achievement, and the associated institutional reforms restricting the ability of governments to fuel inflation through money base expansion will also be welcomed by most monetary economists.

---

\* I am very grateful to Lincoln University and to the Reserve Bank of New Zealand for financial assistance to attend the RES Conference at which this paper will be presented, although the research reported in this paper cannot be attributed as the view of either organisation. A large part of the research took place while I was the guest of Wolfson College and the Faculty of Economics and Politics at Cambridge University during the first seven months of 1994, and I am pleased to record my gratitude for their hospitality, and to Lincoln University for financing sabbatical leave during that period. Earlier versions of the theory presented in this paper have been presented at seminars in the Economics Departments of Lincoln University, Macquarie University, the University of Sydney, Cambridge University, Stirling University, the University of East London, the University of Modena, the Reserve Bank of New Zealand and the University of Canterbury, as well as to a session on monetary policy at the 24th Conference of Economists at the University of Adelaide in September 1995. I am grateful to all participants for their many suggestions for improvement, but would like to particularly record my debt to Dr Geoffrey Harcourt and Professor Peter Earl for their insightful and detailed written comments on the research reported here. The usual disclaimer applies.

**Figure 1**  
**Private Consumption Deflator**  
**Rates of Inflation**



Source: *OECD Economic Outlook*, 57, June 1995, Annex Table 15.

The purpose of this paper, however, is to draw attention to a problem of monetary control that has not been addressed by the reforms of the last decade, and which may be an important contributor to the inflationary pressures that emerged in the second half of 1994, and which required the monetary authorities in all six countries to raise domestic interest rates at least twice during that year. For the most part, discussions in the monetary policy documents of the respective central banks sought explanations for the emerging inflationary pressures in non-monetary factors such as rising wage demands by organised labour or excess demand in key bottleneck industries. The following extract from the minutes of the monthly monetary meeting between the Chancellor of the Exchequer and the Governor of the Bank of England on the 2nd of February 1995 (at which it was agreed that the base interest rate would be increased by 0.5 per cent) is typical.

The Governor continued that all of this confirmed that the economy as a whole had been growing at well above trend, and the survey evidence of broadening capacity shortages was consistent with this. It was not known with any certainty, a priori, how long this could continue without generating inflationary pressures. But there were clear danger signals in the direct evidence of cost and price pressures already seen.

This focus on non-monetary sources of inflationary pressure is understandable, since the primary objective of recent institutional reforms has been to restrict the ability of governments to initiate inflationary expansions in the money supply. This is in keeping with the literature on monetary inflation, which has assumed, almost without exception, that all monetary growth is the result of actions by the monetary authorities, as the following representative quotations from leading scholars illustrate.

Whatever was true for tobacco money or money linked to silver and gold, with today's paper money, excessive monetary growth, and hence inflation, is produced by governments. (Friedman and Friedman, 1980, p. 264)

The government determines the nominal money stock at the start of period  $t$  to be the amount  $M_t$ . No private issues of money are considered. (Barro, 1983, p. 3)

We assume that the policymaker controls an instrument - say, monetary growth,  $m_t$  - which has a direct connection to inflation,  $p_t$  in each period. (Barro and Gordon, 1983, p. 594)

The direct result of this literature - namely, the recent reforms to restrain the power of governments to initiate excessive money supply growth - has been an important policy advance, but it is clearly not the case that only governments have the power to create money. To the contrary, almost all money in modern economies is credit-money, created through simple balance sheet transactions by private sector financial institutions. In March 1994, for example, the United Kingdom's total money supply (M4) was £400 billion, but of that amount only £18 billion was currency issued by the Bank of England; the remaining ninety-five per cent had been created by other financial institutions. If the authorities are to control inflation efficiently, therefore, attention must be paid to the non-government sources of monetary expansion.

The model of this paper is concerned precisely with this issue; namely, the relationship between private sector money creation and inflation. The concepts introduced here are not complicated, but they produce some important results and a robust framework for further research into the problem of designing efficient policies to maintain price stability without harming long-term growth rates or sacrificing the pursuit of full employment. In particular, the model presents a theory of inflation caused entirely by monetary expansion, but without any government impulse. Instead, an excess supply of credit-money, created by the banking system, spills over into excess demand for equities, which causes an inflation in the price of

investment goods and then of consumption goods. Further, the extent of the inflation is determined by a simple relationship between the marginal debt-capital ratio of firms and the money-wealth ratio of households, scaled by the supply-side growth rate of the economy. The simplicity of this relationship (in which the inflation rate is dependent on only three variables) is, of course, comparable with the simplicity of other well-known relationships in monetary economics such as Fisher's (1911) equation of exchange, Weintraub's (1959) wage-cost mark-up equation, and Eckstein's (1981) categorisation of inflation into core, supply-side and demand-side elements.

