Credit-Market, Interest Rate and Three Types of Inflation*

By Karl Brunner, Rochester, N. Y.

I. The Intellectual Heritage

Two macro-theories of interest have been considered extensively over the past decades. The discussion erupted with the publication of *Keynes'* "General Theory". Keynesian analysis explains interest rates (proximately) by the interaction of money demand and money supply. It also centered attention on the role of stock magnitudes. Another view was championed at the time by Bertil *Ohlin* and Dennis *Robertson*. The loanable funds theory explains the behavior of interest rates in terms of a demand for and supply of "loanable funds". These funds were represented by flow magnitudes related to savings and investments. The discussion contributed very little to the development of alternative empirical theories. It veered off into analytic exercises proposing definitions of flow and stock magnitudes assuring the equivalence of the two language systems.

Friedrich *Lutz* concluded after a survey of these discussions: "We are inclined to conclude that the entire discussion about the equivalence of the theory of loanable funds and the liquidity preference theory was hardly worth the bother[1]." The uselessness of the discussion was essentially conditioned by the problem pursued. Once professional consensus settled on the question how to convert a stock theory into a "flow" theory with suitably defined "flows", or how to convert the latter into a stock theory, the discussion was condemned to sterility.

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[1] Friedrich *Lutz*, "The Theory of Interest", 1968, Dordrecht, Holland, p. 18.

The question distracted professional attention from the main job, i. e., to develop useful empirical theories capable of explaining the observable behavior of interest rates. It is remarkable that Arthur *Okun*'s contribution to the Commission on Money and Credit in the early 1960's is the first systematic empirical examination of interest rates[2]. It is also noteworthy that *Okun*'s interpretation and arguments are based on the liquidity preference theory. It should be noted, however, that some elements of his formulation, e. g. the role assigned to stocks of short-term and long-term securities, are difficult to reconcile with the traditional liquidity preference theory. The large scale econometric models typically represented by the Federal Reserve — MIT model and its variants adopted a liquidity preference theory to explain at least the short-term interest rate.

The loanable funds theory attracted little attention beyond the textbooks covering the old discussions. This neglect is regrettable. This theory contains suggestions which can be usefully exploited for the development of systematic explanations. Its basic idea offers an alternative approach to the crucial failure of the liquidity preference theory. The latter implies that variations of the stock supply of securities affect interest rates via the change in money demand induced by changes in the public's wealth due to the underlying change in the stock of securities. This formulation moves, however, beyond the traditional Keynesian version which omit or disregard any effect of the stock of securities on interest rates. The elementary (or traditional) Keynesian versions are thus inconsistent with relevant propositions of price theory. The modified version of liquidity preference theory is on the other hand compatible with price theoretical propositions, provided the analysis is restricted to a world consisting of money and "bonds". An excess supply of bonds is completely mirrored in this world by an excess demand for money.

Changes in money demand thus reflect the variations in the stock of securities. The liquidity preference theory fails, however, in a three-asset world consisting of money, securities and real capital. Variations in the stock of securities are neither necessarily nor most probably identified with changes in money demand. Moreover, price-theoretical propositions would suggest that the rate of interest on securities is

[2] Arthur *Okun*, "Monetary Policy, Debt Management, and Interest Rate: A Quantitative Appraisal". In: "Stabilization Policies", Prentice Hall, Englewood-Cliffs, N. J., 1963.

proximately determined by the interaction of a demand with a suitably defined supply. This is the suggestive element inherited from the loanable funds theory, i. e. that interest rates are proximately determined on a credit-market. This idea is implemented by means of a specific analytic framework developed in the subsequent sections. It is certainly not the only possible explanation of the basic idea. It uses much of our previous work and thus offers a construction based on tentative empirical foundations. The reader will eventually note that neither the pure loanable funds theory nor the pure liquidity preference theory survive in the explication advanced. The analysis rejects the traditional associations between investment and the demand for funds, or saving and the supply of funds fostered by the loanable funds theory. It also rejects the dominant role of money demand postulated by the liquidity preference theory.

II. Outline of the Model

The assets of the economy under examination are grouped into three classes: money, financial assets and real capital. We require thus three markets to describe the interaction between assets and their prices. With the price of money (in terms of money) fixed at unity, there remain two prices. One market is thus removed by means of *Walras*-Law. The selection of the "redundant" description is guided by pragmatic considerations bearing on the requirements of empirical research. Our previous research suggests that an examination of credit-market and money-market poses less forbidding problems than a direct assault on the market for real capital.

Our analysis is thus organized around the description of a credit-market and the Walrasian money-market. Equation (1) describes the two sides of the credit-market. The left side states the banks' portfolio of earning assets E as a product of the asset multiplier a and the adjusted monetary base UB (unborrowed base).

$$(1) \qquad a\,(i - \Theta, P, c, \ldots)\, UB = \sigma\,(i - \pi - \Theta, P, p, ap, W^n, W^h, S^g + S^p, e)$$
$$a_1 > 0 < a_2;\; a_3 < 0;\;\; \sigma_1 < 0 > \sigma_2;\;\; \sigma_3 > 0 < \sigma_4;\;\; \sigma_7 > 0 < \sigma_8$$

The latter is the sum of the sources base, derived from the consolidated statements of appropriate agencies in the government sector, and the cumulated sum of reserves liberated from (or impounded into) required reserves. The resulting magnitude is adjusted for the banks' borrowing from the Central Bank. It follows from this definition of UB that changes in reserve requirement affect the adjusted base and not the asset multiplier. The latter depends indirectly via its proximate determinants[3] on the interest rate i, net of the tax imputation Θ on interest payments, the asset price level P of real capital, the true cost of borrowing c defined as the sum $d + h$, of the discount rate d and the administrative cost h of harassment of borrowers by the Central Bank. The asset multiplier responds positively to $i - \Theta$, and P, and negatively to $d + h$. The cost of borrowing affects the bank's borrowing ratio b and the reserve ratio r via the desired excess reserve ratio. The responses of r and b are then transmitted to the asset multiplier. Changes in P affect dominantly the time deposit ratio t, whereas changes in $(i - \Theta)$ affect both t and the banks' reserve and borrowing ratio. Changes in t, r and b are again transmitted to the asset multiplier.

The right side of the equation describes the public's asset supply on the credit-market. This asset supply consists essentially of two components, the public's desired loan liability position L and the public's implicit supply $S - \delta$ of securities to banks. The magnitude S can be understood as the sum of a predetermined stock supply S^g of government securities, the inherited stock S^p_{-1} of privately earned securities and an endogeneous magnitude of new issues ΔS^p. The stock demand δ describes the private sector's total demand for private and government securities. The public's asset supply σ is defined as the sum of the public's desired loan liability position L plus the portion of outstanding securities not absorbed into the private non-banking sector's portfolio. The following expression states this definition:

$$\sigma = L + S^g + S^P + \Delta S^P - \delta$$

This expression is derived by aggregating the loan and securities markets. It is advisable for a discussion of several problems to disaggregate the credit-market into underlying markets. This is particularly required

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[3] The asset-multiplier a is defined by the expression

$$a = \frac{(1 + t) \cdot [1 + n - (r + l - b)]}{(r + l - b) \cdot (1 + t) + k}$$

where k = public's currency ratio, t = public's time deposit ratio, n = public's non-deposit ratio, r = banks' actual reserve ratio, b = banks' borrowing ratio, l = ratio of cumulated volume of liberated reserves to banks' total deposits. The public's parameters are relative to demand deposits, the banks' are relative to total deposits.

for an analysis of role and consequences of limits imposed by Central Banks on the banks' loan portfolio. This analysis is not included into the present formulation, which concentrates the reader's attention on some major aggregative aspects.

The public's asset supply depends negatively on the net real rate $i - \pi - \Theta$, i. e., the net nominal rate $i - \Theta$ adjusted for the anticipated rate of inflation prevailing among operators on financial markets. It also depends on the asset price level P, the output price p, the anticipated output price ap, human and non-huma wealth W^h and W^n, the inherited stock supply of securities $S^g + S^p$, and the anticipated net yield e on real capital.

The description of the money market is contained in equation (2).

$$(2) \qquad m\,(i - \Theta, P, d + h, \ldots)\,UB = \lambda\,(i - \Theta, P, p, ap, W^n, W^h\,e)$$
$$m_1 > 0 > m_2;\; m_3 < 0$$
$$\lambda_1 < 0 < \lambda_2;\; \lambda_3 > 0 > \lambda_4;\; \lambda_5 > 0 < \lambda_6;\; \lambda_7 < 0$$

The (exclusive) money stock on the left, expressed as a product of monetary multiplier m and adjusted base UB is juxtaposed with a money demand λ. The monetary multiplier depends on the same arguments as the asset multiplier. The manner of dependence differs, however, quite substantially[4]. The monetary multiplier responds positively to $i - \Theta$, but negatively to both P and $d + h$. The money demand function λ differs in several respects from the public's asset supply σ. The elasticity $\varepsilon\,(\lambda, ap)$ is negative, whereas $\varepsilon\,(\sigma, ap)$ is positive. Similiarly, $\varepsilon\,(\lambda, e)$ is negative and $\varepsilon\,(\sigma, e)$ positive. Moreover, σ depends directly on S^g, whereas S^g occurs in λ only indirectly as a component of the public's non-human wealth. These differences between λ and σ contribute to the identifiability of suitably constructed regressions in the econometric work based on this analysis[5].

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[4] This difference follows from the differences in the dependence of the two multipliers on their proximate determinants. The monetary multiplier is defined by the expression

$$m = \frac{1 + k}{(r + l - b) \cdot (1 + t) + k}$$

This definition is appropriate for the exclusive money stock.

[5] The reader should note that the independent occurrence of σ and λ characterizes the credit-market theory of the money supply process. The money-market theory of the money supply process advocated by *Gramley-*

The wealth variables still require some description. We omit, however, the specification of human wealth in this paper. We only mention that it depends on real income, the anticipated price level ap and a tax parameter summarizing the tax schedule on income from human wealth. The dependence on real income is mediated via a postulate imposing some patterns of regularity on distribution of income. Equation (3) introduces non-human wealth as the sum of the market value of real capital K in the private

$$W^n = PK + (1 + \omega) UB + v (i - \Theta) \cdot S^g \tag{3}$$

sector outside the monetary system, the monetary system's net contribution $(1 + \omega)$ UB to the public's wealth and the market value vS^g of outstanding government securities. The parameter ω expresses the monetary system's net worth multiplier. This multiplier depends on both the real capital invested in the monetary system not included in the K and also the possible occurence of a *Pesek-Saving* component in the monetary system expressing deviations from a competitive equilibrium with open entry in the banking system. The term v measures the market value of a security unit as a function of the net nominal rate of interest.

