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Towards a New Monetary Paradigm: A Quantity Theorem of Disaggregated Credit, with Evidence from Japan

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I. Introduction

Thomas *Kuhn*'s (1962) account of the growth of scientific knowledge describes the process of a paradigm shift as follows: the received theory or approach, consisting of a set of assumptions and procedures, becomes unable to explain an increasing number of 'anomalies'. It is initially patched up by *ad hoc* assumptions or adjustments, but as the number of inexplicable facts rises, it is eventually replaced by a new paradigm that explains as much as the previous approach but in addition can also account for the 'anomalies'. Similarly, *Lakatos* (1970), who suggested the concept of scientific research programmes that are based on a hard core of provisionally accepted assumptions, argues that a research programme will be rejected, if another programme can explain everything its rival can explain, but also those facts the rival could not (see *Backhouse*, 1985, for a discussion of economic methodology).

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In the 1980s and early 1990s, three 'anomalies' have occurred in a number of countries which have been difficult to reconcile with the generally accepted relationship of money, economic activity and prices according to the traditional monetary paradigm. These are (1) the apparent velocity decline and the resulting instability or 'breakdown' of the money demand function in several Anglo-Saxon countries, Scandinavia and in Japan; (2) the occurrence of significant asset price rises, often dubbed 'bubbles', especially in the UK, Scandinavian countries, Taiwan, Korea and Japan; and (3), the enormous surge of capital flows from Japan in the 1980s and their sudden collapse in the early 1990s.

In this paper a different monetary paradigm is proposed that, despite its simplicity is found to encompass the old approach and at the same time accounts for the anomalies that the old approach could not explain.

The paper is organised as follows: First, the three main 'anomalies' are reviewed, as reflected in the recent literature. Second, a simple alternative macro-economic model is introduced that is in theory able to explain these 'anomalies'. The new approach suggests (1) to replace the standard definition of the money supply as deposits with a definition based on credit creation; (2) that the standard 'quantity theory of money' is a special case of a more general disaggregated quantity theorem, which distinguishes between credit creation used for 'real' and 'financial' transactions; a sudden rise of the latter may be induced by banks, which results in asset price bubbles; and (3) that excess credit creation entering the 'financial circulation' is likely to spill over abroad as foreign investment and hence determine capital flows. Third, the relationships postulated by the alternative model are tested empirically. Since Japan is the most important country where all 'anomalies' have occurred and indeed seem to have been most pronounced, the Japanese experience is drawn on for the empirical work. It is found that all three anomalies can be explained empirically by the new approach. The paper ends by discussing some implications for economic policy and future research.

II. Anomalies of the standard macro monetary model

The received approach in monetary economics, centring on the macroeconomic relationship between money, economic activity and prices, is usually expressed in its most basic form by the well-known equation of exchange, commonly referred to as the 'quantity theory of money' (deriving from *Newcomb*, 1885, and *Fisher*, 1911). Often in logarithmic form, it is still the core workhorse of most macro-economic models:

$$MV = PY \tag{1}$$

P is the price level of goods and services and Y represents national output or income. M is the supply of money, originally defined as 'cash'. In practice, money is usually defined as an aggregate of private sector assets, largely deposits. Often, several definitions of money, from M1 to M4, are used in parallel without *a priori* theoretical superiority, simply depending on which suits the purposes of the author best or happens to have the best empirical fit. Velocity V is assumed to be constant. With a stable velocity, a dependable relationship between nominal national income PY and M exists in the form of a money demand function. This has been put to use by central banks in an attempt to control nominal GDP by money supply targeting.

1. *The anomaly of the velocity decline*

The stable relationship between M and P or M and PY proposed by the equation of exchange more or less appeared to hold until the 1970s. However it „increasingly came apart at the seams during the course of the 1980s" (*Goodhart*, 1989), especially in several Anglo-Saxon and Scandinavian countries and Japan, where significant declines in velocity were observed. „Once viewed as a pillar of macro-economic models, it is now widely regarded as one of the weakest stones in the foundation" (*Boughton*, 1991). Variable velocity is a problem for traditional monetary models, because it renders the money demand function 'unstable' and hence monetary policy difficult or impossible to implement.

A large body of literature has tried to grapple with this 'anomaly' (see the surveys by *Goodhart*, 1989, and *Goldfeld* and *Sichel*, 1990). Many writers have explained it by financial liberalisation and structural changes in the financial system which are difficult to quantify (see *Bank of Japan*, 1988, for such an argument about the Japanese case). In response, different definitions of money have been used, usually getting broader and culminating in a liquidity-weighted average of deposits, the 'divisia index' (see, for instance, *Bank of England*, 1996). Others have suggested different measures of prices P by incorporating not only goods and services, but also asset prices (*Shibuya*, 1991). Similarly, the so-called P^* models have tried to modify the old theory (see, for instance, *Deutsche Bundesbank*, 1992). Nevertheless, the main problem remains: 'recurring bouts of instability in money demand' (*Goldfeld* and *Sichel*, 1990, p. 349). As a result, most researchers have abandoned the ambition of finding a generally applicable measure of the money supply or a general explanation of the anomaly. In the UK and the US, policy makers have shifted monetary targeting until finally giving it up altogether.[1] Today, virtually all central banks monitor various deposit aggregates and make *ad hoc* judgements. Given this state of affairs concerning a central tenet of macro-economics, many researchers have called for 'an alternative paradigm' (*Spindt*, 1987; also *Judd* and *Scadding*, 1982; *Gordon*, 1984; *Roley*, 1985).[2]

2. *The anomaly of asset price bubbles*

Another important 'anomaly' is the occurrence of significant rises of asset prices in several countries during the 1980s. Often this has been referred to as asset price inflation or financial 'bubbles' (see *Muellbauer* and *Murphy*, 1989, and *Muellbauer*, 1992, on the UK, *Ministry of Finance*, 1993, on Japan and *Shigemi*, 1995, for an overview of selected countries). The Japanese case is particularly rich in evidence, as during the 1980s Japan witnessed what must rank as the biggest financial 'bubble' on record. Stock and land prices rose rapidly. According to the National Land Agency (1990), the consumer price index rose by less than 500 % between 1955 and 1989. Land prices, however, increased by more than 5000 % over the same period, the biggest rises taking place in the late 1980s. In 1989 it was calculated that the real estate value of Metropolitan Tokyo exceeded the real estate value of the entire United States of America. Land accounted for 70 % of Japan's total net worth, while it made up less than 25 % of US net worth. *Noguchi* (1990) argued that in the 1980s land prices were detached from their theoretical net present value. *Asako* (1991) found that the Japanese land price 'bubble' was too large to qualify as 'rational bubble'. Japanese asset prices have therefore remained unexplained by economic fundamentals (*French* and *Poterba*, 1991). Some observers (*Werner*, 1991, 1993, 1994) had however begun to point out the importance of bank behaviour and credit creation in the propagation of asset bubbles. This is disputed by others (*Hutchison*, 1994).

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1 The Federal Reserve 'de-emphasised' M1 targeting in 1982 and abandoned formal targeting altogether in 1987 (see *Board of Governors of the Federal Reserve System*, 1988).

2 *Leventakis* and *Brissimis* (1991) call for a new approach that can also take capital flows into consideration.

3. *The anomaly of Japanese foreign investment*

The third major 'anomaly' of monetary economics in the 1980s concerns Japanese capital outflows, which in the 1980s far exceeded the record-high current account surplus and rendered Japan the biggest ever net long-term capital exporter. This dramatic expansion of Japanese foreign investment was followed by an equally dramatic collapse: In 1991, Japanese net capital exports suddenly vanished and the world's largest creditor nation turned into a net importer of capital, despite a resurgent current account surplus. Although these extraordinary developments should have attracted widespread interest, surprisingly little work has been done on Japanese capital flows.[3] The few existing studies, mainly based on interest rate differentials and exchange rates, have not been very successful empirically[4] – despite the fact that none attempts to tackle the collapse of foreign investment in 1991.

The only paper that successfully explains Japanese capital flows in the 1980s and early 1990s has done so by moving beyond the traditional portfolio models by incorporating, more or less *ad hoc*, a variable that represents the Japanese asset price bubble: *Werner* (1994) found that in a *Kouri-Porter* (1974) type model of capital flows, price variables had little explanatory power, while land-related credit creation, which was suspected to be fuelling the land price boom in Japan, was strongly significant. However, this attempt to reconcile traditional models with reality has done so only with great difficulty: the key variable of the portfolio model is not a price, but a quantity. Moreover, this quantity – land-related credit – is not a private sector asset, but a liability. This raises questions about the applicability of the portfolio model approach altogether, which so far has been the theoretical underpinning of capital flow studies.

Werner's finding resembles another 'anomaly' occurring in the 1960s, when enormous US capital outflows seemed to buy up large parts of Europe – dubbed *le défi Américan* at the time. Some observers had argued that US capital flows might be due to excess credit creation in the US. *Charles Kindleberger* (1966) relayed this suspicion as follows:

[3] As in other studies on Japanese foreign investment, the focus is on long-term capital flows, which dominated the capital account and seem to have been the autonomous force, with short-term capital flows behaving more like a residual in order to balance the balance of payments identity between the capital and current accounts.