A word should be said about the methodology employed in this paper. The aim of the research is not so much to create an instrumental model of inflation, but rather 'to identify and understand real structures or mechanisms that govern the (equally real) phenomena that are experienced' (Lawson, 1989, p. 62). In this case, the experienced phenomenon is inflation, and the paper's objective is to identify the structures and mechanisms in a modern credit-money system that can contribute to inflationary pressures. In keeping with this 'realist' approach, the analysis proceeds in three stages. In Section I, Keynes's (1937a and 1937b) concept of a revolving fund of investment finance is used to provide an underlying structure of real and monetary flows. This structure is constructed within a process analysis framework recently presented by Meade (1993), and is very general, since it relies on three macroeconomic identities only. In Section II, the model is simplified by abstracting from any short-term differences between the price of equities and the price of capital goods, and by assuming that the Keynesian expenditure-income multiplier is instantaneous. The model thus created reveals the possibility of differences between the supply of credit-money (resulting from the debt decisions of firms) and the demand for credit-money (resulting from the desire by households for a liquid store of wealth). In Section III, two behavioural parameters are introduced to capture these respective debt-capital and money-wealth decisions, and it is the interplay between these two parameters, scaled by the economy's supply-side growth rate, that produces the model's causal mechanism of inflation. Section IV concludes with a brief discussion of some of the model's implications for future research and policy development.

## 1. Keynes's Revolving Fund of Investment Finance

The first step towards constructing a monetary theory of inflation without government is to set out a structure of real and monetary flows that might plausibly be associated with an increase in credit-money created by an economy's banking system. An outline of such a structure can be found in four papers by Maynard Keynes (1937a, 1937b, 1938, 1939; see, also, Kalecki, 1935a and 1935b) published after *The General Theory*. In these papers, Keynes observed that a critical role of the banking system is to extend credit to finance the production of investment goods in advance of the saving that is necessarily generated through Kahn's (1931) multiplier process. This role creates an immediate link between the real and monetary sectors. There are further links when the saving is converted into equity in the new capital stock, since this allows the original bank loans to be retired, and the fund of investment finance to be replenished.

I return to the point that finance is a revolving fund. In the main, the flow of new finance required by current *ex ante* investment is provided by the finance released by current *ex post* investment. When the flow of investment is at a steady rate, so that the flow of *ex ante* investment is equal to the flow of *ex post* investment, the whole of it can be provided in this way without any change in the liquidity position. (Keynes, 1937b, pp. 219-20)

Keynes's concept of a revolving fund of investment finance, and the structure of real and monetary flows it identifies, can be more easily understood if it is presented within a process analysis framework that James Meade (1993) has recently explained was the method by which he first demonstrated the Keynesian identity between investment and saving (see, also, Chick, 1984, Cottrell, 1986, Earl, 1990, Chapter 10, and Dalziel, 1996, for recent examples of process analysis in the context of investment finance). This is set out in Figure 2 below.

**Figure 2**  
**Process Analysis of Keynes's**  
**Revolving Fund of Investment Finance**

$$\begin{array}{rcl}
 F = P^I I & \rightarrow & P^I Y_0 \\
 & \downarrow & \rightarrow S_1 = P^K_1 \Delta E_1 + \Delta H_1 \\
 P^C_1 C_1 & & \downarrow \\
 & \downarrow & R_1 \\
 P^C_1 Y_1 & & \\
 & \downarrow & \rightarrow S_2 = P^K_2 \Delta E_2 + \Delta H_2 \\
 P^C_2 C_2 & & \downarrow \\
 & \downarrow & R_2 \\
 P^C_2 Y_2 & & \\
 & \downarrow & \rightarrow S_3 = P^K_3 \Delta E_3 + \Delta H_3 \\
 P^C_3 C_3 & & \downarrow \\
 & \downarrow & R_3 \\
 P^C_3 Y_3 & & \\
 & \downarrow & \\
 \text{Etc.} & & 
 \end{array}$$