The reader should note that the two asset-market equations occur in the form of equilibrium conditions. This involves no ontological thesis that the world is "always in equilibrium". Such equilibrium conditions constrain the joint variability of all the variables (including exogeneous variables). In particular they express an empirical hypothesis that the adjustment and information costs on the asset markets are sufficiently small and the time period used for actual explanations sufficiently long for all relevant adjustments to environmental conditions to be essentially completed. Our analysis postulates relatively low adjustment cost for financial markets and asserts that adjustments are essentially accomplished within one quarter. This implies that the framework becomes centered on stock magnitudes and describes an interaction between stocks[6].

Chase identifies σ and λ. I have argued on other occasions that this procedure involves bad price theory. The reader is referred for a more detailed discussion to a forthcoming paper "Two Alternative Theories of the Money Supply Process: Money-Market-Theory Versus Credit-Market-Theory".

[6] The underlying analysis establishes a connection between transaction costs and the stock-flow problem. High transaction costs imply the occurrence of a flow demand, and low transaction costs the emergence of a stock demand.

III. The Short-Run Responses of Interest Rates

This section examines the responses of the asset-markets to various changes. The reader should note that the responses listed describe the impact effects on the asset-market. The intermediate-run or longer-run responses of the asset-market involve adjustments conditioned via the feedback over the output and labor-market.

The impact responses are listed in Table I. The elasticities of i provide information about both the nominal and the real rate on financial assets, and the elasticities for P offer indirect information about the real rate rrk on real capital. The reader should note that the latter real rate is defined by the expression

$$rrk = \frac{p \cdot n}{P \cdot K} = \frac{P}{P} \cdot e$$

where n is the net real return on real capital. The ratio n/K is again the expected net (real) yield on real capital. It follows that the elasticities $\varepsilon\,(rrk, x) = -\,\varepsilon\,(P, x)$, provided x has no effect on p, n or K. In the context of a complete analysis containing the relevant repercussions via the output-market, the changes examined modify also p, n, and K. Some indications of this feedback emerge in the subsequent discussions.

The response of the interest rate i on financial assets to changes in the base is described as a product of two terms. The first term is the

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In the first case stocks occur as arguments of flow demand and are themselves related to realized flow demand. In the second case there is still a flow supply explaining the change in stocks. The flow function appropriate for our analysis will be provided by the budget constraint of the government sector introduced in a subsequent section. The present formulation is not the only possible explication of a credit-market centered money supply process. An alternative would acknowledge a substantial difference in the adjustment costs of loan portfolios and security portfolios. This would lead to a mixed stock-flow formulation along the following lines:

loan market

$$1.\quad \dot{L} = h\,[\alpha\, aB - L];\; h^1 > 0$$
$$2.\quad \dot{L} = L^p\,(i^1, i^2, L \ldots)$$
$$3.\quad a\,(\quad)\,B^a - L + I^p = S$$

where α = proportion of loans to total earning assets. This parameter depends on the loan rate i^1 and the guld on securities i^2. All other symbols have already been introduced. Equation 1 describes the banks' loan portfolio adjustment and equation 2 the public's flow demand for loans. Equation 3 describes the stock equilibrium on the security-market. This analysis will be examined at another occasion.

reciprocal of the average interest elasticities on the two asset-markets. Interest sensitive asset-markets thus lower the value of this first term. The second term is the ratio of the net real rate r on financial assets to the nominal rate i. This ratio declines with larger anticipations π of the inflation rate. It follows consequently that increasing anticipations of inflation expressed by a larger π lower the response of the nominal rate of interest i to changes in the base. A similar statement applies also to the tax load on interest income. The responsiveness of i falls with the relative size of Θ.

The response of the asset price P of real capital is equal to the reciprocal of the average asset price elasticities on the two asset-markets. The fundamental order condition bearing on the *relative* interest elasticities of credit-market and money-market determines the response of P. It is necessary and sufficient that the elasticity $\varepsilon(CM, i)$ exceeds the elasticity $\varepsilon(MM, i)$ i. e., the credit-market must be more interest sensitive than the money-market. It is noteworthy that anticipated inflation lowers $\varepsilon(MM, i)$ relative to $\varepsilon(CM, i)$ and thus raises the magnitude of the numerator defining the elasticity $\varepsilon(P, UB)$. Rising values of π, moreover, lower the denominator of the expressions defining $\varepsilon(P, UB)$. It follows that increasing anticipations of inflation *raise* the responsiveness of P to variations in the base. *We establish thus that the Keynesian transmission channel of monetary impulses increases in significance with the magnitude of a deflation, whereas the Non-Keynesian transmission channel increases in importance with the magnitude and persistence of inflation.*

These results can be used to explain the behavior of the real rate r on financial assets and the real rate rrk on real capital. The response of r and rrk are described by the following expressions:

$$\varepsilon(r, UB) = \varepsilon(i, UB)\frac{i}{i - \pi - \Theta} < 0$$

$$\varepsilon(rrk, UB) = -\varepsilon(P, UB) < 0 \ .$$

We obtain thus that $\varepsilon(r, UB)$ is the reciprocal of the average interest elasticities and $\varepsilon(rrk, UB)$ the reciprocal of the average asset price elasticities on the asset-markets. Moreover, the responses are affected quite similarly by the anticipated rate of inflation. Both $\varepsilon(r, UB)$ and $\varepsilon(rrk, UB)$ increase numerically with π. We note, however, that $\varepsilon(rrk, UB)$ is somewhat more sensitive to π than $\varepsilon(r, UB)$. We conclude thus that an increase in the base lowers both real rates on financial assets and on real capital (in the shortrun).

The results obtained for variations in the base extend to all the other response patterns listed in Table I. The reader will note that all elasticities are proportional to the elasticity with respect to the base. It follows that anticipated inflation quite generally lowers the response patterns of the nominal interest on financial assets and raises the responses of P with respect to any underlying change. The effect of a change in the stock supply S^g of government securities is particularly noteworthy. With $\varepsilon(\sigma, S^g)$ near unity in the U. S. A., the elasticity $\varepsilon(i, S^g)$ is definitely smaller numerically than $\varepsilon(i, UB)$. The response of i to S^g is given by expression 3 in Table I.

$$\varepsilon(i, S^g) = -\varepsilon(\sigma, S^g) \cdot \varepsilon(i, UB) \frac{\varepsilon(MM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)}$$
$$\sim \varepsilon(i, UB) \frac{-\varepsilon(MM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)}$$

The last term in the product is obviously less than unity. It follows that $\varepsilon(i, S^g) < |\varepsilon(i, UB)|$.

We require more information to state the relative magnitudes of $\varepsilon(P, S^g)$ and $\varepsilon(P, UB)$. The asset price level P responds more sensitively to S^g than to UB, provided $\varepsilon(MM, i)$ is at least half of $\varepsilon(CM, i)$. A relatively large interest-elasticity of the money-market raises the responsiveness of P to S^g compared to UB. The reader should also note that asset-price responds *positively* to both UB and S^g. The interest rate on financial assets on the other hand is lowered by an increase in UB and raised by an increase in S^g.

The relative interest elasticities of the asset-market determine in particular the efficacy of open market operations. Such operations involve an exchange between base money and outstanding securities. They are thus characterized by the condition $dUB + dS^g = 0$. The relative changes in i and P associated with a given open market operation can be described by the following expressions:

$$\frac{dP}{P} = \varepsilon(P, UB) \cdot \left[1 - \varepsilon(\sigma, S^g) \cdot \frac{q_2}{1 + q_2} \cdot \frac{UB}{S^g}\right] \frac{dUB}{UB}$$
$$\frac{di}{i} = \varepsilon(i, UB) \cdot \left[1 + \varepsilon(\sigma, S^g) \cdot \frac{1}{1 + q_1} \cdot \frac{UB}{S^g}\right] \frac{dUB}{UB}$$

where $\quad q_1 = \dfrac{\varepsilon(CM, P)}{\varepsilon(MM, P)} < 0 \quad$ and $\quad q_2 = \dfrac{\varepsilon(MM, i)}{\varepsilon(CM, i)} > 0$.

The reader easily notes that the bracketed expression multiplying ε (i, UB) exceeds unity whereas the bracketed expression multiplying ε (P, UB) falls below unity. Open-market operations affect i more and P less than pure changes in the base. *Open-market operations thus shift (midly) the weights of the transmission of monetary impulses from the Non-Keynesian to the Keynesian channel.* The reader will note, however, that the effect depends on the relative magnitude of the government sector's demand debt. The smaller this debt in total government debt, the less is the deviation from changes in the base. A rough estimate based on our previous work suggests that the bracketed expression for i is at most 1.1 and for P at least .8. The reader should also note lastly the divergence between the real rate on financial assets r and the real rate rrk on real capital. An increase in S^g raises r but lowers rrk. It is particularly important at this stage to remember that we are only considering the asset-market responses and disregard the interactions with the output market. This interaction modifies the eventual results substantially. The analysis developed in this paper thus denies that r and rrk are equal or proportional or always move together. Divergent movements of real rates on different assets are essential aspect of short-run adjustment mechanisms.

The effects of changes in the discount rate d exhibit a pattern with some significance for monetary policy. The elasticities ε (i, d) and ε (P, d) are proportional to ε (i, UB) and ε (P, UB). The proportionality factors are products of $d\,(d + h)^{-1}$ and of an average elasticity of the asset and monetary multiplier with respect to total borrowing cost $(d + h)$. These average elasticities are substantially less than unity according to our previous work. Moreover, the other term in the proportionality factor, i. e., $d\,(d + h)^{-1}$, varies with the relative importance of the administrative cost of harassment h in the total cost $(d + h)$. *A large h lower the responsiveness of both i and P to changes in the discount rate.* A large h reenforces thus the low elasticities of a and m with respect to $(d + h)$. The responsiveness of i and P thus remains at a low level compared to the responsiveness with respect to changes in the base. The result also implies that variations in h relative to d over a sample period distort regressions of interest rates on the discount rate and may explain the unsatisfactory results frequently obtained with regressions on the discount rate in the U.S.A. It is doubtful, however, that this h-factor operates in European monetary systems. These systems are characterized by radically different discounting procedures.

They seem to rely comparatively little on the administrative cost of harassment preferred by the Federal Reserve bureaucracy. It follows that discount policy remains potentially more effective in Europe, provided European Central Banks are willing to actually use the discount rate.

Inflation affects market rates of interest via two distinct channels. They may be interpreted in terms of a velocity effect and an acceleration effect of inflation. The acceleration effect works via the anticipated inflation rate of credit-market operators and the velocity effect via the anticipated price level *ap* of purchasers on the output market. Formula 6 in Table I shows that an increase in π raises both i and P. Moreover, the response increases with the anticipated rate of inflation. The larger the inherited value of π, the greater becomes the response of i or P to a further increase in π. This increase is more pronounced for P than for i. We also note that $\varepsilon(i, \pi) > \varepsilon(P, \pi)$ for sufficiently low values of π. It follows that an incipient inflation *initially* conveys *deflationary* effects via the *acceleration* channel to the output-market. Once π has risen sufficiently, the asset price effect induced by a further increase in π dominates the interest rate effect and increases in π are transformed into expansions of private real demand for output. A mirror effect occurs for persistent deflations. With negative values of π the interest rate effect dominates probably the asset price effect.