[4] *Ueda's* (1990) regression has a disappointing fit and is not subjected to the standard tests.

> A favourite European banking view is that the capital outflow from the USA is the result of excessive credit creation in the latter. It is sometimes said that the USA exports inflation, although it is not explained how it happens that the USA has lower rates of increase in prices and money supply than European countries. (In one view, the USA has no inflation because it exported it to Europe!) ... John Exter of the First National City Bank of New York has gone so far as to say that a dollar in credit creation is a dollar of capital outflow (p. 216).

However, *Kindleberger* dismissed such a link, so that it was never put to a serious econometric test or embedded in a theoretical model.

III. Towards a new paradigm of disaggregated Credit

Various attempts have been made to amend the old monetary paradigm by adding *ad hoc* assumptions and extensions to the standard framework in order to account for the three 'anomalies'. However, major problems remain. Thus a new general approach that can account for whatever the old framework could explain, but also the observed anomalies should receive precedence over the old framework. Below an attempt is made at presenting such an approach in its most basic form.

1. *'Money' is credit*

The tradition to define M in (1) as a deposit aggregate is problematic for several reasons:

(a) The 'quantity theory of money' argues that money is directly related to nominal income or output, and hence to prices. However, only purchasing power that is actually used for transactions can influence nominal income. Therefore, a quantity relationship between prices or GDP and money should more precisely refer to that part of the money supply that becomes *effective purchasing power*. Traditional money supply measures, such as M1, M2 or M3 mainly refer to money that is deposited with banks. At any moment in time, this is merely *potential*, not *effective* purchasing power, since deposits need to be withdrawn first. Deposits do not represent spending but the opposite, namely savings. But only spending can be expected to affect GDP directly in (1).

(b) Defining money by certain private sector assets, such as deposits, leads to the theoretical dilemma that is not clear where to draw the line among the wide spectrum of private assets. Since none of them is at any moment in time directly used for purchases, but merely represents potential purchasing power, there is no *a priori* theoretical reason why not increasingly broader definitions of private sector assets should be used to define *M*. Time deposits, CDs, bonds and perhaps even real estate could be defined as money in this view. Any chosen monetary aggregate is then susceptible to shifts of private sector assets into or out of its definition domain. This would suggest increases or reductions in the 'money supply', without any macro-economic change in the amount of purchasing power or transactions in the economy.[5] Consequently, the large literature on the definition of the money supply had to remain arbitrary and inconclusive.

(c) Early writers such as *Hume* (1752), *Say* (1803) and *Newcomb* (1885) that firmly established the idea of the 'quantity theory' were mainly thinking about an economy using commodity money, such as gold, as medium of exchange. The role of banks was both smaller and less well understood than it is today. The redefinition of *M* as bank deposits has been justified since *Phillips* (1920) by the assumption of a stable link between deposits and the monetary base, the familiar money multiplier, which seems to render unnecessary the explicit modelling of the role of banks.

However, since the treatment of informational imperfections in the credit market by *Stiglitz* and *Weiss* (1981), this view has increasingly been challenged by the 'credit school'. A wealth of empirical evidence has been supportive of the credit view.[6] Yet, the tendency of modern macro-economics to start with the 'micro-foundations' has hindered even the credit literature: On the micro-level, each bank appears to be taking in deposits and then giving the money out as loans. 'Credit view' research thus treats banks merely as 'financial intermediaries'. However, for the whole economy the causation is in reverse: banks create new purchasing power by the extension of loans. Thus the literature has so far focused on micro-economic models and has neglected the implications of the credit view on macro-economic relationships, such as the equation of exchange (1).

This paper proposes that the problems of the traditional approach can be solved by changing the focus from deposit aggregates to measures of

[5] In Japan, for instance, the traditional deposit measure M2+CD does not include private deposits with the postal savings system. Any shift of private deposits from banks to postal savings accounts has therefore tended to slow the growth of the 'money supply' defined by M2+CD and any reverse shift suggested faster 'money supply' growth – when in actual fact neither effective purchasing power, nor economic transactions, nor GDP was affected.

[6] See *Gertler* (1988), *Goodhart* (1989), *Jaffee* and *Stiglitz* (1990) and *Allsopp* and *Mayer* (1994) for a survey.

credit creation.[7] Using total bank credit as the measure of the 'money supply' *M* in equation (1) has the advantage that (a) credit always represents *effective* purchasing power, as no borrower will take out a loan if there is no plan to use the money for transactions; (b) it becomes possible to define effective purchasing power clearly – namely not bank liabilities, but bank assets or private sector liabilities to the bank sector; and (c) credit aggregates are available by economic sector and hence provide us with additional information about the direction of purchasing power – something deposit aggregates cannot tell us.

2. A Dichotomous Equation of Exchange

Another fundamental flaw of the traditional approach has been that equation (1) assumes that money M is spent on transactions involving goods and services only, represented by *Y*. Clearly, this is doubtful. Events of the 1980s – booming financial markets and rising asset prices – are suggestive of the hypothesis that, increasingly, private sector purchasing power had been used for financial transactions that had a bigger impact on asset prices than on GDP growth.

Fisher and Keynes felt similarly about the experience of the 1920s. *Keynes* (1930) suggested to divide deposit-money flows into those entering the 'industrial' circulation and those being employed in the 'financial' circulation. This division, however, was practically impossible, since deposits do not give any indication about the use to which money is put in the economy. However, adopting the credit view, and defining *M* in (1) as total credit, such a distinction becomes possible, because data on the direction of loans by sector are available in most countries. By institutional analysis and the use of such disaggregated credit data it can be determined, at least approximately, what share of purchasing power is primarily spent on 'real' transactions that are part of GDP and what part is primarily used for financial transactions.

[7] Proponents of the deposit view sometimes argue that it should not matter, whether deposits or loans are being analysed, as both tend to be equal in the long run. Due to the problem of defining deposit money, this is often not true. *Werner* (1996b) has shown that in the Japanese case, a broad credit measure and M2+CD, the traditional deposit measure, diverged greatly in the 1990s. While significant growth of M2+CD seemed to suggest an economic recovery in 1995, the credit aggregate suggested a contraction of nominal GDP growth – for the first time since 1931. The latter is what happened. Conversely, while M2+CD growth remained stable from mid-1995, the credit aggregate suggested a sudden economic recovery from the fourth quarter of 1995, which again materialised.

While a more complex disaggregation is possible, here the first basic step of a dichotomous credit-money circulation is undertaken:

$$C = C_R + C_F \tag{2}$$

C represents loans by deposit-taking financial institutions. C_R is credit-money used for 'real transactions' that are part of GDP, such as investment or consumption, and C_F is credit-money used for financial transactions, such as speculative real estate purchases, which are not part of GDP. With this distinction the classical quantity theory of money can now be reformulated in a more precise way. For the 'real economy' we obtain the following equation of exchange:

$$C_R V_R = P_R Y \tag{3}$$

With a stable 'real' velocity of credit-money, V_R, the stock of credit-money that enters the real circulation determines the nominal value of goods and services. However, credit-money may also be used to purchase financial or real estate assets, without directly entering the investment-wage-consumption cycle of the real economy for a significant length of time. Initially making the simplistic assumption that asset price adjustment takes the same form as goods price adjustment, a tentative formulation of the financial circulation (which abstracts from other factors) may be:

$$C_F V_F = P_F A \tag{4}$$

With a stable 'financial' velocity of credit-money, the stock of credit-money that enters the 'financial' circulation determines the nominal value of assets, $P_F \times A$.

3. *Financial asset bubbles*

When credit creation is increasingly channelled into the financial circulation, total C in (2) rises, while P_R may not be affected by much. But P_F would be pushed up according to equation (4). In other words, in times when banks lend heavily for speculative purposes, such as the margin lending of the 1920s in the US or the property lending of the 1980s in Scandinavia and Japan, asset price inflation is likely to occur, although consumer prices may hardly rise.[8] In a world of perfectly competitive

[8] In the UK experience, a speculative bubble in the housing market was triggered by competition among banks to extend mortgages to individuals. The share

financial markets, symmetric information and perfect foresight, this would not happen. However, in a world similar to the one we live in, this is easily possible: Banks tend to extend loans with real or financial assets as collateral. *Ceteris paribus*, if more purchasing power is newly created that is used for real estate transactions (i. e. C_F rises), land prices (a large part of P_F) rise. Thus the appearance of asset price bubbles is not an 'anomaly', but a result that is to be expected, if C_F rises significantly.