Figure 2 assumes a closed economy in which there is no government (so that there are no tax flows or government bonds, as well as no changes of the monetary base). Suppose that in some arbitrary interval of time, a certain value of investment goods is produced, denoted  $P^I I$ , where  $I$  is the real quantity of investment and  $P^I$  is the price of investment goods. Without loss of generality (since it is a simple matter to incorporate more realistic features of investment finance without affecting the macroeconomic relationships that must prevail), assume that all of this investment expenditure is financed by a flow of new credit-money, denoted  $F$ , provided by bank loans. This produces the first equality in the first row of Figure 2. The investment expenditure also generates an equal value of income for the factors of production in the capital good industries,  $P^I Y_0$ , which is received in the form of credit-money that will finance consumption expenditure and saving in the next round of the multiplier process. Thus, at the end of this initial interval, the following identity holds:

$$P^I I = P^I Y_0 \tag{1}$$

In the first round of the process (which cannot be identified with any particular time interval) households use their incomes to purchase consumption goods to the value of  $P^C_1 C_1$ , where  $C_1$  is the real quantity of consumption in round 1 and  $P^C_1$  is the price of consumption goods in this first round. The remainder of the income is saved,  $S_1$ . Note that there is no price level associated with  $S_1$ ; saving is simply a residual (that is, income not spent).

$$P^I Y_0 = P^C_1 C_1 + S_1 \quad (2)$$

The consumption expenditure generates further income,  $P^C_1 Y_1$ , and so the process continues until a round occurs (perhaps asymptotically) in which there is no consumption expenditure. In every round  $r \geq 1$ , the following identity holds:

$$P^C_r C_r = P^C_r Y_r \quad (3)$$

and in every round  $r \geq 2$ :

$$P^C_{r-1} Y_{r-1} = P^C_r C_r + S_r \quad (4)$$

These equations can be used to derive under very general conditions (that is, without requiring a fixed marginal propensity to save in each round, as Meade, 1993, assumed) the famous Keynesian result that investment expenditure necessarily creates an equal value of voluntary saving. This is because equations (1) to (4) imply that ‘a conservation of saving’ principle is observed in every round of the process,  $r \geq 1$ , as follows:

$$P^I I = \sum_{j=1}^r S_j + P^C_r Y_r \quad (5)$$

The process ends in some terminal round,  $T$ , in which there is no consumption expenditure (so that  $Y_T = 0$ ), and hence equation (5) implies that:

$$P^I I = \sum_{j=1}^T S_j = S \quad (6)$$

In the meantime, the households who save in each round must decide in what form they will hold those savings. In the absence of government, the two choices open to them are to

purchase equity in the new capital stock produced by the investment production or to accept an increase in their credit-money balances. Let  $P^K_r$  be the price of an equity (defined in the same units as the capital stock) in round  $r$ , so that  $P^K_r \Delta E_r$  is the value of the increase in equity purchased by households out of their saving in round  $r$ , and the remainder of their saving is held in the form of increased money balances,  $\Delta H_r$  ('hoarding'). Note that again there is no price level associated with the residual item, in this case hoarding. The purchase of equity in each round transfers money from households back to the firms managing the new capital stock, and so the proceeds of the equity sales can be used by these firms to retire their outstanding debt incurred to finance the investment production. This repayment is denoted as  $R_r$  in each round of the process. Note carefully that since equation (6) implies that the initial finance flow equals subsequent saving, and since saving is divided between equity purchases (which retire debt) and increased money balances, the analysis in Figure 2 implies that at the end of the process (where the non-subscripted variables refer to the sum of their respective subscripted values from  $r = 1$  to  $r = T$ ):

$$F - R = \Delta H \quad (7)$$

Keynes (1937a and 1937b) implicitly assumed no increase in hoarding ( $\Delta H = 0$  in equation 7) in order to obtain his conclusion that the revolving fund of investment finance is fully self-replenishing ( $R = F$ ). There is no reason to think that this assumption will always hold, however, and Davidson (1968 and 1978) has analysed some of the implications if indeed 'the marginal propensity to demand placements' is less than one. More generally, it might be assumed that the overall level of finance flows,  $F - R$ , is determined by the debt-capital decisions of firms while changes in the demand for money as a stock,  $\Delta H$ , is determined by the money-wealth decisions of households. In such a case, a mechanism is needed to ensure that the equality in equation (7) is maintained, and Section III will demonstrate how inflation can act as that mechanism. But first, two simplifying assumptions need to be formally recorded.