The effect of π on the real rates r on financial assets and *rrk* on real capital can be established with the aid of the formula 6. The real rate r is difined as $i - \pi$ (disregarding Θ) and we obtain thus

$$\varepsilon(r, \pi) = \varepsilon(i, \pi) \cdot \frac{r + \pi}{r} - \frac{\pi}{r} .$$

Upon replacing the appropriate expression for $\varepsilon(i, \pi)$ in Table I we derive

$$\varepsilon(r, \pi) = -\frac{\pi}{r}\left[1 + \varepsilon(\sigma, r)\ \frac{\varepsilon(MM, P)}{\Delta}\right] < 0 .$$

The sign clearly depends on the bracketed expression. The second term inside the bracket is negative. It can be shown that this term is less than unity in absolute value. Division of the denominator Δ by $\varepsilon(\sigma, r)$ yields approximately

$$\frac{\Delta}{\varepsilon(\sigma, r)} \sim \varepsilon(CM, P) \cdot \frac{\varepsilon(\lambda, i)}{\varepsilon(\sigma, r)} \cdot \frac{r}{r + \pi} - \varepsilon(MM, P) > |\varepsilon(MM, P)| > 0$$

This expression exceeds numerically the numerator $|\varepsilon(MM, P)|$. It follows that the second term inside the bracket is negative but greater than minus one. An increase in π thus lowers the real rate on financial assets. An increase in π also lowers the real rate *rrk* on real capital according to the expression

$$\varepsilon(rrk, \pi) = -\varepsilon(P, \pi) < 0 .$$

The reader should carefully note once more that these results depend on interactions constrained to the asset-markets. Interactions with the output-market modify these results.

The effect of inflation velocity, i. e., the influence of a change in *ap*, is defined by expression 12 in Table I. An increase in the anticipated price-level *ap* unambiguously raises the asset price *P*. Its effect on the nominal rate *i* of interest on financial assets depends on the relative responses of asset supply and money demand. If an increase in *ap* lowers money demand substantially and raises the public's assets supply very little, *i falls* in response to an increase in *ap*. With the asset supply σ sufficiently sensitive to *ap* an increase in the anticipated price-level raises *i*. It is sufficient for this result that $\varepsilon(\sigma, ap)$ is at least as large as $|\varepsilon(\lambda, ap)|$.

The repercussions to an impulse from the output-market exhibit a similar ambiguity depending on the properties of money demand and asset supply. An increase in output raises the nominal rate of interest. This occurs quite unambiguously. But the response of *P* depends on the relative sensitivity of money-demand with respect to human wealth, output price *p*, the expected real yield *e* on real capital, and the responsiveness of *p*, W^h and *e* to an increase in output *y*. With *e* sufficiently sensitive to *y* in the short-run and the elasticity of money demand with respect to the expected net (real) yield *e* on real capital sufficiently large compared to the price and wealth elasticity of money demand, an increase in output *y* raises the excess supply on the money-market. This output elasticity $\varepsilon(MM, y)$ of excess supply on the money-market plays a decisive role according to expression 11 in Table I. A positive output elasticity [i. e. $\varepsilon(MM, y)$] is a sufficient condition for a positive feedback effect of the output-market on the asset price *P*. This constraint on $\varepsilon(MM, y)$ represents not only properties of money demand but also properties of shorter-run adjustments of human wealth and expectations of return on real capital to variations in output.

The reader will find some additional patterns in Table I. Once the asset-market analysis is incorporated into a system admitting all the relevant feedbacks from the output-market, the response of i and P to capital-accumulation occurs as an important link connecting financial markets with the real sector. The next section offers to the readers a preliminary survey of the interaction between interest rate and the economic process.

IV. The Structure of Movements in Interes Rates

1. The Time Profile of Interest Rates

A schema for the analysis of the structure of influences working on interest rates can be derived from the asset-markets and a description of the output-market. The relative change di/i of interest rates determined by the asset-market equations can be partitioned into a variety of influences simultaneously at work. We write specifically

$$\frac{di}{i} = b_1 \frac{dUB}{UB} + b_2 \frac{dS^g}{S^g} + b_3 \frac{dS^p}{S^p} + b_4 \frac{d\tau}{\tau} + b_5 \frac{dy}{y} + b_6 \frac{dap}{ap} + b_7 \frac{d\pi}{\pi} + b_8 \frac{dwic}{wic}$$

All terms except τ and wic have already been used; τ is a vector of tax rates, including Θ, on income from human wealth or non-human wealth, or excise taxes on output, and wic is a Wicksellian term signifying an autonomous effect in the expected net yield e on real capital. The b_i-terms are elasticities. The terms b_1, b_2 and b_7 have alredy been discussed. The remainder, with the exception of the vector b_4, can be found in Table I. The reader should note particularly that b_6 and b_8 depend crucially on the comparative properties of the σ or λ-function. A sufficient condition for b_8 to be positive is an elasticity of the asset supply with respect to e at least as large as the corresponding elasticity of money demand. Similarly, with $\varepsilon(\sigma, ap)$ at least as large as $|\varepsilon(\lambda, ap)|$, the elasticity b_6 is also positive. Positive effects of anticipations on interest rate thus depend on a relatively non-dominant responsiveness of money demand to such anticipations. The (direct) effect of tax rates determined by the interaction on the asset-markets without regard to the repercussions via the output-market differ substantially between excise taxes and taxes on income. Interest rates respond negatively to an increase in tax rates on income from both human and non-human wealth, whereas an increase in excise taxes raises market rates of interest. An explicit analysis of tax effects requires suitable incorporation of tax rates into the behavior or explanatory functions. The output price p would have to be replaced by an actual market price defined as the product of a net price and an excise tax parameter. The tax rate on income from non-human wealth occurs as an argument with negative derivative in the function explaining the net return n on real capital. And lastly, the tax rate on income from human wealth occurs as an argument with negative derivative in the function explaining human wealth.

A rearrangement of the formula describing di/i yields some useful economic interpretations of the process shaping the movement of market rates of interest. We combine the terms on the right side into three expressions and obtain

$$\frac{di}{i} = SRE + IMRFE + LRFE$$

where *SRE* denotes the short-run effect of policies or of the Wicksellian element. *IMRFE* summarizes the intermediate-run feedback via the output-market, the LRFE describes the longer-run feedback effects via price anticipations. The terms are defined as follows

$$\begin{aligned} SRE \quad &= \left[\mu\, \varepsilon\,(i, UB) + (1-\mu)\,\frac{UB}{S^g}\cdot \varepsilon\,(i, S^g)\right]\cdot \frac{G-t}{UB} \\ &+ \left[\varepsilon\,(i, UB) - \varepsilon\,(i, S^g)\,\frac{UB}{S^g}\right]\cdot \frac{\nu}{UB} \\ &+ \varepsilon\,(i, UB)\,\frac{dFSC}{UB} + b_3\frac{dS^p}{S^p} + b_4\,\frac{d\tau}{\tau} + b_8\,\frac{dwic}{wic} \end{aligned}$$

$$IMFRE \quad = \varepsilon\,(i, y)\cdot\frac{dy}{y}$$

$$LRFE \quad = \varepsilon\,(i, ap)\,\frac{dap}{ap} + \varepsilon\,(i, \pi)\,\frac{d\pi}{\pi}\,.$$

Some new items are introduced here as follows: G = nominal government expenditures, t = nominal tax revenues, μ = proportion of deficit $(G - t)$ financed by the creation of new base money, ν = pure open-market operation (i. e., creation of base money occurring independently of budget position $(G - t)$ and associated with an exchange of outstanding securities), and FSC = foreign source component of monetary base. A positive value of ν signifies an open-market purchase and a negative value a sale. The bracketed expression associated with ν is necessarily negative. The reader should note that ν is zero whenever $0 < \mu < 1$. A necessary condition for ν to be non-zero is that $\mu = 0$ or $\mu = 1$. Pure open-market operations do not occur so long as μ is in the open unit interval.

The sign of the first term in the short-run effect depends on the financial parameter μ and the budget position $(G - t)$. By suitable replacements of the expressions occurring in this term with the aid of definitions listed in Table I we obtain an equivalent formulation

$$\varepsilon(i, UB)\left[\mu - (1-\mu)\cdot\varepsilon(\sigma, S^g)\cdot\frac{\varepsilon(MM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)}\cdot\frac{UB}{S^g}\right]$$

We use, moreover, the fact that $\varepsilon(\sigma, S^g) = \dfrac{S^g}{aUB}$. This result follows from the fact that the derivative of σ with respect to S^g is by construction unity. We also use the parameter q_2, already defined previously as the ratio of $\varepsilon(CM, P)$ to $|\varepsilon(MM, P)|$. We obtain thus

$$\varepsilon(i, B^a)\left[\mu - (1-\mu)\frac{1}{a}\frac{1}{1+q_2}\right]$$

where a is the asset multiplier connecting bank credit E and the monetary base UB. A deficit $G - t > 0$ thus depresses interest rates in the short-run provided

$$\mu - (1-\mu)\frac{1}{a}\frac{1}{1+q_2} > 0$$

This is equivalent to

$$\frac{1}{1 + a(1+q_2)} < \mu$$

The expression $[1 + a(1 + p_2]^{-1}$ defines the boundary between values of μ which yield a negative and a positive short-run impact effect of a given budget position on interest rates. With $a \sim 5$ and $q_2 \sim 1/2$ we obtain a boundary value of about .12. This implies that a deficit financed at least 12 % by new base money lowers interest rates in the short run. A deficit financed, on the other hand, with more than 88 % by new securities raises interest rates already in the context of the short-run impact. The remaining short-run components refer to the impact effect of changes in foreign reserves FSC, of changes in tax rates and of autonomous changes in the anticipated net yield e on real capital. Their sign has already been established before.

The reader should carefully note the general nature of the short-run effects of monetary policy on interest rates. The Neo-Keynesian analysis ably represented by the *FMP* model interprets the short-run effect as a liquidity effect operated by the interaction between money stock and money demand. This interpretation has even been accepted by some monetarists. The formulation of the short-run effect in our analysis cannot be interpreted as a liquidity effect. It emerges from an interaction between a credit-market and a money-market. It reflects more than adjustments in money demand to changes in a money stock. It also includes adjustments in the public's asset supply to changes in the bank's desired portfolio position. Our analysis thus assigns a major influence to the credit-market process.