The process that can trigger such asset price bubbles deserves consideration. Banks engage in asset collateralisation, because each bank assumes it cannot influence the price level of the collateral asset. However, if a large proportion of a country's banks engage in increased real estate-related lending, real estate prices will be pushed up according to (4). Due to the fallacy of composition – individual banks take land prices as given, while in effect all banks together influence land prices – there is an externality in the banks' behaviour. Land prices, although driven up by the collective behaviour of banks, are seen as good reason to extend further land-related loans by individual banks. A land 'bubble' is the result. The process is triggered by changed bank behaviour: When a shock renders banks keen to expand their loan books, they can do so by focusing on collateralised loans. As banks raise the loan/valuation ratios (see *Muellbauer*, 1992, on the UK), credit constraints are alleviated, collateral prices pushed up and speculative borrowing demand rises. This represents a kind of 'Say's law of credit': credit supply creates its demand via appreciating collateral values.

In the UK and Scandinavian countries changed bank behaviour seems to have been triggered by deregulation of banking controls and heightened competition between banks for market share. It may be equally due to regulation, however as in Japan. Moreover, historic experience suggests that asset price 'bubbles' can be created using any kind of asset class as preferred collateral. In the 1980s, banks focused on real estate collateralisation. In the 1920s in the US, they engaged in margin lending, using stocks as collateral. The outcome is the same: the price of the collateralised asset is driven up, which facilitates further loan growth.

of mortgage loans out of total loans rose sixfold from 1980 to 1984 alone (*Drayson*, 1985). In terms of our model, excess credit creation entered not only the financial, but also the real circulation, as speculators were mainly individuals, not firms (as in the case of Scandinavia and Japan in the 1980s). Their increased purchasing power reduced savings, boosted consumption and by entering the real circulation pushed up consumer prices. It also produced a balance of payments deficit, as the domestic economy was not able to satisfy the increased demand produced by excess credit creation.

4. *The velocity 'anomaly'*

In our framework it is also not surprising that researchers reported velocity declines in those countries where asset bubbles occurred, because both phenomena are due to a disproportionate rise in C_F. This can easily be seen when comparing the traditional 'quantity theory of money' velocity from (1) with our disaggregated credit velocity, given by:

$$V = V_R + V_F = \text{constant} \tag{5}$$

$$V = P_R Y/C_R + P_F A/C_F = \text{constant} \tag{5'}$$

Even if the real velocity V_R remained constant over the 1980s, the velocity of the traditional quantity theory of money, here called V_M, would give the erroneous impression that overall velocity has declined, since it is defined as:

$$V_M = P_R Y/M. \tag{6}$$

With the broad money supply M approximately equalling the total credit aggregate C, redefine (6) as:

$$V'_M = P_R Y/C \tag{6'}$$

and compare it with the real velocity V_R:

$$V_R = P_R Y/C_R. \tag{5.1}$$

Keeping (2) in mind, it is clear that V'_M will fall as C_F rises faster than C_R and income. However, real velocity V_R need not decline. The observed decline is merely due to the mis-specification of (1), which neglects financial transactions. The framework of disaggregated credit therefore also explains the velocity 'anomaly'.

5. *Open Economy Extension*

The basic model of disaggregated credit can be extended for open economies to take account of international capital flows. Foreign assets constitute one component of a diversified asset portfolio. Since the real circulation is confined to the domestic real economy, funds for net foreign investment (both 'direct' and 'portfolio' investment[9]) derive from the financial circulation. Similarly to the 'diffusion of specie' of classical writers, in a world with high capital mobility, increased C_F is unlikely to remain restricted to domestic financial transactions, but is likely to increase foreign investment as well. In the pure case net capital outflows are directly proportional to excess credit creation entering the financial circulation:

$$\Delta F = k \Delta C_F \tag{7}$$

This framework provides a theoretical explanation of the 'anomaly' of Japanese capital flows in the 1980s and early 1990s: with the rise of credit creation in financial circulation, capital would be expected to flow out of Japan, irrespective of interest rate and exchange rate movements. It would also support the 1960s' suspicion about US capital flows. It is also in line with earlier critique of the prevailing capital flow models that place undue emphasis on stock adjustment and interest differentials, thus neglecting the importance of flow adjustment and overall portfolio growth (see *Willett* and *Forte*, 1969; *Floyd*, 1969; *Niehans*, 1984; *Werner*, 1994).[10] Moreover, it is in line with the finding by *Werner* (1994).

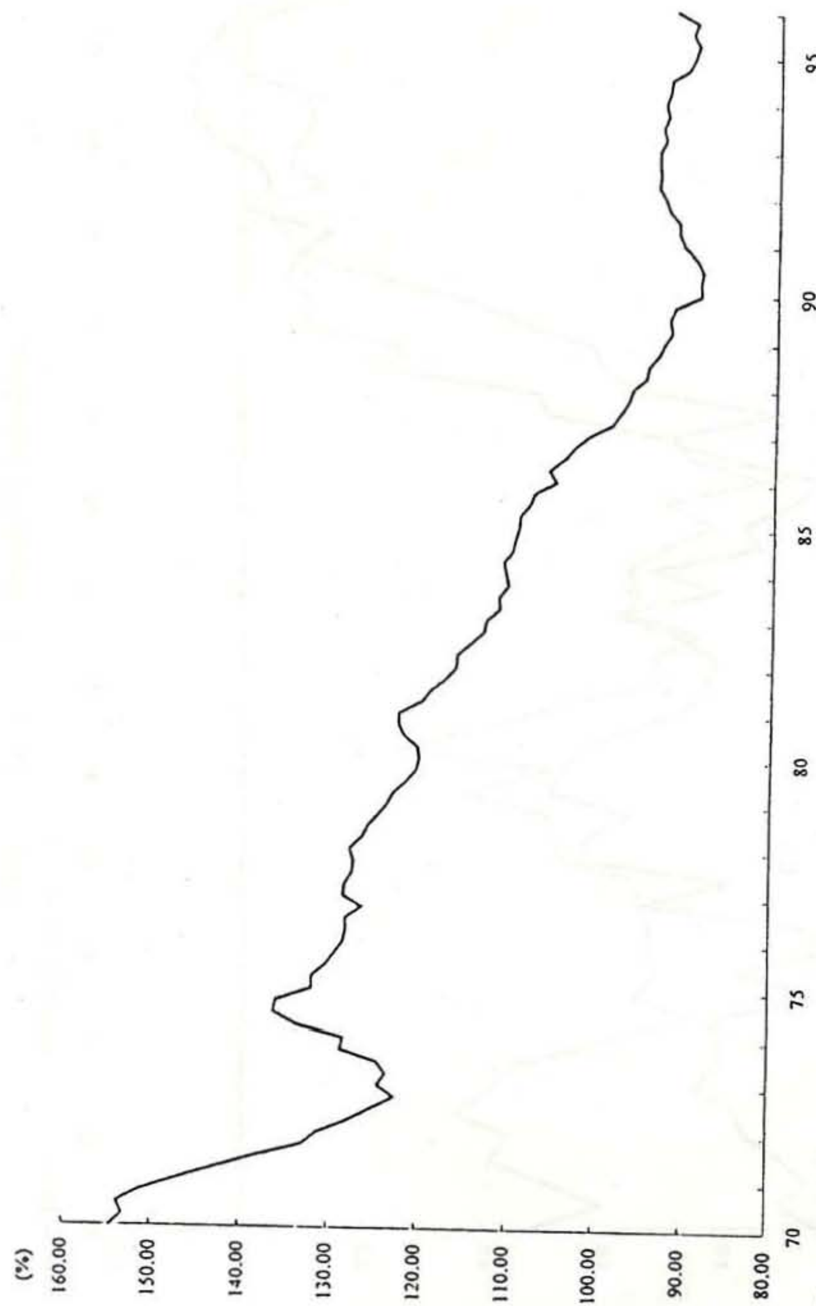
IV. Explaining the Japanese 'anomalies' empirically

1. *The Illusion of a Velocity Decline in the 1980s*

Using the traditional definition of the velocity from (1) and (6), with $P_R Y$ represented by nominal GDP and adopting the accepted practice of defining M as the broad deposit aggregate M2+CD (see, for instance, *Bank of Japan*, 1988), we obtain the velocity curve shown in Figure 1 for the time period 1970 to 1996. As can be seen, velocity declined significantly, especially in the decade of the 1980s. This confirms the 'anomaly' of traditional monetary theory. According to our disaggregated frame-

[9] *Ruffin* and *Rassekh* (1986) discuss why in an international macro-economic model, portfolio and 'direct' foreign investment should be considered in aggregate, rather than individually. They provide empirical evidence for the substitutability of both forms of long-term investment for the US case. *Werner* (1994) provides explicit empirical evidence in support of the substitutability hypothesis in the case of 1980s' Japan.

[10] Excess credit creation in the financial circulation expands the total national financial portfolio. In this case even with an unchanged share of foreign assets, one would expect credit creation to result in capital outflows. In the words of *Willett* and *Forte* (1969), p. 247: "Thus as portfolios grow over time, the absolute amount of capital placed abroad would increase even though relative interest incentives remained the same". The open economy model could also be interpreted as a credit-economy version of the monetary approach to capital flows (see IMF, 1977; *Gordon*, 1977; *Polak* and *Argy*, 1977).