## 2. Two Simplifying Assumptions

The process analysis of Section I is extraordinarily general, since it relies on three identities only: (i) expenditure equals income; (ii) income not spent is saved; and (iii) saving not used to purchase equity is held as increased nominal money balances. The analysis includes, however, two details which it is convenient to exclude by assumption for the purpose of simplifying the

algebra. First, Figure 2 makes a distinction between the price of investment goods,  $P^I$ , and the price of equities,  $P^K$ . In the famous  $q$ -statistic analysis of James Tobin (Tobin and Brainard, 1968; Tobin, 1969 and 1982), these two prices are equal in the long-run, and this long-run assumption will be assumed to prevail in this model. Let  $P$  denote this common price of investment goods and equities.

$$P = P^I = P^K \quad (8)$$

Secondly, Figure 2 traces out the workings of the multiplier process over time. Following the example of Keynes (1937b), assume that the rounds of the multiplier process (and its associated equity purchases and money hoarding) occur instantaneously. This assumption creates a two period model, in which investment expenditure takes place in the first period, and the multiplier processes take place in the second period.

**Figure 3**  
**The Basic Structure of the Theory of Monetary Inflation Without Government**

$$\begin{array}{rcccl}
 P_{-1}\Delta K & = & R & + & \Delta D \\
 \uparrow & & \downarrow & & \downarrow \\
 F_{-1} & = & P_{-1}I_{-1} & \text{Equity Market} & \Leftrightarrow & \text{Money Market} \\
 \downarrow & & \uparrow & & \uparrow \\
 S & = & P\Delta E & + & \Delta H
 \end{array}$$

Figure 3 sets out this basic structure of the theory produced by these two simplifying assumptions. Its starting point is the previous period's investment,  $P_{-1}I_{-1}$ , financed by credit flows,  $F_{-1}$ . Note that subscripts now refer to periods in time (so that -1 refers to the previous period), rather than to rounds of the process as in Figure 2. The investment production has two impacts. First, it increases the economy's capital stock by  $\Delta K$ , which is initially valued at  $P_{-1}\Delta K$  in the firms' balance sheets. Firms must then decide how those capital assets will be financed in the long-term by a mixture of increased shareholders' equity (allowing debt repayment,  $R$ ) and increased long-term debt ( $\Delta D$ ). Secondly, the investment production produces an equal amount of voluntary saving through the multiplier. Households must then

decide how the new saving will be held in some mixture of new equities,  $P\Delta E$ , and increased money balances,  $\Delta H$ . These respective decisions of firms and households make up the two sides of the equity and money markets, which are connected by the identities just mentioned. Note carefully that the aggregate level of new liabilities in firms' balance sheets and the aggregate level of new saving by households are both valued at the *previous* period's price level, but equities are valued at the *current* period's price level. This is the feature of the model that allows inflation to bring the equity and money markets into equilibrium, as the next section formalises.

### 3. A Model of Monetary Inflation

The model of this section is a standard equilibrium analysis of the money market. Expressions are obtained for nominal money supply and nominal money demand within the structure set out in the previous section, and the price of equities is then allowed to adjust in order to bring supply and demand into equality. Consider first the supply of money, denoted  $M^S$ . From Figure 3, there are two influences that will cause the money supply to change from that in the previous period. First, it will be increased by the finance,  $F$ , created to fund the current period's investment; and, second, it will be reduced by the period's level of retired debt,  $R$ . This is recorded in equation (9).

$$\Delta M^S = F - R \quad (9)$$

Suppose that firms choose to retire only some proportion,  $(1 - d)$ , of the debt incurred to finance their previous period's investment production. The ratio  $d$  can be called the firm's marginal debt-capital ratio, since it states what proportion of the *new* capital stock remains financed by long-term debt (note that the adjective 'marginal' is used, since the impact of inflation on asset prices will cause a different 'average ratio' of debt to capital, as briefly discussed in Section IV below). This assumption is recorded in equation (10).

$$R = (1-d)F_{-1} \quad (10)$$

Substituting (10) into (9) produces an equation describing changes in the money supply:

$$\Delta M^S = \Delta F + dP_{-1}I_{-1} \quad (11)$$

Consider now the demand for nominal money balances,  $M^D$ . Money is demanded by households for two reasons: to finance consumption transactions in the following period, and as a liquid store of wealth. Figure 2 in Section I revealed that, in the framework of this model, all consumption transactions are financed by the credit created for the investment expenditure at the beginning of the multiplier process. Once investment expenditure is financed, in other words, the financing needs for the subsequent induced consumption are satisfied *ipso facto*, because all income flows are matched by money flows. Hence, the transactions demand for money balances at the end of the period is simply the period's level of investment expenditure finance.