The intermediate-run feedback effect *IMRFE* consists of a single term proportional to the relative change in output. The nature of this feedback mechanism can be made somewhat more explicitly. This requires, however, a description of the output-market. The following elements are introduced for this purpose.

$$\frac{dy}{y} = h\,[\log(d+g) - \log y]$$
$$d = d\,[i - \pi - \Theta, p, P, ap, W^n, W^h, e];\; d_1 < 0 < d_2\;;$$
$$p = p\,(y, K, w),\quad p_1 > 0 > p_2;\quad p_3 > 0 \text{ with } \varepsilon(p, w) = 1$$
$$d, d_2 < 0 < d_3, d_4, d_5, d_6 > 0$$

where d is the private real demand and g the government sector's real demand for output. The demand side of the output-market is represented by d and g. The supply side is represented by the output adjustment function h and the price setting function p. The latter contains y with a positive derivative, K with a negative derivative, and nominal efficiency wages w with a positive derivative. Differentiating the output-market equation with respect to time and replacing di/i and dP/P in the expression thus obtained by solutions from the assets-markets yields an expression describing the second time derivative of log y. Integration over time determines eventually a functional expression for the relative change in output y.

$$\frac{dy}{y} = \eta\left[G - t, \mu, \nu, \frac{dg}{g}, \frac{d\tau}{\tau}, \frac{dwic}{wic}, \frac{dFSC}{UB}\right]$$

The arguments of the η-function are not scalar magnitudes but time paths. The sign η thus refers to a functional. With appropriate constraints on the order conditions of private real demand d and the asset-markets, the expression for $\frac{dy}{y}$ can be simplified into

$$\frac{dy}{y} = \bar{\eta}\left[\frac{dM}{M}, \frac{dF}{F}, \frac{dwic}{wic}\right]$$

where the arguments of the functional $\bar{\eta}$ again refer to the time path of the relative change in the money stock $\frac{dM}{M}$, the time path of a linear combination $\frac{dF}{F}$ of relative changes in fiscal variables g and τ with coefficients determined by the underlying structure, and the time path of the Wicksellian impulse $\frac{dwic}{wic}$. This formulation implies that the positive feedback effect increases with a recent history of monetary or fiscal acceleration. It also increases with a recent history of increasing Wicksellian impulses.

The longer-run effect *LRFE* also depends on the history of financial and Wicksellian impulses. The crucial difference between *IMRFE* and *LRFE* is the relevant time horizon of the history. The *IMRFE* depends in general on a shorter history covering at most 3 to 4 quarters, whereas the *LRFE* involved feedback processes covering significantly more than four quarters. A persistent history of larger financial or Wicksellian impulses raises the anticipated inflation *velocity* $\frac{dap}{ap}$. Similarly the anticipated rate of inflation π is also be modified.

The interaction between the three types of effects on interest rate movement can be explained with the aid of a diagram. This diagram can also be used to explain the destabilizing consequences of an interest target policy associated with any given impulses operating on the economic process, Our first diagram describes the short-run problem. The interaction with the *IMRFE* and *LRFE* is described in the following diagrams. The vertical axis measures relative changes in interest rates i and the horizontal axis scales the deficit $G - t$. The two lines in the diagram are drawn on the assumption that the sum of terms 2 to 4 in the *SRE* is zero. The short-run effect associates under this condition $\frac{di}{i}$ with $(G - t)$ in such a way that $\frac{di}{i} = 0$ whenever $G - t = 0$. Moreover, the slope of the line depends on μ. Two extreme positions

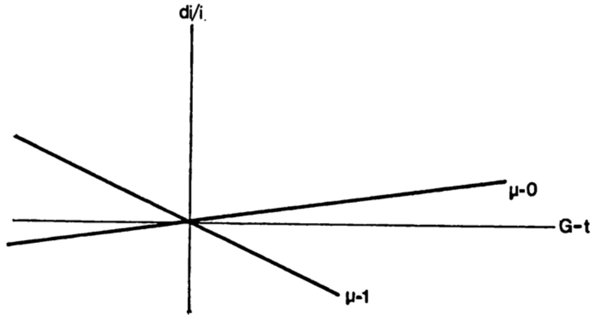

Diagram I

are described. With $\mu = 1$ the line slopes downwards with a slope $\varepsilon\,(i, UB)$ and with $\mu = 0$ the line inclines positively with a slope substantially less than $|\,\varepsilon\,(i, UB)\,|$. For any μ in the open unit interval the line has a slope between the two extreme positions. The remaining terms in the *SRE* move the intercept of the line, whatever its slope between the extremes may be, away from the origin. An accrual of foreign reserves (i. e., $dFSE > 0$) lowers the intercept below the origin, and so does a reduction in excise tax rates or a weakening of the Wicksellian impulse. Vertical shifts of the line due to pure open market operations can only occur for lines in an extreme slope position (i. e., when $\mu = 0$ or $\mu = 1$). If $G - t > 0$ and $\mu = 1$, then $\nu > 0$ lowers the intercept Similarly, with $G - t < 0$ and $\mu = 0$, a positive ν again lowers the intercept. On the other hand, a deficit $G - t > 0$ combined with $\mu = 0$ implies that $\nu \leq 0$, and a negative ν raises the intercept. Similarly, a surplus $G - t < 0$ with $\mu = 1$ implies that $\nu \leq 0$ and the intercept also rises.

Consider now some initial monetary impulse associated with an inherited deficit $G - t$ and a monetary policy determined by the financial parameter μ. We may also consider an accumulation of foreign reserves *FSC*. The initial position of the line expressed by *I*, combined with the inherited deficit, yields initially a decline in the interest rate equal to $(di/i)_0$. The monetary impulse is subsequently transmitted to the output-market. The monetary acceleration raises the relative change $\frac{dy}{y}$ of output. This feedback effect pushes the line upwards into position II. A monetary impulse, whether initiated by a combination $(G - t, \mu)$, an inflow of foreign reserves or a pure open market operation, thus induces via the repercussions over the output-market an increase in interest rates which offsets the impact effect. The subsequent increase due to the feedback is actually larger than indicated. The expansion of output raises tax revenues and the deficit falls. The feedback thus involves simultaneously a shift in the line and a motion to the left along the line (provided μ is unchanged).

A persistent monetary acceleration eventually induces revisions of prevalent price expectations. Such revisions gradually increase the anticipated inflation velocity $\frac{dap}{ap}$ and the anticipated inflation acceleration $\frac{d\pi}{\pi}$. Both changes shift the line upwards into a position III. The longer-run price expectation effect thus pushes interest rates beyond the levels determined by the intermediate-run feedback effect. It is noteworthy that our analysis traces an influence on the relative change of interest rate $\frac{di}{i}$ both from inflation *velocity* and *acceleration.*

2. The Long-Run Consequences of Financial Inflation

The discussion considered the adjustment process of interest rates to a monetary acceleration. We note in summary that the real rate r on financial assets falls in the short-run and increases in the intermediate-run. The formula describing $\frac{di}{i}$ reveals that current interest movements are determined by the impact of *current* policies and via the *IMRFE* and *LRFE* by the *history* of financial policies. The longer-run consequences of a persistent monetary impulse still requires some clarification. We rewrite the underlying system somewhat for our purposes as follows:

The output-market:

$$y = d\left[r + \pi, 1 + \pi, \frac{P}{p}, \frac{P}{p} K + (1 + \omega) \frac{UB}{p} + v(r) \frac{S^g}{p}, e\right] + g$$

The credit-market:

$$a(\quad) \frac{UB}{p} = \sigma\left[r, 1 + \pi, \frac{P}{p}, \frac{S^g}{p}, \ldots\right]$$

The money-market:

$$m(\quad) \frac{UB}{p} = \lambda\left[r, 1 + \pi, \frac{P}{p}, \ldots\right]$$

The budget constraint of the government sector:

$$pg + I(r + \pi) \cdot S^g = t(y, \tau) \cdot p$$

All functions including the tax revenue function are postulated to be homogeneous (zero degree for d, degree 1 for σ, λ and t). The term $1 + \pi$ occurs as an argument in the behavior function because the ratio $\frac{ap}{p}$ becomes $\frac{p(1+\pi)}{p} = 1 + \pi$ on a steady path with fully adjusted anticipations of inflation. The reader should note that with $S^g > 0$ total government expenditures are the sum of pg, expenditures on output, and $I(i) \cdot S^g$, total interest payments. The interest payment I per unit of security is a function of i with an elasticity $\varepsilon(I, i)$ conditioned by the maturity structure of outstanding securities. The analysis can be easily converted into a context of growth by suitable reinterpretation of y, K and the financial stock variables as output per capita (or efficiency labor unit) and similarly for the other non-price variables. The growth rate of a steady state is then determined by the exogenous growth rate of "efficiency-labor" denoted by the letter γ. The four equations may be interpreted to determine the relative asset price $\frac{P}{p}$, the real rate r on financial assets, the real base $\frac{UB}{p}$ and the real volume of government securities $\frac{S^g}{p}$, for any given output y and stock of real capital K. Only one of the nominal *financial* stock variables can be predetermined. With UB given, the stock S^g of securities and also the price levels p and P are determined. It should also be noted that for any given y and K in a steady state the determination of p is transmitted to the argument w (nominal efficiency wage) in the price setting function via the price setting equation.

The system has still to be completed for the determination of the real variables y and K. Two final conditions are introduced for this purpose which characterize a steady state. The stock of real capital per unit of efficiency labor can be determined with the aid of an additional equilibrium condition. We impose for this purpose an equality between the real rate r on financial assets and the real rate rrk on real assets.

We write thus

$$r = \frac{p}{P} \frac{n(y, \tau)}{K}$$

The steady state condition of portfolio equilibrium thus yields an implicit determination of the equilibrium stock of real capital for any given fiscal policy and output level y.

It is noteworthy that the equilibrium stock K was derived without any information about capital accumulation. Such information can be added to the system by means of the equation

$$\frac{dK}{K} = h\left(r, \frac{P}{p}, e\right); \; h_1 < 0 < h_2; \; h_3 > 0$$

An additional constraint thus appears for the description of the steady state

$$\frac{dK}{K} = \gamma$$

This condition imposing equality between the accumulation rate and the natural rate of growth determines implicitly the output level y per capita via the dependence of e on y.

The result of once and for all increases in financial variables which do not trigger the expectations mechanism are clear by inspection. This event is characterized by $\pi = 0$. It is easily established that an equiproportional increase in the base UB and the stock of government securities S^g induces an increase in p, P and efficiency wages w by the same proportion. The real rate on financial assets and the real rate on real capital rrk remain thus unaffected by a temporary financial inflation. The reader should also note that the equiproportionate increase of UB and S^g is implied by the system. The existence of the budget constraint imposes this condition. It determines proximately the equilibrium stock of outstanding government securities. The temporary inflation induced by a once and for all increase in UB also raises the two price levels p and P by the same proportion.

A *persistent* financial impulse inducing fully adjusted price expectation requires a separate analysis. This state involves a non-vanishing π. The change of the problem is reflected by the modification of the budget constraint. The output-market and asset-market equations are essentially unchanged. But the budget constraint must be rewritten as follows:

$$pg + I(r + \pi) \cdot S^g - t(y, \tau) \cdot p = (\pi + \gamma) . (UB + S^g) \; .$$

The steady state inflation implies that the relative changes of financial variables coincides with $\pi + \gamma$, i. e. the rate of inflation and the "natural rate γ of growth". All real variables and financial stocks are again defined per unit of efficiency labor.

We omit in this paper any detailed analytic evolution and concentrate on the answer to our main question: How does the credit-market respond to variations in the steady rate of inflation π accomplished by a corresponding financial expansion?