Source: Economic Planning Agency, Bank of Japan

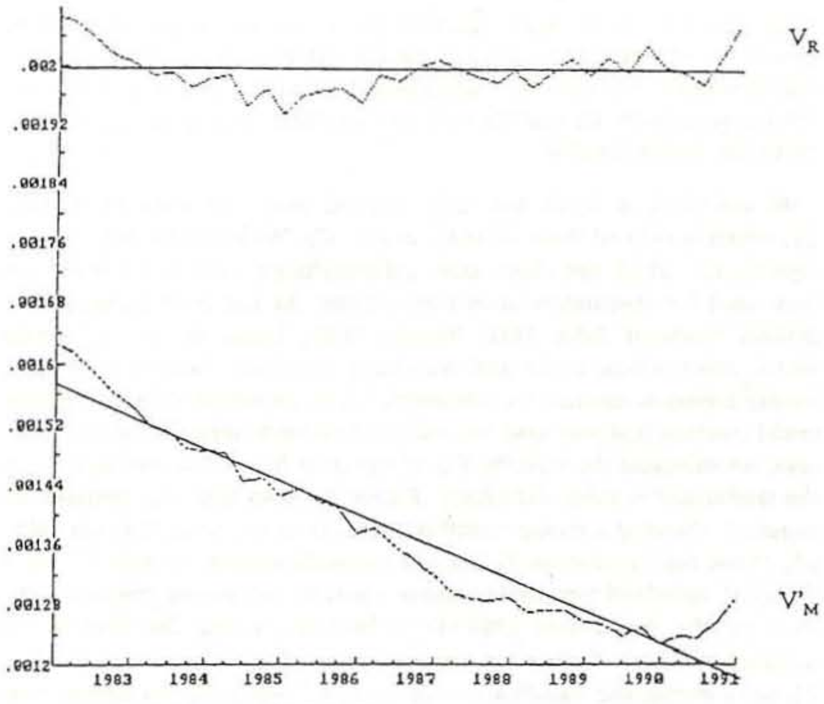
Figure 1: Nominal GDP to M2 + CD ratio (Quarterly, s. a. series)

work, this is to be expected. The first test of the new approach is therefore to see whether the velocity of the real circulation, V_R, is also declining, or whether it is constant. Since institutional analysis is used to identify the proxies for C_R and C_F, this also constitutes a test of the suitability of the chosen proxies.

We use Bank of Japan quarterly sectoral bank loan data to measure C_R, which is defined from (2) as $C_R = C - C_F$. We therefore only need to identify C_F, which are those asset collateralising bank loans that have been used for speculative asset transactions. As has been found earlier (*Nikkei Koshasai Joho,* 1991; *Werner,* 1991), loans to the real estate sector, construction firms and non-bank financial institutions (which mainly served as conduit for real estate loans) represent such speculative credit creation that was used for real estate transactions. Using these figures, we calculate the velocity V'_M of equation (6') which corresponds to the traditional velocity definition. Figure 2 shows that V'_M declined as expected, showing a strong negative trend. It can be seen that the velocity of the real circulation V_R, i.e. the correctly defined velocity of equation (5.1), remained remarkably stable – and in fact stayed precisely constant for the time period 1982 (1) to 1991 (1), during the time of the financial 'bubble'. Testing for the time trend (Table 1), we can see that V'_M has a strong and significant negative trend, while V_R has virtually no time trend at all. This supports the proposed framework of a dichotomous credit circulation and indicates that the proxies used represent C_F and C_R fairly accurately.

It may be concluded that the alleged velocity decline did not occur in Japan: It was merely due to the misleading definition of the velocity, based on the traditional 'quantity theory of money', which neglects the possibility of a rise in 'money' used for financial transactions. The real circulation velocity did in fact not decline.

Since V_R is on average constant, equation (3) holds and C_R should be closely correlated with national income or GDP. In Figure 3 we plot the growth of nominal GDP (the real economy) against the growth of the real credit circulation, C_R. As can be seen, once we have filtered out credit for financial transactions C_F, we find a stable one-to-one relationship between that 'money' (i.e. credit C_R) that enters the real economy and the tangible economy. To test (3) explicitly, we take differences (the entire model is kept in differences, because (a) breaks in the credit series can only accurately be adjusted when in differences, (b) capital flows in equation (7) are a flow variable on which accurate levels are unavailable,



Source: Bank of Japan, Economic Planning Agency

Figure 2: Quantity Theorem of Money Velocity V'_M, Disaggregated Credit Real Velocity V_R and Trend Lines

Table 1

Testing V'_M and V_M for Trend

The sample is: 1982 (1) to 1991 (1)

Modelling V'_M by OLS (with constant)

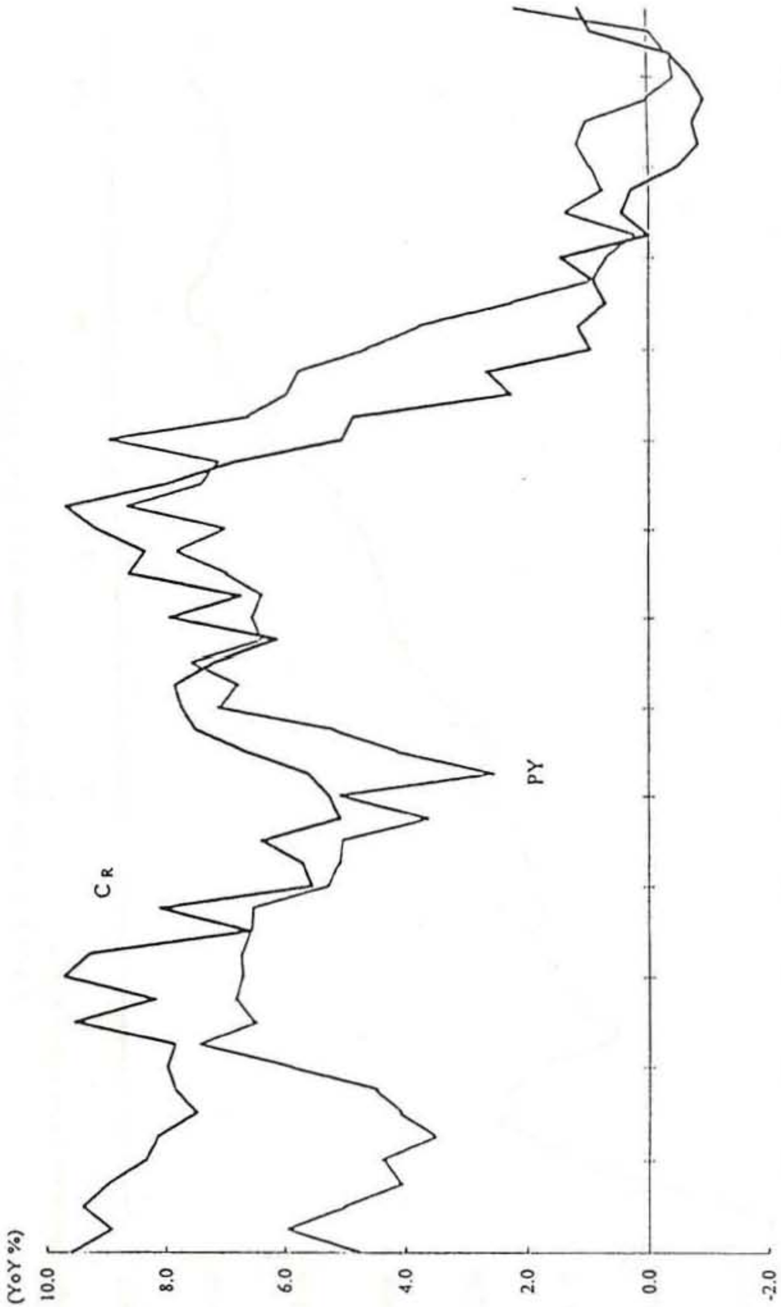
Variable	Coefficient	Std. Error	t-value	HCSE	Part R^2
Trend	−1.0884e−005	4.9812e−007	−21.850	6.7131e−007	0.9317

$R^2 = 0.931698$ $F(1,35) = 477.43$ [0.0000] $\sigma = 3.23508e{-}005$ DW = 0.237

Modelling V_R by OLS (with constant)

Variable	Coefficient	Std. Error	t-value	HCSE	Part R^2
Trend	−6.4997e−008	4.5864e−007	−0.142	5.8768e−007	0.0006

$R^2 = 0.000573501$ $F(1,35) = 0.020084$ [0.8881] $\sigma = 2.97868e{-}005$ DW = 0.562



Source: Economic Planning Agency, Bank of Japan

Figure 3: Credit in the 'real circulation' and nominal GDP

(c) log differencing is the most elegant and consistent seasonal adjustment for the type of quarterly data we are using, (d) differencing avoids spurious correlations and (e) credit creation is a flow concept) and expect to find, in the pure case:

$$\Delta(P_R Y) = \Delta C_R \quad (8)$$

In other words, one dollar in credit creation results in one dollar of economic activity. We use the log difference of actual, quarterly nominal GDP figures to represent $P_R Y$ and of the proxy for C_R, as described above. We add a lag structure to account for partial adjustment dynamics and then reduce to the parsimonious form, which is then subjected to rigorous testing. We obtained (using PC GIVE 8,0 software):

$$\Delta \text{GDP} = a_0 + a_1 \Delta \text{GDP}(-1) + a_2 \Delta C_R$$

which is, of course, nothing but the empirical formulation of (8). ΔC_R is found significant at the 1 % level and the equation seems well defined. Table 2 shows the test results. There is an *a priori* case against spurious correlation, which is supported by unit root tests. Tests for the signifi-