The stock demand for money, on the other hand, is a portfolio decision about the allocation of accumulated saving between money and equities. As Friedman (1970, p. 202) recognised, this demand for money may be expected to be a function of total wealth as 'the analogue of the budget constraint in the usual theory of consumer choice'. In this model the only source of real wealth is the accumulated stock of capital, and so let the demand for money by ultimate wealth-holders be proportional to the nominal value of the accumulated capital stock. Denote this money-wealth ratio as  $h$ . The two components of nominal money demand can now be brought together into a single expression:

$$M^D = F + hPK \quad (12)$$

Equilibrium requires money supply to equal money demand. Assuming equilibrium at the beginning of the period, this will be satisfied if the change in money supply during the period (given in equation 11) equals the change in money demand. The latter is found by differentiating equation (12):

$$\Delta M^D = \Delta F + h\Delta PK_{-1} + hP_{-1}\Delta K \quad (13)$$

Setting (11) equal to (13), and eliminating the common term produces the following:

$$dP_{-1}I_{-1} = h\Delta PK_{-1} + hP_{-1}\Delta K \quad (14)$$

Note the disappearance from the equation of the increase in the size of the revolving fund of investment finance,  $\Delta F$ . This feature has led many post-Keynesian authors (notably,

Robinson, 1970, Weintraub and Davidson, 1973, Kaldor, 1980, Kaldor and Trevithick, 1981, and Moore, 1988) to argue that money cannot cause inflation because it is always endogenously supplied in response to demand. This analysis confirms that this is true for *transaction* flows, but it also reveals that allowance must be made for the *stock* supply of money created as the counterpart of outstanding debt in the balance sheets of firms and the *stock* demand for money by households desiring a liquid form of holding wealth. These are the elements found in equation (14). Divide both sides of that equation by  $P_{-1}$ , and rearrange to isolate the rate of inflation, denoted by the small letter  $p$ .

$$p = \Delta P/P_{-1} = (d/h)I_{-1}/K_{-1} - \Delta K/K_{-1} \quad (15)$$

This can be further simplified by recognising that  $I_{-1} = \Delta K$ , and by noting that, if there is a constant capital-output ratio, the percentage change in the capital stock represents the supply-side growth rate of the economy, which can be denoted as  $g$  ( $g = \Delta K/K_{-1}$ ):

$$p = [(d - h)/h]g \quad (16)$$

The economic interpretation of equation (16) is straightforward. Given a certain growth rate,  $g$ , an economy must undertake a certain level of investment as a proportion of national income. The investment has two impacts. Credit-money is created for its finance, and the amount of money that remains in existence after the subsequent multiplier process depends on the marginal debt-capital ratio of firms,  $d$ . Investment also creates new capital wealth which leads households to demand more money balances depending on their money-wealth ratio,  $h$ . If the marginal debt-capital ratio is greater than the money-wealth ratio, then the implied excess money supply is absorbed by inflation increasing the nominal value of capital (wealth) in order to stimulate further money demand.

Equation (16) is the key result of this paper. It presents a theory of inflation that does not depend on excess demand-side expansions in the goods market, nor on supply-side restrictions in the labour market, nor on excessive money creation by the government. Instead, inflation depends on just three variables: the marginal debt-capital ratio of firms, the money-wealth ratio of households and the economy's supply-side growth rate. Further, it states that price stability can be maintained in the presence of positive growth if and only if the economy's marginal debt-capital ratio equals its money-wealth ratio.

## 4. Conclusion

The theory presented in this paper is part of an ongoing research project exploring the relationship between private sector credit-money creation and inflation. To conclude this paper, it may be useful to discuss briefly three research and policy implications that emerge from the theory's main result in equation (16).