The structure used to discuss the temporary inflation modified by the budget equation appropriate for an autonomous financial expansion demonstrates that all real variables depend on the inflation rate π and thus on the financial impulse $\frac{dUB}{UB}$ or (dS^g/S^g). An increase of the financial impulse modifies in principle all real variables. A higher rate of inflation lowers the real volume of base money and the real volume of government securities. The responses of r, y and K depend on detailed order constraints and remain small relative to the changes in the real volume of financial stocks. These aspects will be examined at another occasion. It is sufficient for our purposes here to emphasize that variations in the nominal yield i on financial assets are dominated in contexts of financial inflations by the variations in the inflation rate π. Moreover, with constant inflation rates π the real volume of financial stocks and the relative price of real capital remain constant.

3. The Consequences of a Wicksellian Inflation

The literature has frequently assigned major importance to the *Wicksell*ian or *Keynes*ian impulse as motor forces driving an economy. These impulses still deserve some attention with respect to the shorter-run and longer-run effects on interest rates. The different impulse hypotheses exhibit radically different implications bearing on the longer-run behavior of interest rates. The *Wicksell*ian impulse is represented by an additional argument wic occuring in the real net revenue function $n\ (y, \tau, wic)$ of real capital. In particular, the relative change of wic induces autonomous changes in the expected real yield e on real capital. The emergence of a *Wicksell*ian impulse $\frac{dwic}{wic}$ pushes the line in diagram II above position I. The dominant occurrence of a *Wicksell*ian impulse thus removes the short-run reduction in interest rates associated with a monetary impulse. Moreover, the feedback effect pushes the line even further and yields eventually similar long-run price expectation effects as a monetary impulse.

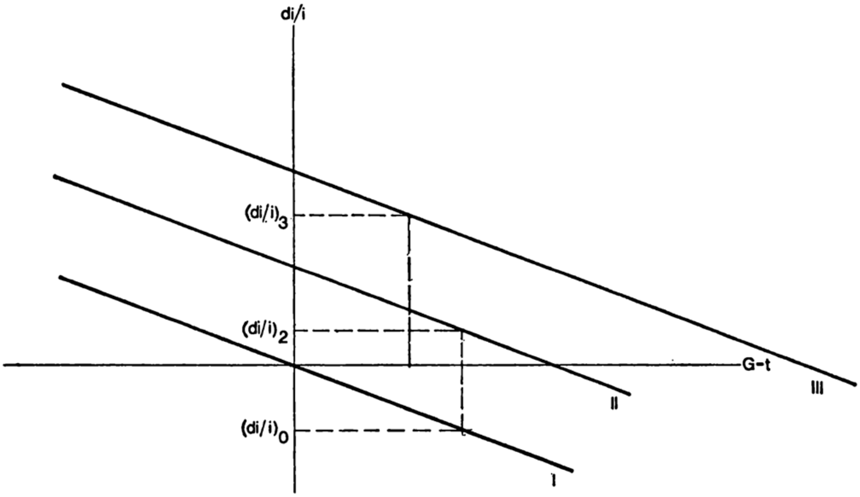

Diagram II

The equilibrium system used to trace the longer-run steady state effect of a "financial inflation" can also be used to explore the longer-run effects of a *Wicksell*ian inflation. Inspection of the system shows that all real variables are jointly determined by π, fiscal policy, and the *Wicksell*ian element *wic*. The constant financial inflation discussed in the previous section implies a constant rate of inflation π. There emerge thus constant real variables y, K etc. on the steady state path. The *Wicksell*ian inflation implies on the other hand a continuous *change* of all real variables associated with a *constant* rate of inflation π. A persistent increase of the anticipated real yield e induces via the interaction of output and asset-markets a persistent increase in prices $\frac{dp}{p}$. The reader should note that values of $\pi = \frac{dp}{p}$ are uniquely associated with $\frac{dwic}{wic}$ by the market equations.

*Wicksell*ian inflations thus involve two distinct real effects. We note first the effect of different level of π, associated with a distinct path of *wic* with a constant time slope. Clearly, π increases with increasing $\frac{dwic}{wic}$. An acceleration of the *Wicksell*ian impulse thus raises π with the consequences already discussed in the previous section. But the *Wicksell*ian impulse unleashes in *addition continuous* changes in the real variables even with a *constant* $\frac{dwic}{wic}$. An increase in e induced by *wic* lowers the real base $\frac{UB}{p}$ and real securities $\frac{S^g}{p}$, but raises on the other hand the real rate r and the relative price $\frac{P}{p}$. A persistent increase, i. e. $\frac{dwic}{wic} > 0$, required to maintain a steady inflation, thus lowers continuously the real base and the real volume of securities. It also yields a *constant increase* in the real rate r on financial assets together with a constant increase in the relative price of real capital. It follows that an increase of the *Wicksell*ian impulse induces a *once and for all effect via* a larger π and imposes a *persistent* effect, pushing $r, \frac{P}{p}, \frac{UB}{p}, \frac{S^g}{p}$ to new time paths with steeper ascent or decline. The real rate r at any point in a *Wicksell*ian inflation is thus a function of the *whole time path* of π. Larger π-values on this path and a longer path in time determine a higher level of the *current* real rate r. Moreover, this time path of π also determines the current real volume of the base and of securities. Larger π-values in the past and a longer period of inflation determine a smaller real base or real volume of securities and a larger market value of real capital measured in terms of output units. These implications differentiate between a financial and a *Wicksell*ian inflation.

4. The Consequences of a Keynesian Inflation

There remains the "*Keynes*ian inflation". This inflation is unleashed by a continuous increase in the government sector's real absorption of output. The immediate effect on credit-markets is an increase in the deficit $(G - t)$. With μ sufficiently high, the initial increase in g lowers interest rates in the short-run. With μ less than .12 (in the U. S. A.), the initial effect would immediately raise interest rates. The impact effect would be represented in this case by a line in the diagram sloping upwards to the right through the origin. The intermediate-run feedback effect pushes the line again upwards along the vertical and accelerates the increase in interest rate. The longer-run price-expectation effect emerges eventually with a persistent increase in g. The reader should also note that the feedback effects depend substantially on the financial parameter μ. The feedbacks unleashed with a given path $g(t)$ increase with μ.

The longer-run consequences of a *Keynes*ian inflation can be explored with the aid of the system already used for the financial and *Wicksell*ian inflation. The budget equation is formulated in a manner designed to isolate a *Keynes*ian inflation from monetary effects.

The budget equation is

$$pg + I(r + \pi) \cdot S^g - \mathrm{t}(y, \tau) \cdot \mathrm{p} = \frac{dS^g}{dt} = (\pi + \gamma) S^g$$

The reader should remember that all variables are per capita. In particular the time derivative of S^g means the change of S^g per capita. This is equal on the steady state path with γ times the volume of securities per capita.

The reader already noted in previous discussions that the system associates equilibrium levels of real variables with the inflation rate π, the *Wicksell*ian element *wic* and the fiscal variables g and τ. Inspection of the system shows that inflation emerges either in response to a real or a financial impulse. Variations of the financial impulse do modify levels of real variables, but a constant financial inflation does not change real variables. Inflations produced by real impulses on the other hand continuously modify the values of real variables even when the market and portfolio conditions of a steady state are satisfied and the inflation rate is held constant.

A *Keynes*ian inflation involves a real impulse similar, but not identical, to the *Wicksell*ian impulse. The system implies that a value $\pi = \frac{dp}{p}$ is associated with a given $\frac{dg}{g}$, i. e. with any given time path $g(t)$ exhibiting a constant time slope. We also note that an increase in g raises p, r and P. Effects on y are essentially transitory. They vanish with the ensuing adjustments of nominal efficiency wages to the ongoing inflation. It follows that a persistent increase in g, i. e. $\frac{dg}{g} > 0$, continuously raises prices p. This price movement is an essential piece of the mechanism reallocation output between private use and government obsorption.

The emergence of a *Keynes*ian inflation induces two distinct effects somewhat similar to the *Wicksell*ian case. One effect is associated with a given value of π determined by a specific path of g with a constant $\frac{dg}{g}$. This effect has already been discussed. It should be noted that a constant π has exerted its influence. If g is shifted to a new path with different $\frac{dg}{g}$, a new π value emerges which modifies r and $\frac{P}{p}$ in the manner traced before. The second effect is associated with the persistent change in g, i. e., $\frac{dg}{g} > 0$, which maintains the *Keynes*ian inflation. This path of g raises the real rate r on financial assets *continuously* and also lowers *persistently* $\frac{P}{p}$. *A Keynesian inflation is thus associated with a persistent rise in the real and the nominal rate of interest and a persistent relative decline in the market value of real capital.*

5. The Consequences of an Interest Target-Policy

The analysis developed in previous sections can also be used to examine the consequences of controls on interest rates and bank credit. We consider first a traditional pattern of Central Bank behavior. Central Banks have been inclined to use market rates of interest to guide their operations. We do not examine the Central Banks' rationale or the circumstances which determined the historical prevalence of an interest target policy. We constrain our attention to the consequences of such a policy. This policy can be represented in our analysis be means of a horizontal control band drawn in diagram III. The in-

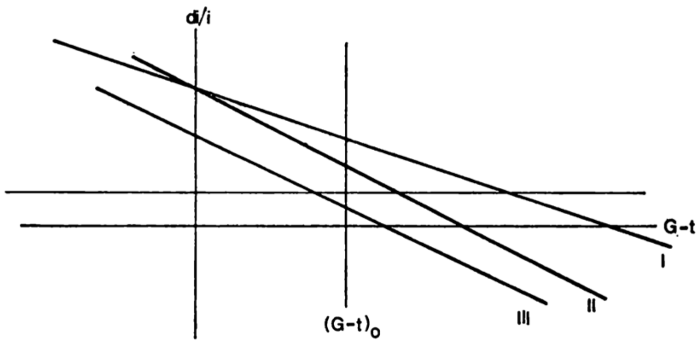

Diagram III

dicated range describes admissible changes in market rates. Changes outside this area evoke suitable responses by the monetary authorities designed to contain actual changes within the control area. Suppose for instance the line *I* has the position indicated as a result (possibly) of a balance of payments deficit (i. e., $dFSC < 0$), a positive *Wicksell*ian impulse or a positive feedback ($IMFE$ and $LRFE > 0$) due to past financial policies or the past history of *Wicksell*ian impulses. Suppose also that the inherited deficit is $(G - t)_0$, noted in the diagram. All terms in the expression describing $\frac{di}{i}$ with the exception of μ and ν are data confronting the Central Bank, even if they were conditioned by the past behavior of the Central Bank. The monetary authorities can modify the slope of the line by changing μ or select the appropriate ν to shift the line whenever μ is at the endpoints. In the present case the monetary authorities first raise μ. This moves the line into a steeper position representd by line II in diagram III. But this policy is still not sufficient under the circumstances conditioning the intercept of the line. With a strong *IMRFE. LRFE,* or current *Wicksell*ian impulse the intercept is sufficiently high to force a positive ν in order to push the $\frac{di}{i}$ associated with $(G - t)_0$ into the control band. The positive ν lowers the line II to the parallel position III in the diagram. We observe in this manner that the imposition of a control band on $\frac{di}{i}$ by a Central Bank's interest target policy determines implicitly constraints on μ and ν, i. e. the parameters describing the Central Bank's behavior. The two financial parameters μ and ν are *uniquely* determined whenever $\frac{di}{i}$ is fixed by policy. The lower this *point* target and the larger the current *IMRFE* or *LRFE* the larger is the ordered pair (μ, ν). But the larger this ordered pair, the larger becomes the history of monetary expansion $\frac{dM}{M}$ unfolding in the future. This implies that the future *IMRFE* and *LRFE* will increase. This increase forces the monetary authorities either to accelerate monetary expansion by revising (μ, ν) upwards or revising the interest target upwards. We thus conclude that an interest target policy amplifies both *Wicksell*ian and fiscal impulses. It also converts past monetary accelerations into magnified current and future monetary accelerations. Length and persistence of such amplification depend on a Central Bank's persistence in holding a control band. Fortunately, Central Bank's "flexibily adjust" this control band on many occasions to the emerging market pressures.