Table 2

Modelling Δ NGDP by OLS

The sample is: 1981 (1) to 1995 (4)

Variable	Coefficient	Std. Error	t-value	t-prob	Part R^2
Constant	0.22219	0.26301	0.845	0.4017	0.0124
ΔNGDP_1	0.72620	0.069050	10.517	0.000	0.6599
ΔC_R	0.18290	0.052195	3.504	0.009	0.772

$R^2 = 0.871841$ $F(2, 57) = 193.88$ [0.0000] $\sigma = 0.959369$ DW = 2.14
RSS = 52.46220552 for 3 variables and 60 observations

Dynamic analysis:

Solved Static Long Run equation:

ΔNGDP =	+0.8115	+0.668 ΔC_R	
(SE)	(0.8791)	(0.1319)	WALD test Chi2 (1) = 25.659 [0.0000] **

Tests on the significance of each variable:

variable	F (num, denom)	Value	Probability	Unit Root t-test
ΔNGDP	$F(1, 57)$ =	110.61	[0.0000] **	−3.9652 **
Constant	$F(1, 57)$ =	0.71371	[0.4017]	0.84481
ΔC_R	$F(1, 57)$ =	12.279	[0.0009] **	3.5041

Tests on the significance of each lag:

Lag	F (num, denom)	Value	Probability
1	$F(1, 57)$ =	110.61	[0.0000] **

Table 2

Continue

Test of Error Term Normality:

Resid. Autoregression: (7 lags)	$F(7, 45) = 0.732991$ [0.6451]
Error Autocorrelation (lags 1 to 4)	Chi2 (4) = 6.0337 [0.1966]; F-Form (4, 53) = 1.4814 [0.2210]
ARCH (lags 1 to 4):	Chi2 (4) = 3.1334 [0.5358]; F-Form (4, 49) = 0.72605 [0.5784]
Normality:	Normality Chi2 (2) = 1.3126 [0.5188]
Heteroscedastic errors:	Chiý (4) = 3.6158 [0.4605]; F-Form (4, 52) = 0.83367 [0.5100]

Test of Functional Form

Chi2 (5) = 3.6597 [0.5994] and F-Form (5, 51) = 0.66256 [0.6535]
RESET test for adding Yhat^2: RESET $F(1, 56) = 0.041441$ [0.8394]

LM test for omitted variables

Added variables: M2+CDs, M2+CDs_1, YenUS$, YenUS$_1, JGB%, JGB%_1, ΔJGB, Call%, Call%_1:
Add $F(9, 48) = 1.6978$ [0.1156]

Added variables: M2+CDs, M2+CDs_1, M2+CDs_2, YenUS$, YenUS$_1, YenUS$_2, JGB%
JGB%_1 JGB%_2 ΔJGB: Add $F(10, 47) = 1.0669$ [0.4059]

Added variables: ΔC_R _1, ΔC_R _2, ΔC_R _3, ΔC_R _4:
Add $F(4, 53) = 0.65604$ [0.6252]

Added variables: M2+CDs, M2+CDs_1, M2+CDs_2, M2+CDs_3:
Add F (4, 53) = 1.4939 [0.2173]

Added variables: JGB%, JGB%_1, JGB%_2:
Add $F(3, 54) = 0.92952$ [0.4328]

Granger Causality Test between ΔNGDP and ΔC_R:

The sample is: 1981 (2) to 1995 (4)
Autoregressive-distributed lag model of ΔNGDP on ΔC_R
(autoreg.: lags 1 to 5; distrib.: lags 0 to 5) $F(11, 47) = 38.839$ [0.0000] **

Granger-Causality test for adding ΔC_R (indep.) to ΔNGDP (dep.):
$F(6, 47) = 3.5622$ [0.0055] **

Autoregressive-distributed lag model of ΔC_R on ΔNGDP
(autoreg.: lags 1 to 5; distrib.: lags 0 to 5) $F(11, 47) = 73.5512$ [0.0000] **

Granger-Causality test for adding ΔNGDP (indep.) to ΔC_R (dep.):
$F(6, 47) = 0.80235$ [0.5731]

cance of the parameters find joint significance. The dynamic analysis results show that the long-run coefficient of both proxies are well determined and significant at the 1 % level, rejecting the null that it is zero. The lag polynomials and their standard errors are analysed and F-tests of the joint significance of each variable's lag polynomial conducted. These, and each lag length are found to be significant at the 1 % critical level. The error terms are found to be normal: The Durbin-Watson statistic is close to 2, indicating that the null hypothesis of no autocorrelation of residuals fails to reject. Moreover, Lagrange multiplier tests failed to reject the hypothesis of no autocorrelation. Tests for autoregressive conditional heteroscedasticity (ARCH) failed to reject the null of no ARCH. The null hypothesis of normality of errors failed to reject, thus no skewness and kurtosis problems exist. The null of no heteroscedasticity in the disturbance failed to reject, indicating unconditional homoscedasticity of errors. The functional form also appears without problems, as the RESET test of functional form mis-specification failed to reject the null that the model is correct, as did the CHI^2 and F-form tests, indicating that the model is correctly specified and no variables are omitted. Explicit tests for omitted variables, adding M2+CD, ten year bond yields and exchange rates also found no omissions. Finally, the direction of causation between credit creation in the 'real' circulation and nominal GDP growth is tested by an autoregressive-distributed lag model. We found that real circulation credit C_R Granger-causes nominal GDP growth at the 1 % significance level, but there is no causality in the other direction.

In conclusion, the final empirical relationship (9) passes all standard tests at highest significance levels and without visible statistical problems. The relationship is strong enough to be visible without statistical techniques, as Figure 3 shows. Growth of loans to the real economy single-handedly accounts for almost 90 % of nominal GDP growth in the observed time period. Moreover, redefining the velocity as in (5.1) above, our explicit test of the stable velocity assumption was successful. Thus the anomaly of the seeming velocity decline in Japan during the 1980s could be explained. Moreover, the model also explains why Japanese nominal GDP growth suddenly fell after 1991: credit growth collapsed.

2. *The Creation of the Japanese bubble*

Since the mid-1970s, large firms in Japan have increasingly substituted equity financing for bank loans. Hence the demand for bank loans for productive investment (entering the 'real' credit circulation) dropped. At the same time, however, central bank 'guidance' procedures, in which loan growth ceilings were set for all individual banks, together with the banks' bias towards market-share orientation that is common to most large Japanese oligopolistic firms (see *Aoki* and *Dore*, 1994) created an environment where banks strived to always fulfil the loan growth ceilings set by the central bank, effectively rendering them loan growth targets.[11]

Banks, keen to extend loans but unable to increase C_R, raised C_F by expanding loans collateralising land. In order to raise credit demand to match the desired credit expansion rates, banks drastically pushed up loan/valuation ratios from below 70 % at the beginning of the decade, to well over 100 % in the late 1980s (interviews yielded ratios of up to 300 %, due to banks' generous anticipation of future land price rises in their current lending decision). The increased purchasing power in the real estate market pushed up land prices, which in turn stimulated demand for speculative real estate loans. There are documented cases where bank loan officers, pressed to fulfil their loan expansion targets, both actively searched for borrowers and offered to generously fund the speculative purchase of a piece of land – already chosen and its value 'estimated' by the loan officer – with 'guaranteed' capital gain. Banks considered land as the safest form of collateral, without questioning the nominal market value and the degree to which their own collective actions had contributed to the overvaluation of land prices. This externality seems to have entailed an underestimation of systemic credit risk. Consequently, banks strived to fulfil the double-digit loan growth targets set by the Bank of Japan, while the real economy grew by less than 5 % for most of the 1980s. Since total loans outstanding are about as large as nominal GDP, it is clear that Japan was heading for disaster: total borrowing was rising more than twice as much as income growth for almost half a decade.