First, the inflation rate explained in equation (16) refers to changes in the average price of equities, which is assumed to equal changes in the average price of capital goods by appeal to the long-run value of Tobin's  $q$ -statistic (equation 8). Policymakers, however, are more often concerned with inflation in the prices of consumption goods (as illustrated in the choice of data for Figure 1, for example), so that the theory in equation (16) needs to be supplemented with a suitable transmission mechanism to reflect this. The easiest way to achieve this is to assume that firm managers in the consumption goods industries are required to earn some given rate of return,  $r$ , on the nominal value of their capital assets,  $PK$ . If  $W/A$  is the unit labour costs in the consumption goods industries (that is, wages divided by average productivity) and  $Y$  is the volume of output, then the output price,  $P^C$ , that needs to be charged to achieve the required rate of return is given by the implicit equation:

$$(P^C - W/A)Y = rPK \quad (17)$$

Note that equation (17) implies that if the price of capital goods rises by some percentage, then the required rate of return will be satisfied if both the wage rate and the price of consumption goods rise by the same percentage. In practice this would be experienced as the familiar wage and price spiral that has been the subject of considerable analysis in the Keynesian literature, but in this case the impulse for the spiral would have come from the money market, not the labour market.

Second, this paper has emphasised the role of inflation in increasing the willingness of households to hold nominal money balances (because of the nominal increase in the value of wealth). Inflation, however, also has an impact on the balance sheets of firms. In particular, inflation increases the nominal value of assets, without increasing the face value of debt, until the post-inflation ratio of debt to capital equals the money-wealth ratio of households (this must be true since in the model debt equals money balances and capital is the only form of real

wealth). This is obviously beneficial to existing shareholders, so that it is possible to analyse what determines the optimal marginal debt-capital ratio for firms, given their expectations about inflation and the nominal interest rate on debt. Space does not permit an examination here, but it is not difficult to derive some reasonably general results for the optimal debt-capital ratio and the optimal rate of investment within this framework that produce unique values for the economy's equilibrium growth rate and rate of inflation (see Dalziel, 1995, for a summary).

Finally, there are important implications for economists searching for efficient monetary policies that can maintain price stability at least cost to the real economy. From equation (16), it is clear that a pre-existing inflation can always be reduced by slowing down the economy, since, *ceteris paribus*, a reduction in the growth rate,  $g$ , produces a reduction in the inflation rate,  $p$ . The model, however, suggests alternative options for further research effort. In particular, policies that directly affect the marginal debt-capital ratio decisions of firms (for example, by reducing the marginal benefit of inflation-induced capital gains or by increasing the responsiveness of nominal interest rates to changes in inflationary expectations) offer the prospect of directly reducing inflationary pressures caused by the mechanism outlined in this paper, without the need to sacrifice economic growth.

## *References*

- Barro, R.J. (1983). 'Inflationary Finance Under Discretion and Rules.' *Canadian Journal of Economics*, vol. 16, pp. 1-16.
- Barro, R.J. and Gordon, D.B. (1983). 'A Positive Theory of Monetary Policy in a Natural Rate Model.' *Journal of Political Economy*, vol. 91, pp. 589-610.
- Chick, V. (1984). 'Monetary Increases and Their Consequences: Streams, Backwaters and Floods.' Chapter 13 in Ingham, A. and Ulph, A.M. (Eds) *Demand, Equilibrium and Trade: Essays in Honour of Ivor F. Pearce*. London: Macmillan.
- Cottrell, A. (1986). 'The Endogeneity of Money and Money-Income Causality.' *Scottish Journal of Political Economy*, vol. 33, pp. 2-27.
- Cukierman, A. (1994). 'Central Bank Independence and Monetary Control.' *Economic Journal*, vol. 104, pp. 1437-48.