The implications of an interest target policy are further explored by means of the interaction between asset-markets.

$$a\,(\ldots)\,UB = \sigma\,[i, p, P, W^n, W^h, S^g, e, x]$$
$$m\,(\;,\;)\,UB = \lambda\,[i, p, P, W^n, W^h, e, z]$$

Once interest rate i is fixed at some target level the base UB and the asset price P are jointly determined in response to the stock of government securities S^g, output y, the expected real yield on real capital e and the disturbances x and z in the public's asset supply σ and the money demand λ. The major responses are listed in table II. We note that, even with interest rates held fixed, an increase in S^g or in e exerts an expansionary effect. The asset price P is raised and this expands private aggregate demand for output. The reader should note particularly that this expansionary effect can occur even with a contraction in the base. This will occur if $|\varepsilon(\lambda, e)|$ exceeds $\varepsilon(\sigma, e)$ by a sufficient margin, i. e., when money demand is much more sensitive to changes in the expected real yield on real capital than the public's asset supply. An $IS - LM$ analysis implies in contrast that an interest target policy effectively prevents any transmission of disturbances originating in the asset-markets to the level of activity. This proposition fails in our extended analysis based on an unconstrained range of substitution relations centered on money.

The response to the disturbances x and z is particularly informative with respect to some issues bearing on the choice between an interest target and a money target policy. It has been argued that an interest target policy is preferable whenever the variability of disturbances z in money demand exceeds the variability of similar disturbances in aggregate real demand for output. The standard formulation also assures that the variations in the position of an output-market and asset-market line in an $(i - y)$ plane are uniquely assignable to disturbances either in the output-market or disturbances in the asset-market. In particular, it is assumed that the variations of he IS line do not depend systematically on the variations of the asset-market line. This dichotomy and unique assignment characterize a *Keynes*ian system and are denied by the analysis presented in this paper. Both changes in z and x modify the asset price P and thus also private aggregate real demand. Changes in z and x thus shift simultaneously the AM curve [i. e., the locus of (i, y) points in a $i - y$ plane consistent with the two asset-market equations and a given set of other variables] *and* the output-market curve in the $i - y$ plane. The *standard* argument justifying the superiority of the interest target policy under the conditions stated thus fails in our case. An interest target policy may still be the best choice *in a world dominated by the variability of z*. It does require, however, a specific combination of order conditions. Most particularly, it requires a substantial and *dominant* operation of unpredictable disturbances well *beyond* the shortest run. This problem will not be pursued further in this paper. It deserves, however, some detailed attention on another occasion[7].

V. Conclusions and Summary

The interest rate on financial assets and the real rate on real capital is explained in the short-run by the interaction of asset-markets. It was shown that the repercussions via the output-market substantially contribute to the longer-run responses of interest rate. A stock model was used which assigns some significance to the "money-market" but centers attention particularly on the credit-market. This stock formulation is based on the assumption that adjustment and informaion costs on the two markets are sufficiently low to yield large adjustment speeds relative to the time-units used for empirical analysis. This assumption of the underlying process determined the central role of stock aspects. It will be shown at another occasion that this stock theory is not equivalent to a flow theory based on relatively large adjustments and information costs. The attention to stocks alloted in the present formulation vaguely resembles the liquidity preference theory. On the other hand, the proximate determination of the market rate of interest on a credit-market follows the suggestive heritage of the loanable funds theory. But the loanable funds supplied (i. e., the volume of bank credit) are not related to savings in the traditional manner. Neither are the loanable funds demanded (i. e., the public's asset supply) related to investments. This departure from traditional loanable funds theory does not depend on a formulation centered on stochs.

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[7] The reader will find some further, but still incomplete analysis in two forthcoming papers on "Two Alternative Theories of the Money Supply Process: Money-Market Theory Versus Credit-Market Theory", and "A Diagrammatic Exposition of the Money Supply Process".

An important characteristic of the analysis is the differentiation between money demand and asset-supply (i. e., loan demand and implicit supply of securities to banks). The properties of money demand and asset supply differ substantially in crucial respects. This differentiation implies in particular that the standard analysis of the superiority of an interest target policy based on the relatively dominant variability of the *LM* curve cannot be subsumed under our analysis. It also implies that the transmission of monetary impulses does not depend on the absolute magnitude of the interest elasticity of money demand. It depends on the other hand on the *relative* magnitude of the interest-elasticities on credit-market and money-market.

The structure of the model also implies that the real rate on financial assets and the real rate on real capital do not always coincide or even move together. The analysis of short-run responses of asset-market interactions established cases of divergent responses in the two real rates. The intermediate run repercussions via the output-market modify the results, however, and the two rates converge in the long-run. Divergent movements of the two rates are thus an essential element of short-run adjustment processes.

Movements in the market rate of interest were organized into an impact effect, an intermediate-run feedback effect and a long-run feedback effect. The impact effect is determined by the interaction of asset-markets without any feedbacks via any other markets. It was also shown that this impact effect cannot be interpreted as a liquidity effect. The intermediate-run feedback effect depends on the repercussion via the output-market. The long-run effect depends on the other hand on the operation of price expectation mechanisms. The interaction of those effects implies that short-run and longer-run effects of monetary impulses differ in sign, and that short-run and longer-run consequences of *Wicksell*ian or *Keynes*ian impulses differ in magnitude.

Three types of inflations were distinguished and their consequences with respect to credit-markets examined. It was shown that the behavior of interest rate and equity values relative to output prices differentiates between the major types of inflation. A financial inflation determines a given level of real base and real securities with a constant real rate r. Changes in r, $\frac{UB}{p}$ and $\frac{\mathbf{S}^g}{p}$ require an acceleration or deceleration of inflation. Moreover, changes in r induced by variations in the magnitude of the inflationary impulse expressed by π are negligible compared to the associated changes in the nominal rate of interest. The *Wicksell*ian and *Keynes*ian inflation exhibit a substantially different pattern. A constant rate of inflation π *continuously raises* the real rate r. It follows that the nominal rate also continuously rises even with fully adjusted and constant anticipations of the inflation rate. The nominal rate can be determined under a financial inflation to a first approximation by the rate of inflation π. Under a *Wicksell*ian or *Keynes*ian inflation the nominal rate is determined to a first approximation by the whole past history of π. The longer the inflation and the larger past π-values, the larger are real and nominal rates of interest. The *Wicksell*ian and *Keynes*ian inflation exhibit thus similar pattern with respect to the real rate r on financial assets. They differ, however, with respect to the movement of the relative price $\frac{P}{p}$. In a *Wicksell*ian inflation equity values rise relative to output prices, and in a *Keynes*ian inflation these values fall relative to output prices. On the other hand, equity values do not change relative to output prices under a financial inflation. A systematic study of interest rates and equity values should thus yield some information on the relative frequency or prevalence of the various inflationary motor forces.

The paper introduced the reader to some major aspects bearing on interest rates emerging from the work jointly pursued with Allan H. *Meltzer*. Much remains to be done. No empirical work has been reported. Moreover, alternative formulations differentiating the level of adjustment and information costs on loan and securities-market and involving thus a mixed stok-flow structure require examination. Lastly, these analytic frameworks should be applied to investigations of the various measures of credit-policy preferred by many Central Banks.

Table I: The Response of Interest Rates

(1) Remarks: The notation $\varepsilon(y, x)$ designates an elasticity of y with respect to x.

All response patterns are constituted by means of four building blocks which form the interest elasticities or asset-price elasticities of excess supplies on credit-market and money-market. These building blocks are defined by the expressions $\varepsilon(CM, i)$, $\varepsilon(MM, i)$, $\varepsilon(MM, P)$ and $\varepsilon(CM, P)$ introduced below:

$$\varepsilon(CM, i) = \varepsilon(a, i - \Theta) \frac{i - \pi - \Theta}{i - \Theta} - \varepsilon(\sigma, i - \pi - \Theta) > 0$$

$$\varepsilon(MM, i) = \left[\varepsilon(m, i-\Theta) - \varepsilon(\lambda, i-\Theta)\right]\frac{i-\pi-\Theta}{i-\Theta} > 0$$

$$\varepsilon(MM, P) = \varepsilon(m, P) - \varepsilon(\lambda, P) < 0$$

$$\varepsilon(CM, P) = \varepsilon(a, P) - \varepsilon(\sigma, P) > 0$$

These building blocks can be interpreted by means of the interest elasticity and asset-price elasticity of excess supplies on credit-market and money-market. We state the defining relations as follows

$$\frac{d}{d\log i}\quad \log\frac{a\,UB}{\sigma} = \varepsilon(MM, i)\quad \frac{i}{i-\pi-\Theta}$$

$$\frac{d}{d\log i}\quad \log\frac{m\,UB}{\lambda} = \varepsilon(CM, i)\quad \frac{i}{i-\pi-\Theta}$$

$$\frac{d}{d\log P}\quad \log\frac{a\,UB}{\sigma} = \varepsilon(CM, P)$$

$$\frac{d}{d\log P}\quad \log\frac{m\,UB}{\lambda} = \varepsilon(MM, P)$$

(2) The response to UB:

$$\varepsilon(i, UB) = -\frac{\varepsilon(MM, P) - \varepsilon(CM, P)}{\Delta}\;\frac{i-\pi-\Theta}{i} < 0$$

$$\varepsilon(P, UB) = -\frac{\varepsilon(CM, i) - \varepsilon(MM, i)}{\Delta} > 0$$

where

$$\Delta = \varepsilon(CM, i)\cdot\varepsilon(MM, P) - \varepsilon(MM, i)\cdot\varepsilon(CM, P) < 0$$

(3) The response to S^g:

$$\varepsilon(i, S^g) = -\varepsilon(\sigma, S^g)\cdot\varepsilon(i, UB)\,\frac{\varepsilon(MM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)} > 0$$

$$\varepsilon(P, S^g) = \varepsilon(\sigma, S^g)\cdot\varepsilon(P, UB)\,\frac{\varepsilon(MM, i)}{\varepsilon(CM, i) - \quad(MM, i)} > 0$$