Figure 4 depicts the dramatic rise of the proportion of bank loans which ended up in real estate related transactions (loans to real estate, construction and non-bank financial institutions), the ratio of C_F to total credit. With such a rise in C_F/C, the increasing credit creation for speculative purposes expanded the financial circulation and nominal asset prices P_F rocketed according to (4). Since mainly corporations benefitted from land speculation and re-invested in the 'financial' circulation, this purchasing power hardly entered the wage-income-spending cycle (unlike the mortgage boom in the U.K.). Thus the 'leakage' to the real

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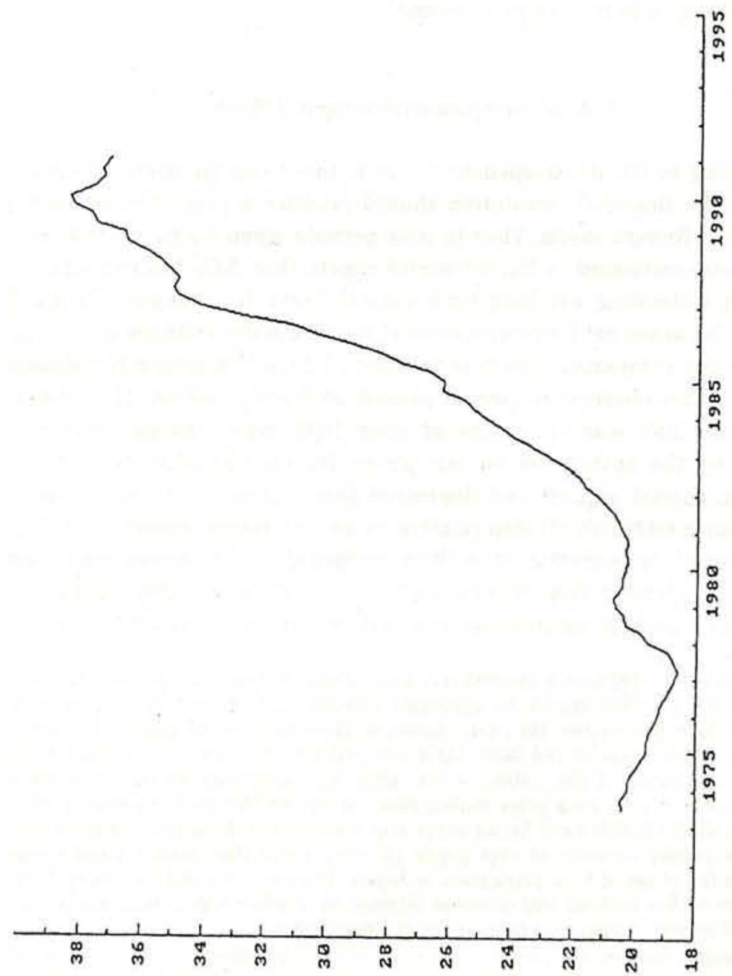
[11] The interaction of central bank guidance and bank behaviour that gave rise to the credit aggregates observed during the 1980s is subject of more detailed work forthcoming by the author.



Source: Bank of Japan

Figure 4: *% Share of Bank Lending to Real Estate, Construction and Non-Bank Financial Institutions*

circulation was limited. This is attested by a remarkably low consumer price inflation (at times even registering a deflation), despite double-digit credit-money growth rates.

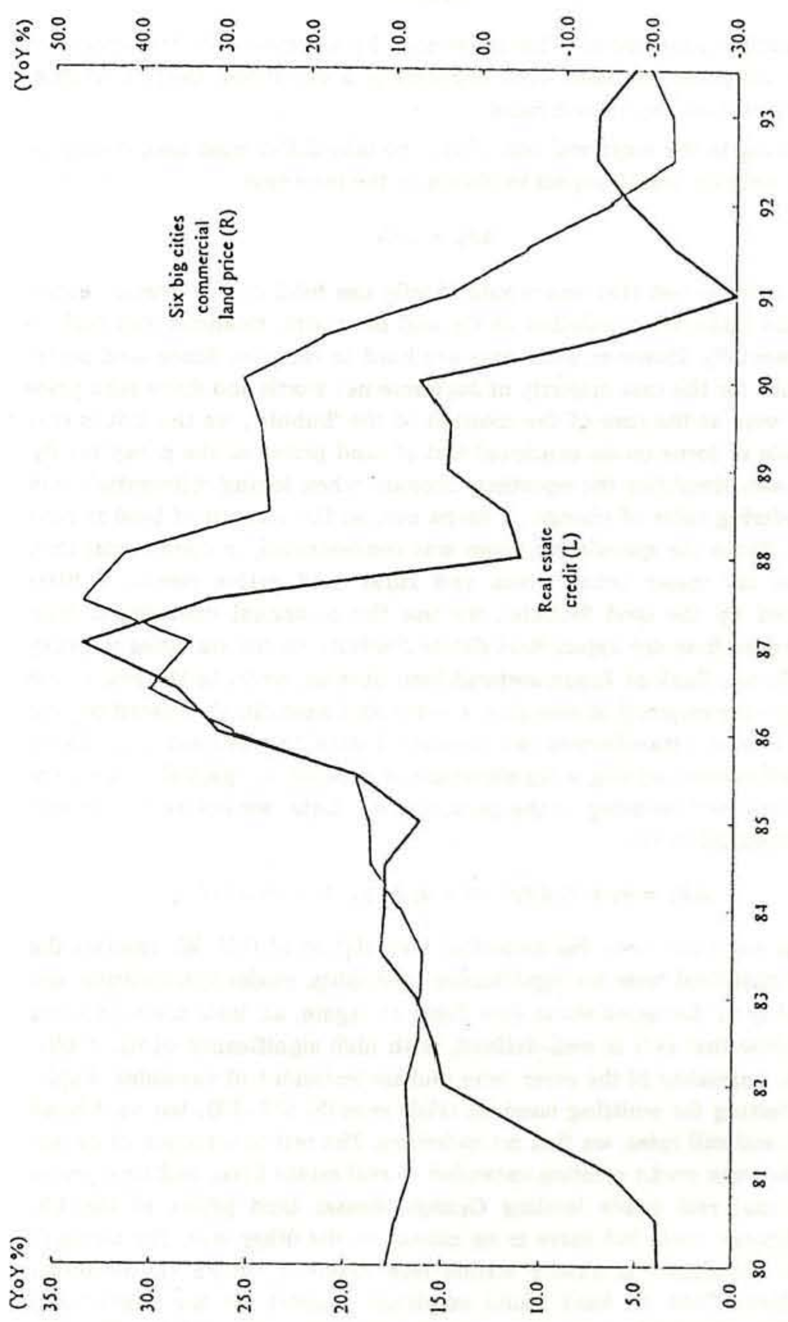
Moving to the empirical test of (4), we take differences and, with constant velocity, would expect to obtain in the pure case:

$$\Delta P_F = \Delta C_F \tag{10}$$

In order to test (10), one would ideally use total credit creation entering the financial circulation as C_F and *all* assets, financial and real, to represent P_F. However, such data are hard to compile. Since land prices account for the vast majority of Japanese net worth and since land price rises were at the core of the creation of the 'bubble', we think it is reasonable to focus on an empirical test of land prices as the proxy for P_F. This also simplifies the equation, because when taking differentials and considering rates of change, A drops out, as the amount of land is constant. Since the speculative boom was concentrated on commercial land in the six major urban areas and rural land prices remained little affected by the land 'bubble', we use the bi-annual commercial land price data from the Japan Real Estate Institute on the six cities to proxy P_F. We use Bank of Japan sectoral loan data on credit to the real estate sector – the majority of speculative loans and most closely related to land transactions – transformed into bi-annual data, to represent ΔC_F. Using log differences, adding a lag structure to account for partial adjustment dynamics and reducing to the parsimonious form, we obtain the following empirical model:

$$\Delta P_F = a_0 + a_1 \Delta P_F(-1) + a_2 \Delta C_F(-1) + a_3 \Delta C_F(-5) \tag{11}$$

This turns out to be the empirical formulation of (10). We conduct the same statistical tests for significance, normality, model specification and causality as discussed above (see Table 3). Again, all tests are supportive and show that (11) is well-defined, with high significance of the coefficients, normality of the error term and no omissions of variables. Explicitly testing for omitting nominal GDP growth, M2+CD, ten year bond yields and call rates, we find no omissions. The test of direction of causation between credit creation extended to real estate firms and land prices finds that real estate lending Granger-causes land prices at the 1% significance level, but there is no causation the other way. The strength of the correlation is clearly visible (see Figure 5, which shows actual variables). Thus we have found empirical support for the relationship postulated in (10) that maintains that credit creation used for financial



Source: Japan Real Estate Research Institute, Bank of Japan

Figure 5: Bank lending to real estate firms and big city commercial land price (bi-annual)

transactions will lead to rises in asset prices. The 'anomaly' of the Japanese asset price bubble is explained both theoretically and empirically by the new approach. The main determinant of Japanese land prices in the 1980s has been real estate-related bank lending. This is in contrast to the literature, which has not been able to find determinants of land price rises or has argued, as in *Hutchison* (1994), that monetary policy has not played a large role in land price rises.[12]

3. *Explaining Japanese capital flows*

According to (7), in an open economy without capital controls, excess credit in the financial circulation should produce a proportionate accumulation of foreign assets. Thus in time periods when C_F becomes significant in size compared to C_R, we would expect that ΔC_F has explanatory power in estimating net long-term capital flows from Japan. Figure 6 portrays Japanese net long-term capital flows and the changes in lending to real estate companies, which is the core of ΔC_F.[13] A strong correlation over the entire observation period cannot be denied. Indeed, the robustness of this link was demonstrated after 1990, when the imposition of controls by the authorities on our proxy for C_F virtually stopped net long-term capital exports and depressed asset prices. However, in order to rigorously establish (7) also relative to an alternative model, we adopt the impartial econometric modelling methodology of proceeding from 'general to specific' (see *Hendry* and *Mizon*, 1978, *Hendry*, 1979). We start from a general macro-economic portfolio model similar to the one

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12 *Hutchison* (1994) uses a general test framework that models monetary factors as one of the possible shocks to aggregate demand and finds little explanatory power for land price rises. He finds, however, that unspecified supply shocks in the land market, such as tax laws, land-use policies, etc., are of importance. To him the experience of the 1980s, when, after all, 'monetary factors may have played a large role in land price movements', is but an 'isolated episode' (p. 81). *Ito* and *Iwaisako* (1996) have found statistical support for the argument presented already in earlier versions of this paper (*Werner*, 1993) that land related credit creation is the cause of land price rises in Japan. Their paper considers many variables in an *ad hoc* fashion and does not attempt to produce a generally applicable theoretical model. It also fails to mention *Werner*, (1993).