- Dalziel, P. (1995). 'Inflation and Endogenous Money: A Process Analysis.' A paper presented to the 24th Conference of Economists, University of Adelaide, September.
- Dalziel, P. (1996). 'The Keynesian Multiplier, Liquidity Preference and Endogenous Money.' *Journal of Post Keynesian Economics*, vol. 18, forthcoming.
- Davidson, P. (1968). 'Money, Portfolio Balance, Capital Accumulation and Economic Growth.' *Econometrica*, vol. 36, pp. 292-321.
- Davidson, P. (1978). *Money and the Real World*. Second Edition. London: Macmillan.
- Earl, P. (1990). *Monetary Scenarios: A Modern Approach to Financial Systems*. Aldershot: Elgar.
- Eckstein, O. (1981). *Core Inflation*. Englewood Cliffs: Prentice-Hall.
- Fisher, I. (1911). *The Purchasing Power of Money*. New York: Macmillan.
- Friedman, M. (1970). 'A Theoretical Framework for Monetary Analysis.' *Journal of Political Economy*, vol. 78, pp. 193-238.
- Friedman, M. and Friedman, R. (1980). *Free to Choose: A Personal Statement*. London: Secker and Warburg.
- Goodhart, C.A.E. (1994). 'What Should Central Banks Do? What Should Be Their Macroeconomic Objectives and Operations?' *Economic Journal*, vol. 104, pp. 1424-36.
- Greenaway, D. (1994). 'Policy Forum: The Banking System and Monetary Control.' *Economic Journal*, vol. 104, pp. 1422-3.
- Kahn, R. (1931). 'The Relation of Home Investment to Unemployment.' *Economic Journal*, vol. 41, pp. 173-98.
- Kaldor, N. (1980). 'Monetarism and U.K. Monetary Policy.' *Cambridge Journal of Economics*, vol. 4, pp. 293-318.
- Kaldor, N. and J. Trevithick (1981). 'A Keynesian Perspective on Money.' *Lloyds Bank Review*, no. 139, pp. 1-19.
- Kalecki, M. (1935a). 'A Macrodynamical Theory of Business Cycles.' *Econometrica*, vol. 3, pp. 327-44.
- Kalecki, M. (1935b). 'The Mechanism of the Business Upswing.' Published in Polish. Translated and reprinted as Chapter 3 in *Selected Essays on the Dynamics of the Capitalist Economy, 1933-70*. Cambridge: Cambridge University Press, 1971.
- Keynes, J.M. (1936). *The General Theory of Employment Interest and Money*. London : Macmillan.
- Keynes, J.M. (1937a). 'Alternative Theories of the Rate of Interest.' *Economic Journal*, vol. 47, pp. 241-52. Reprinted in *The Collected Works of John Maynard Keynes*, Vol. XIV. London : Macmillan for the Royal Economic Society, 1973, pp. 201-15.

- Keynes, J.M. (1937b). 'The "Ex Ante" Theory of the Rate of Interest.' *Economic Journal*, vol. 47, pp. 663-9. Reprinted in *The Collected Works of John Maynard Keynes*, Vol. XIV. London : Macmillan for the Royal Economic Society, 1973, pp. 215-23.
- Keynes, J.M. (1938). 'Mr Keynes and "Finance": Reply.' *Economic Journal*, vol. 48, pp. 318-22. Reprinted in *The Collected Writings of John Maynard Keynes*, Volume XIV. London: Macmillan for the Royal Economic Society, 1973, pp. 229-33.
- Keynes, J.M. (1939). 'The Process of Capital Formation.' *Economic Journal*, vol. 49, pp. 569-74. Reprinted in *The Collected Writings of John Maynard Keynes*, Volume XIV. London: Macmillan for the Royal Economic Society, 1973, pp. 306-18.
- Lawson, T. (1989). 'Abstraction, Tendencies and Stylised Facts: A Realist Approach to Economic Analysis.' *Cambridge Journal of Economics*, vol. 13, pp. 59-78.
- Meade, J.E. (1993). 'The Relation of Mr Meade's Relation to Kahn's Multiplier.' *Economic Journal*, vol. 103, pp. 664-5.
- Moore, B.J. (1988). *Horizontalists and Verticalists: The Macroeconomics of Credit Money*. Cambridge: Cambridge University Press.
- Robinson, J. (1970). 'Quantity Theories Old and New: A Comment.' *Journal of Money, Credit and Banking*, vol. 2, pp. 504-12.
- Tobin, J. (1969). 'A General Equilibrium Approach to Monetary Theory.' *Journal of Money, Credit and Banking*, vol. 1, pp. 15-29.
- Tobin, J. (1982). 'Money and Finance in the Macroeconomic Process.' *Journal of Money, Credit and Banking*, vol. 14, pp. 171-204.
- Tobin, J. and Brainard, W.C. (1968). 'Pitfalls in Financial Model Building.' *American Economic Review Papers and Proceedings*, vol. 58, pp. 99-122.
- Weintraub, S. (1959). *A General Theory of the Price Level, Output, Income Distribution, and Economic Growth*. Philadelphia: Chilton.
- Weintraub, S. and Davidson, P. (1973). 'Money as Cause and Effect.' *Economic Journal*, vol. 83, pp. 1117-32.