(4) The response to the discount rate d:

$$\varepsilon(i, d) = \varepsilon(i, UB)\frac{\varepsilon(a, d+h)\cdot\varepsilon(MM, P) - \varepsilon(m, d+h)\cdot\varepsilon(CM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)}\cdot\frac{d}{d+h} > 0$$

$$\varepsilon(P, d) = -\varepsilon(P, UB)\frac{\varepsilon(m, d+h)\cdot\varepsilon\;(CM, i) - \varepsilon(a, d+h)\cdot\varepsilon(MM, i)}{\varepsilon(CM, i) - \varepsilon(MM, i)}\cdot\frac{d}{d+h} < 0$$

(5) The response to h:

$$\varepsilon\,(i, h) = \varepsilon\,(i, d)\ \frac{h}{d}\,;\ \varepsilon\,(P, h) = \varepsilon\,(P, d)\,\frac{h}{d}$$

(6) The response to π:

$$\varepsilon\,(i, \pi) = -\,\varepsilon\,(\sigma, i - \pi - \Theta)\,\frac{\varepsilon\,(MM, P)}{\Delta}\,\frac{\pi}{i} > 0$$

$$\varepsilon\,(P, \pi) = \varepsilon\,(\sigma, i - \pi\ \Theta)\,\frac{\varepsilon\,(MM, i)}{\Delta}\ \frac{\pi}{i - \pi - \Theta} > 0$$

(7) The response to Θ:

$$\varepsilon\,(i, \Theta) = \frac{\Theta}{i} > 0$$

$$\varepsilon\,(P, \Theta) = 0$$

(8) The response to the output price-level:

$$\varepsilon\,(i, p) = -\,\varepsilon\,(i, UB)\,\frac{\varepsilon\,(\sigma, p)\cdot\varepsilon\,(MM, P) - \varepsilon\,(\lambda, p)\cdot\varepsilon\,(CM, P)}{\varepsilon\,(MM, P) - \varepsilon\,(CM, P)} > 0$$

$$\varepsilon\,(P, p) = -\,\varepsilon\,(P, UB)\,\frac{\varepsilon\,(\lambda, p)\cdot\varepsilon\,(CM, i) - \varepsilon\,(\sigma, p)\cdot\varepsilon\,(MM, i)}{\varepsilon\,(CM, i) - \varepsilon\,(MM, i)} < 0$$

(9) The response to a change in the anticipated net return n on real capital:

$$\varepsilon\,(i, n) = -\,\varepsilon\,(i, UB)\,\frac{\varepsilon\,(CM, n)\cdot\varepsilon\,(MM, P) - \varepsilon\,(MM, n)\cdot\varepsilon\,(CM, P)\cdot\varepsilon\,(CM, n)}{\varepsilon\,(MM, P) - \varepsilon\,(CM, P)}$$

where

$$\varepsilon\,(MM, n) = \varepsilon\,(m, n) - \varepsilon\,(\lambda, n) > 0$$

$$\varepsilon\,(CM, n) = \varepsilon\,(a, n) - \varepsilon\,(\sigma, n) < 0$$

$$\varepsilon\,(P, n) = \varepsilon\,(P, UB)\,\frac{\varepsilon\,(MM, n)\cdot\varepsilon\,(CM, i) - \varepsilon\,(MM, i)}{\varepsilon\,(CM, i) - \varepsilon\,(MM, i)}$$

(10) The response to a change in the stock K of real capital:

$$\varepsilon\,(i, K) = +\,\varepsilon\,(i, UB)\,\frac{\varepsilon\,(CM, K)\cdot\varepsilon\,(MM, P) - \varepsilon\,(MM, K)\cdot\varepsilon\,(CM, P)}{\varepsilon\,(MM, P) - \varepsilon\,(CM, P)} \gtreqless 0$$

$$\varepsilon\,(P, K) = +\,\varepsilon\,(P, UB)\cdot\frac{\varepsilon\,(MM, K)\cdot\ (CM, i) - \varepsilon\,(CM, K)\cdot\varepsilon\,(MM, i)}{\varepsilon\,(CM, i) - \varepsilon\,(MM, i)} \gtreqless 0$$

where

$$\varepsilon\,(CM, K) = \varepsilon\,(a, K) - \varepsilon\,(\sigma, p)\cdot(p, K)\ - \varepsilon\,(\sigma, W^n)\,\frac{PK}{W^n} + \varepsilon\,(\sigma, e) > 0$$

$$\varepsilon(MM, K) = \varepsilon(m, K) - \varepsilon(\lambda, p) \cdot \varepsilon(p, K) - \varepsilon(\lambda, W^n) \frac{PK}{W^n} + \varepsilon(\lambda, e) \lesseqgtr 0$$

The following patterns are relevant:

At low y/K: $\varepsilon(p, K)$ dominates both expressions so that $\varepsilon(CM, K) > 0 < \varepsilon(MM, K)$.

At high levels of y/K the expression $\varepsilon(p, K)$ vanishes relatively. Note that $\varepsilon(\lambda, W^n) > \varepsilon(\sigma, W^n) \sim 0$, but $\varepsilon(\sigma, e)$ and $\varepsilon(\lambda, e)$ have opposite signs. The result is that at high levels of y/K the last two terms in $\varepsilon(MM, K)$ reenforce each other.

The results with respect to i and P are thus the following:

	at low y/K:	at high levels y/K:
$\varepsilon(i, K)$	negative	slightly negative or positive
$\varepsilon(P, K)$	positive	negative

With $|\varepsilon(\lambda, e)|$ sufficiently larger than $\varepsilon(\sigma, e)$, the response $\varepsilon(i, K)$ is positive at higher levels of y/K.

(11) The response to a change in output y:

$$\varepsilon(i, y) = \varepsilon(i, UB) \frac{\varepsilon(CM, y) \cdot \varepsilon(MM, P) - \varepsilon(MM, y) \cdot \varepsilon(CM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)} > 0$$

where

$$\varepsilon(CM, y) = \varepsilon(a, y) - \varepsilon(\sigma, p) \cdot \varepsilon(p, y) - \varepsilon(\sigma, W^h) \cdot \varepsilon(W^h, y) - \varepsilon(\sigma, n) \cdot \varepsilon(n, y)$$

$$\varepsilon(MM, y) = \varepsilon(m, y) - \varepsilon(\lambda, p) \cdot \varepsilon(p, y) - \varepsilon(\lambda, W^h) \cdot \varepsilon(W^h, y) - \varepsilon(\lambda, n) \cdot \varepsilon(n, y)$$

$$\varepsilon(P, y) = \varepsilon(P, UB) \frac{\varepsilon(CM, i) \cdot \varepsilon(MM, y) - \varepsilon(MM, i) \cdot \varepsilon(CM, y)}{\varepsilon(CM, i) - \varepsilon(MM, i)}$$

(12) The response to a change in the anticipated price level:

$$\varepsilon(i, ap) = -\varepsilon(i, UB) \frac{\varepsilon(\sigma\, ap) \cdot \varepsilon(MM, P) - \varepsilon(\lambda, ap) \cdot (CM, P)}{(MM, P) - (CM, P)}$$

$$\varepsilon(P, ap) = -\varepsilon(P, UB) \frac{\varepsilon(CM, i) \cdot \varepsilon(\lambda, ap) - \varepsilon(MM, i) \cdot \varepsilon(\sigma, ap)}{\varepsilon(CM, i) - \varepsilon(MM, i)}$$

Table II: The Response of Base and Asset Price with Interest Rate Held Fixed

(1) The response to a change in S^g:

$$\varepsilon(P, S^g) = -\frac{\varepsilon(\sigma, S^g)}{\varepsilon(MM, P) - \varepsilon(CM, P)} > 0$$

$$\varepsilon(UB, S^g) = \varepsilon(\sigma, S^g)\frac{\varepsilon(MM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)} > 0$$

(2) The response to changes in e:

$$\varepsilon(P, e) = \frac{\varepsilon(\lambda, e) - \varepsilon(\sigma, e)}{\varepsilon(MM, P) - \varepsilon(CM, P)} > 0$$

$$\varepsilon(UB, e) = \frac{\varepsilon(\sigma, e)\cdot\varepsilon(MM, P) - \varepsilon(\lambda, e)\cdot\varepsilon(CM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)} \lesseqgtr 0$$

(3) The response to an asset supply disturbance x:

$$\varepsilon(P, x) = -\frac{\varepsilon(\sigma, \mathbf{x})}{\varepsilon(MM, P) - \varepsilon(CM, P)} > 0$$

$$\varepsilon(UB, x) = \varepsilon(\sigma, x)\frac{\varepsilon(MM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)} > 0$$

(4) The response to a money demand disturbance z:

$$\varepsilon(P, z) = \frac{\varepsilon(\lambda, z)}{\varepsilon(MM, P) - \varepsilon(CM, P)} < 0$$

$$\varepsilon(UB, z) = -\varepsilon(\lambda, z)\frac{\varepsilon(CM, P)}{\varepsilon(MM, P) - \varepsilon(CM, P)} > 0$$

Zusammenfassung

Kreditmarkt, Zins und drei Typen der Inflation

Der Aufsatz entwickelt ein analytisches Gerüst, das die gemeinsame Determinierung von Zinssätzen bei Geldanlagen, des Marktwerts von Realkapital (oder der realen Ertragsrate des Realkapitals), des Geldvermögens und des gesamten „Bankkredits" erklärt. Diese vier Größen ergeben sich aus der Reaktion des Publikums, der Banken und der Geldbehörden aufgrund des Wirkungszusammenhanges der Anlagemärkte.

Ein wichtiges Merkmal der Analyse ist die Unterscheidung zwischen Geldnachfrage und Anlageangebot (d. h. Nachfrage nach Ausleihungen und damit Angebot von Anleihen an Banken). Die Eigenheiten der Geldnachfrage und des Anlageangebotes weichen wesentlich in mehrfacher Hinsicht voneinander

ab. Diese Abweichung bedeutet insbesondere, daß die zur Stützung einer zinspolitisch orientierten Zentralbankpolitik übliche Argumentation von unserer Analyse verworfen wird. Sie ergibt ferner, daß die Übertragung geldpolitischer Impulse nicht von der absoluten Größe der Zinselastizität der Geldnachfrage abhängt; diese hängt vielmehr von der relativen Größe der Zinselastizitäten auf dem Kreditmarkt und dem Geldmarkt ab.

Die Struktur des Modells bedeutet ferner, daß die reale Zinsrate von Geldanlagen und die reale Zinsrate auf Realkapital nicht immer übereinstimmen oder sich aufeinander zubewegen. Die Analyse kurzfristiger Reaktionen auf die Wirkungszusammenhänge des Anlagemarktes ergab Fälle von unterschiedlichen Reaktionen der beiden realen Zinsraten. Die längerfristigen Rückwirkungen über den „Output"-Markt modifizieren allerdings diese Ergebnisse, und auf lange Sicht konvergieren die beiden Zinsraten. Unterschiedliche Bewegungen der beiden Sätze sind also ein wichtiges Element kurzfristiger Anpassungsprozesse.