13 Of course, land-related credit creation does not necessarily imply that those real estate companies which borrowed from banks were also the foreign investors. Credit-money is fungible and *some agent* will eventually purchase foreign assets with it – in practice these were to a great extent large-scale institutional investors, banks and other financial institutions (but also real estate and financial arms of Japanese corporations). Their assets expanded as credit-money was rapidly being created by the banks.

Table 3

Modelling ΔP_F by OLS

The sample is: 1982 (2) to 1993 (1)

Variable	Coefficient	Std. Error	t-value	t-prob	Part R^2
Constant	−19.112	3.6015	−5.307	0.0000	0.6101
ΔP_F_1	0.55314	0.097790	5.656	0.0000	0.6400
ΔC_F_1	1.1366	0.17688	6.426	0.0000	0.6964
ΔC_F_5	0.44489	0.16932	2.628	0.0171	0.2772

$R^2 = 0.94852$ $F(3, 18) = 110.55$ [0.0000] $\sigma = 4.73678$ DW = 1.91
RSS = 403.8680302 for 4 variables and 22 observations

Dynamic analysis:

Solved Static Long Run equation:

ΔP_F =	−42.77	+3.539 ΔC_F	
(SE)	(8.112)	(0.4705)	WALD test Chi2 (1) = 56.574 [0.0000] **

Tests on the significance of each variable:

variable	F (num, denom)	Value	Probability	Unit Root t-test
ΔP_F	$F(1, 18)$ =	31.996	[0.0000] **	−4.5695 **
Constant	$F(1, 18)$ =	28.161	[0.0000] **	−5.3067
ΔC_F	$F(2, 18)$ =	20.65	[0.0000] **	5.4688

Tests on the significance of each lag:

Lag	F (num, denom)	Value Probability
1	$F(2, 18)$ =	125.9 [0.0000] **
5	$F(1, 18)$ =	6.9041 [0.0171] *

Test of Error Term Normality:

Resid. Autoregression:	$F(4, 13) = 1.26113$ [0.3343]
Error Autocorrelation (lags 1 to 3):	Chi2 (3) = 2.1896 [0.5340]; F-Form (3, 15) = 0.55265 [0.6542]
ARCH (lags 1 to 2):	Chi2 (2) = 4.0682 [0.1308]; F-Form (2, 14) = 1.7875 [0.2035]
Normality:	Normality Chi2 (2) = 2.1916 [0.3343]
Heteroscedastic errors:	Chi2 (6) = 4.3609 [0.6280]; F-Form (6, 11) = 0.45325 [0.8285]

Test of Functional Form

Chi2 (9) = 5.5072 [0.7880] and F-Form (9, 8) = 0.29682 [0.9555]
RESET test for adding Yhat^2: RESET F (1, 17) = 4.3978 [0.0512]

Granger Causality Test between ΔP_F and ΔC_F:

The sample is: 1982 (2) to 1996 (1)

Autoregressive-distributed lag model of ΔP_F on ΔC_F
(autoreg.: lags 1 to 5, distributed: lags 0 to 5) $F(11, 16) = 73.1939$ [0.0000] **
Granger-Causality test for adding ΔC_F to ΔP_F: $F(6, 16) = 7.3362$ [0.0007] **

Autoregressive-distributed lag model of ΔC_F on ΔP_F
(autoreg.: lags 1 to 5, distributed: lags 0 to 5) $F(11, 16) = 12.9867$ [0.0000] **
Granger-Causality test for adding ΔP_F to ΔC_F: $F(6, 16) = 1.9163$ [0.1398]

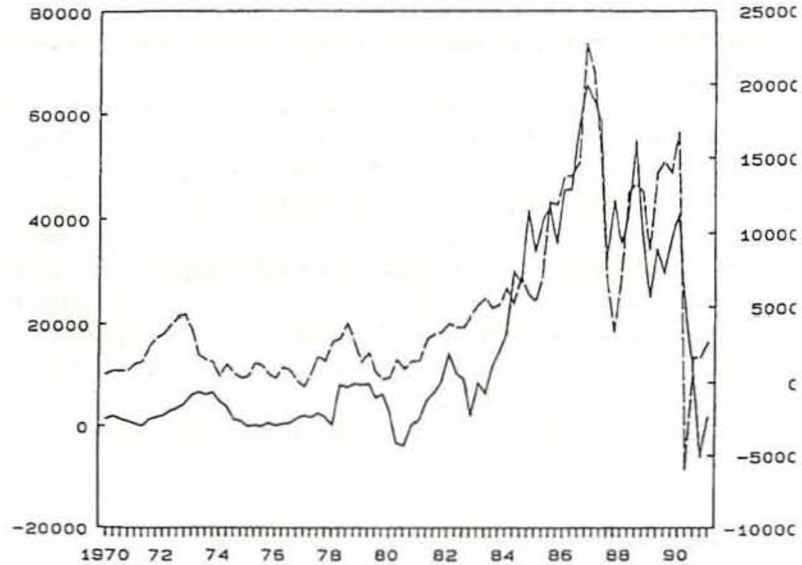
Table 3

Continue

LM test for omitted variables

Added variables: Nominal GDP, M2+CDs, JGB%, Call%
Add $F(6, 12) = 2.352$ [0.0977]

Added variables: Nominal GDP, NGDP_1, M2+CDs, M2+CDs_1, JGB%, JGB%_1, ΔJGB, ΔJGByoy_1
Add $F(8, 10) = 2.6781$ [0.0733]



—— Net Longterm Capital Flows
– – Changes in Lending to Real Estate Institutions

Source: Bank of Japan

Figure 6: Net Capital Flows and Changes of Bank Lending to Real Estate Firms

proposed by *Kouri* and *Porter* (1974). As in *Werner* (1994), we insert our proxy for ΔC_F, add a lag structure to account for partial adjustment dynamics, but unlike in *Werner* (1994), we then reduce to the parsimonious form, which is then subjected to rigorous testing. We find that all other arguments, used in the traditional portfolio model, including exchange rates and interest rates, drop out due to lack of significance and we obtain from this procedure:

$$\Delta F = a_0 + a_1 \Delta F(-1) + a_2 \Delta C_F + a_3 \Delta C_F(-1) + u. \quad (12)$$

This turns out to be precisely the empirical formulation of (7), after lags are added to model dynamic adjustment. ΔC_F is highly significant and single-handedly accounts for about 80% of variations in Japanese capital outflows. We conduct the same statistical tests for significance, normality, model specification and causality as discussed above (see Table 4). Again, all tests are supportive and show that (12) is well-defined, with high significance of the coefficients, normality of the error term and no omissions of variables.[14] In particular, tests of the direction of causation found that ΔC_F Granger-causes ΔF at the 1% significance level, but not vice versa. Our results were robust over different time periods. What is more, the empirical model obtained when sequentially reducing a more general empirical model to the parsimonious form – the independent product of a 'general-to-specific' modelling methodology – coincides with the relationship predicted *a priori* by our theoretical model. Thus, excess credit creation single-handedly accounts for the enormous anomaly of Japanese foreign investment during its surge in the 1980s and the collapse of the early 1990s, just as our simple model of disaggregated credit would suggest. The result suggests that the more traditional portfolio model, based on interest rates and exchange rates (as applied by *Werner*, 1994, in the Japanese case) is encompassed by our disaggregated credit model. For countries and time periods when C_F is rising significantly compared to C_R, our model is preferable to the traditional capital flow theories that are based on stock adjustment.