Die Bewegungen des Marktzinssatzes wurden gegliedert in einen Anfangseffekt, einen mittelfristigen Rückkopplungseffekt und einen langfristigen Rückkopplungseffekt. Der Anfangseffekt ist bestimmt durch den Zusammenhang der Anlagenmärkte ohne Rückkopplung über andere Märkte. Es wird dargelegt, daß dieser Anfangseffekt nicht als Liquiditätseffekt interpretiert werden kann. Der mittlere Rückkopplungseffekt hängt von den Rückwirkungen über den „Output"-Markt ab. Der langfristige Effekt hängt andererseits vom Wirksamwerden von Preiserwartungsmechanismen ab. Das Zusammenspiel dieser Effekte bedeutet, daß kurzfristige und längerfristige Effekte der geldpolitischen Impulse unterschiedliche Merkmale haben, und daß kurzfristige und längerfristige Konsequenzen der Wicksellschen oder Keynesianischen Impulse in der Größenordnung voneinander abweichen.

Drei Typen von Inflationen werden unterschieden und ihre Konsequenzen im Hinblick auf die Kreditmärkte untersucht. Es wird dargelegt, daß sich Zinssatz und Marktwert des Realkapitals im Verhältnis zu den Produktpreisen bei den drei hauptsächlichen Inflationstypen unterschiedlich verhalten. Eine „finanzielle" Inflation bestimmt das Gleichgewichtsniveau des Realwertes von Geldbasis und zinstragenden Regierungspapieren mit einem konstanten realen Zinssatz. Veränderungen in diesen Größen verlangen eine Beschleunigung oder Verlangsamung der Inflation. Darüber hinaus sind Veränderungen des realen Zinssatzes, die durch Veränderungen in der Größe der inflationären Impulse hervorgerufen werden, unbedeutend im Vergleich zu den damit verbundenen Änderungen des nominellen Zinssatzes.

Die Wicksellsche und Keynesianische Inflation liefern ein wesentlich abweichendes Ergebnis. Eine konstante Inflationsrate läßt den Realzins kontinuierlich steigen. Daraus folgt, daß der Nominalzinssatz ebenfalls kontinuierlich steigt, und zwar auch im Rahmen einer vollen Anpassung aller Erwartungen an die tatsächliche Inflationsrate. In einer ersten Annäherung kann unter den

Bedingungen einer Geldinflation der Nominalzins durch die Inflationsrate selbst bestimmt werden. Unter den Bedingungen einer Wicksellschen oder Keynesianischen Inflation wird hingegen der Nominalzinssatz in einer ersten Annäherung durch die gesamte Vorgeschichte der Inflationsrate bestimmt. Je länger die Inflation dauert und je größere vergangene Inflationswerte sind, um so höher sind die realen und nominellen Zinssätze. Im Hinblick auf die Realverzinsung von Geldanlagen laufen also die Wicksellsche und die Keynesianische Inflation auf ein ähnliches Ergebnis hinaus. Aber sie unterscheiden sich bei der Entwicklung der relativen Preise von Realkapital. In einer Wicksellschen Inflation steigen die Sachwerte relativ zu den Produktpreisen, und in einer Keynesianischen Inflation fallen die Realwerte relativ zu diesen Preisen. Unter den Bedingungen einer Geldinflation verändern sich die Sachwerte nicht relativ zu den Produktpreisen. Eine systematische Untersuchung der Entwicklung von Zinssätzen und Realwerten müßte also gewisse Informationen über den relativen Wechsel oder das Vorherrschen der verschiedenen Inflationsmotoren liefern.

Summary

Credit-Market, Interest Rate and Three Types of Inflation

The paper develops an analytic framework explaining the joint determination of interest rates on financial assets, market value of real capital (or real rate of return on real capital) money stock and total "bank credit". These four magnitudes emerge from the responses of public, banks and monetary-fiscal authorities conditioned by the interaction of assetmarkets.

An important characteristic of the analysis is the differentiation between money demand and asset-supply (i. e., loan demand and implicit supply of securities to banks). The properties of money demand and asset supply differ substantially in crucial respects. This differentiation implies in particular that the standard analysis of the superiority of an interest target policy based on the relatively dominant variability of the LM curve cannot be subsumed under our analysis. It also implies that the transmission of monetry impulses does not depend on the absolute magnitude of the interest elasticity of money demand. It depends on the other hand on the realtive magnitude of the interest-elasticities on credit-market and money-market.

The structure of the model also implies that the real rate on financial assets and the real rate on real capital do not always coincide or even move together. The analyse of short-run responses of asset-market interactions established cases of divergent responses in the two real rates. The longer-run repercussions via the output-market modify the results, however, and the two rates converge in the long-run. Divergent movements of the two rates are thus an essential element of short-run adjustment processes.

Movements in the market rate of interest were organized into an impact effect, an intermediate-run feedback effect and a long-run feedback effect.

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Three types of inflations were distinguished and their consequences with respect to credit-markets examined. It was shown that the behavior of interest rate and equity values relative to output prices differentiates between the major types of inflation. A financial inflation determines a given level of real base and real securities with a constant real rate of interest. Changes in these magnitudes require an acceleration or deceleration of inflation. Moreover, changes in the real rate of interest induced by variations in the magnitude of the inflationary impulse are negligible compared to the associated changes in the nominal rate of interest.

The Wicksellian and Keynesian inflation exhibit a substantially different pattern. A constant rate of inflation *continuously raises* the real rate. It follows that the nominal rate also continuously rises even with fully adjusted and constant anticipations of the inflation rate. The nominal rate can be determined under a financial inflation to a first approximation by the rate of inflation. Under a Wicksellian or Keynesian inflation the nominal rate is determined to a first approximation *by the whole past history* of the inflation rate. The longer the inflation and the larger past inflation values, the larger are real and nominal rates of interest. The Wicksellian and Keynesian inflation exhibit thus similar patterns with respect to the real rate on financial assets. They differ, however, with respect to the movement of the relative price of real capital. In a Wicksellian inflation equity values rise relative to output prices, and in a Keynesian inflation these values fall relative to output prices. On the other hand, equity values do not change relative to output prices under a financial inflation. A systematic study of interest rates and equity values should thus yield some information on the relative frequency or prevalence of the various inflationary motor forces.

Résumé

Marché du crédit, taux d'intérêt et trois types d'inflation

L'article développe une construction analytique expliquant la détermination commune des taux d'intérêt des placements monétaires, de la valeur du marché du capital réel (ou du taux réel de rendement du capital foncier), des avoirs monétaires et de l'ensemble du «crédit bancaire». Ces quatre grandeurs ré-

sultent de la réaction du public, des banques et des autorités monétaires face aux situations et interconnexions des marchés de placements.

Un point essentiel de l'analyse est constitué par la distinction établie entre la demande de capitaux et l'offre de placements (c.à.d. la demande d'emprunts ou encore l'offre de prêts aux banques). Le caractéristiques de la demande de capitaux et le l'offre de placements diffèrent largement sous de multiples aspects. Ces distinctions signifient en particulier que notre analyse ne s'identifie pas à l'analyse normale reposant sur la supériorité de la politique finalisée des taux d'intérêt elle-même basée sur une variabilité relativement dominante de la courbe LM; elles établissent en outre que la transmission d'impulsions de la politique monétaire ne dépend pas de la grandeur absolue de l'élasticité des taux d'intérêt de la demande de capitaux; cette transmission dépend plutôt de la grandeur relative de l'élasticité des taux d'intérêt sur les marchés monétaires et du crédit.

La structure du modèle enseigne encore ques les taux réels d'intérêt des placements monétaires et ceux des capitaux fonciers ne concordent pas nécessairement ou ne convergent pas toujours. L'analyse de réactions à court terme sur les interconnexions du marché des placements a établi des cas de réactions divergentes des deux types de taux réels. Les répercussions à long terme sur le marché « output » modifient néanmoins ces résultats et en longue durée, les deux types de taux ont tendance à converger. Les mouvements dissemblables des deux types de taux constituent donc un élément important de processus d'adaptation à court terme.

Les mouvements du taux d'intérêt du marché se répartissent en un effet de démarrage, un effet d'amplification à moyen terme ainsi qu'un autre à long terme. L'effet de démarrage est déterminé par l'interaction des marchés de placements sans répercussion sur les autres marchés. Il est démontré que cet effet de démarrage ne peut être interprété comme un effet de liquidité. L'effet d'amplification à moyen terme dépend des répercussions sur le marché « output ». L'effet d'amplification à long terme dépend lui des résultats de mécanismes de prévision de l'évolution des prix. L'interaction de ces effets monte que les effets à court et à long termes des impulsions de la politique monétaire ont des caractéristiques différentes et que les conséquences à court et à long termes des impulsions de Wicksell et de Keynes divergent en ordres de grandeurs.

L'on a délimité trois types d'inflation et recherché leurs conséquences sur les marchés du crédit. L'on a constaté que le taux d'intérêt et la valeur réelle en comparaison avec les prix des produits se comportent différemment dans les trois principaux types d'inflation. Une inflation « financière » dégage un niveau préétabli de la situation réelle d'origine et de la sûreté réelle avec un taux d'intérêt réel constant. Des variations de ces grandeurs requièrent une accélération ou un ralentissement de l'inflation. Au surplus, les variations du taux d'intérêt réel provoquées par des modifications dans les grandeurs des impulsions inflationistes sont insignfiantes en comparaison avec les variations du taux d'intérêt nominal qui en découlent.

L'inflation de Wicksell et de Keynes livre un résultat très différent. Un taux constant d'inflation incite le taux réel à croître continûment. Il s'ensuit que le taux nominal croît également de manière continue pourvu que l'on accepte le taux d'inflation et que l'on s'y adapte. En une première approche, le taux nominal peut être défini par le taux d'inflation lui-même dans une inflation monétaire. Dans les conditions de l'inflation de Wicksell ou de Keynes, le taux nominal est en première approche déterminé au contraire par toute l'histoire préliminaire du taux d'inflation. Plus la durée de l'inflation est longue et plus les pertes de valeurs occasionnées par l'inflation sont lourdes, plus les taux d'intérêt réel et nominal seront élevés. En ce qui concerne la rémunération réelle des placements monétaires, les inflations de Wicksell et de Keynes aboutissent à des résultats similaires. Mais elles diffèrent à propos de l'évolution des prix relatifs des capitaux réels. Dans l'ineflation de Wicksell, les valeurs réelles croissent relativement par rapport aux prix des produits, alors que dans celle de Keynes, elles s'affaissent relativement. Dans les conditions d'une inflation monétaire, ces valeurs réelles ne se modifient pas relativement aux prix des produits. Une étude systématique de l'évolution des taux d'intérêt et des valeurs réelles devrait donc fournir certaines informations sur l'alternance relative ou sur la prédominance des divers moteurs de l'inflation.