V. Conclusion and Implications

1. Conclusion

This paper has suggested a simple model that can account for the key anomalies of the traditional monetary approach. It disaggregates the quantity of credit into a 'real' and a financial circulation. In time periods, when the ratio of credit in the financial circulation to credit in the real circulation rises, the simple quantity theory must be expected to

14 Testing without any lags over a longer time period (from 1974/1 to 1991/1), the close link between ΔF and ΔC_F was confirmed in the following simple regression (t values in parentheses):

$$\Delta F = \underset{(0.754)}{1142.204} + \underset{(15.2)}{2.118}\, \Delta C_F \qquad R^2 = 0.7725 \qquad \text{D.W.} = 1.79$$

Table 4

Modelling ΔF by OLS with ΔC_F:

The sample is: 1981 (1) to 1991 (1)

Variable	Coefficient	Std. Error	t-value	HCSE	Part R^2
Constant	−1654.7	2159.6	−0.77	572.2	0.0156
ΔF_1	0.43487	0.10735	4.051	0.08845	0.3072
ΔC_F	0.81664	0.19144	4.266	0.12826	0.3297
ΔC_F_1	0.63710	0.23360	2.727	0.12669	0.1674

$R^2 = 0.871632$ $F(3, 37) = 83.744$ [0.0000] $\sigma = 6881.24$ DW = 2.12
Variance instability test: 0.199019; Joint instability test: 0.763375
Information Criteria: SC = 17.9328; HQ = 17.8265; FPE = 5.19711e+007

Dynamic Analysis:

Solved Static Long Run equation:

ΔF =	−2928	+2.572 ΔC_F
(SE)	(3902)	(0.2872)

WALD test Chi^2 (1) = 80.226 **

Tests on the significance of each variable:

variable	F (num, denom)	Value	Probability	Unit Root t-test
ΔF	F (1, 37) =	16.409	[0.0003] **	−5.2643**
Constant	F (1, 37) =	0.58709	[0.4484]	−0.76622
ΔC_F	F (2, 37) =	14.393	[0.0000] **	5.1189

Tests on the significance of each lag:

Lag	F (num, denom)	Value	Probability
1	F (2, 37) =	34.069	[0.0000] **

Test of Error Term Normality

Resid. Autocorrel. (lags 1 to 3): CHI^2 (3) = 3.055; F-Form (3, 34) = 0.91245 [0.4452]
ARCH (lags 1 to 3, res. scaled): CHI^2 (3) = 0.1121; F-Form (3, 31) = 0.030574 [0.9927]
Normality: Normality Chi^2 (2)= 0.59454
Heteroscedastic error: CHI^2 (6) = 9.141; F-Form (6, 30) = 1.4346 [0.2344]

Functional Form test

RESET test for adding Yhat^2: RESET F (1, 36) = 1.1063 [0.2999]
Functional Form: CHI^2 (9) = 11.195; F-Form (9, 27) = 1.1268 [0.3785]

Granger-Causality Test between ΔC_F and ΔF

The sample is: 1981 (1) to 1991 (1)

Autoregressive-distributed lag model of ΔF on ΔC_F
Granger-Causality test for adding ΔC_F to ΔF: F (5, 34) = 3.6642 [0.0093] **

Autoregressive-distributed lag model of ΔC_F on ΔF
Granger-Causality test for adding ΔF to ΔC_F: F (5, 34) = 1.1655 [0.3462]

disappoint, as it is a special case of the more general quantity theorem of disaggregated credit. In such time periods, a financial boom is likely, as asset prices are driven up by speculative borrowing on the back of collateralised assets. This explains why the traditional monetary quantity theory was not popular in the 1920s and 1930s, and again in the late 1980s and early 1990s. Then the traditionally defined velocity of money declines and excess credit creation can 'spill over' as foreign investment. However, during time periods such as the 1950s, when in many countries credit was mainly channelled into the real economy, asset prices remained stable and the traditional quantity theory could be expected to hold. The fact that the model can account for the major anomalies observed in many countries over many time periods demonstrates generality and robustness.

The empirical results for the Japanese case have been unambiguously supportive. The Japanese asset bubble of the 1980s was due to excess credit creation by banks for speculative purposes, largely in the real estate market. The apparent velocity decline is shown to be due to a rise in credit money employed for financial transactions, while the correctly defined velocity of the real circulation is found to be very stable. This result is in contrast to studies using the traditional deposit-money based approach that have found 'little evidence that monetary factors have played a significant *systematic* role in land price fluctuations in Japan' (*Hutchison*, 1994, p. 80). Further, the open economy version also found overwhelming empirical support, indicating that Japanese capital outflows during the 1980s can equally be explained by excess credit creation that entered the financial circulation and that was diffused around the world in the form of foreign investment. Japan in effect created a lot of money that was not backed by real economic activity and set out to purchase foreign assets with it. Many foreign observers were not aware of this, because, using the traditional monetary approach, they used consumer prices as indicator of monetary policy. Since there was no consumer price inflation, monetary policy was not considered too lax. This result supports *Werner's* (1994) empirical finding of the importance of land related credit creation in determining capital flows and is in contrast to traditional portfolio models that rely on interest rate differentials and exchange rates.

2. *Policy implications*

The results imply for policy makers that it is imperative to monitor the allocation of credit and intervene, if credit creation for unproductive, especially speculative purposes takes place to a significant degree. Once an asset bubble has occurred, excess credit creation must turn into bad debt that tends to cripple the banking system and create a credit crunch.[15] The extent of the problem and the degree of fragility of the Japanese banking system can be judged from Figure 2, indicating the large share of speculative loans in banks' portfolios. In this situation, a long, drawn-out recession is likely, as reduced credit in real circulation tends to reduce real economic activity – in line with equation (3) above. In this case, the central bank can stimulate demand by simply creating more money, as was argued by *Werner* (1994b). After a long delay and the longest recession in Japan since the 1930s, the Bank of Japan finally adopted this policy in April 1995, which produced a sudden, significant recovery half a year later.

Our findings suggest that central bank targeting of credit aggregates is likely to be more successful than traditional monetary or interest rate targeting. They also call for comprehensive disclosure by central banks of timely and detailed credit data.

3. *Further Research*

The success of the proposed simple framework in accounting for the major anomalies that the traditional approach has not been able to explain is an indication that further research into a more complex disaggregation of credit may prove fruitful. Since in this paper credit aggregates were taken as given, further research should also explicitly model the bank behaviour and bank supervision that gave rise to those credit aggregates. Finally, our approach casts doubt on the wide-spread emphasis of traditional economic theory on prices – mainly interest rates. We found that key economic variables, namely nominal GDP, asset prices and Japanese foreign investment, could be explained single-handedly with quantity variables – the quantity of disaggregated credit – while interest rates and exchange rates dropped out in parsimonious reductions as insignificant.

[15] See *Werner* (1991) for an early warning of the impending Japanese banking crisis and recession. See *Werner* (1996) for empirical support of the argument that there has been a credit crunch in Japan in the 1990s.

In conclusion, a new, more general approach has been suggested that encompasses the traditional approach by rendering it merely a special case. The framework for the growth of scientific knowledge proposed by Kuhn and Lakatos suggests a paradigm shift in this case. This opens a whole new avenue of promising work in the new research programme of the macro-economic role of credit.

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Summary

Towards a New Monetary Paradigm: A Quantity Theorem of Disaggregated Credit, with Evidence from Japan

Three important "anomalies" that have occurred in the 1980s in several countries, including Scandinavia and Japan, have challenged the traditional monetary model: (1) the observed velocity decline and consequent instability of the money demand function; (2) significant asset price rises, often referred to as "bubbles" and (3) enormous capital outflows from Japan in the 1980s and a sudden reversal in the early 1990s. In this paper, a simple model is proposed that encompasses traditional theory and manages to explain the three main anomalies. It centres on a "quantity theory" framework of credit-money circulation, which is disaggregated into "real" and financial transactions. Excess credit creation in the "financial circulation" is shown to be responsible for asset price booms, the observed velocity decline and, in an open economy extension, foreign investment. Empirical evidence from Japan supports the model. Implications for theory, further research and policy are explored.

Zusammenfassung

Grundlagen eines neuen monetären Ansatzes: Die Quantitätstheorie des disaggregierten Kredits, empirisch belegt am Beispiel Japans

In mehreren Ländern, einschließlich Japans, wurden in den 1980er Jahren drei signifikante „Anomalien" beobachtet, welche den traditionellen monetären Ansatz in Frage stellen: 1. Der scheinbare Abfall der Geldumlaufgeschwindigkeit und die sich daraus ergebende Instabilität der Geldnachfrage; 2. ungewöhnlich steile Anstiege von Vermögenswerten, oft als „Bubble" oder Spekulationsblase bezeichnet; und 3. Kapitalausfuhren von Japan, die in den 1980er Jahren historisch große Proportionen annahmen, aber in den frühen 1990er Jahren plötzlich zusammenbrachen. In diesem Aufsatz wird ein einfaches Modell vorgestellt, das die traditionelle Theorie als Spezialfall beinhaltet und gleichzeitig alle drei obigen „Anomalien" erklären kann. Es basiert auf einer „Quantitätstheorie" der Kreditgeldschöpfung, welche in „Finanzzirkulation" und „reale Zirkulation" disaggregiert wird. Es wird gezeigt, daß überschüssige Geldschöpfung in der Finanzzirkulation für alle drei „Anomalien" verantwortlich ist. Das Modell wird durch empirische Tests am Beispiel Japans bestätigt. Der Aufsatz schließt mit einer Diskussion der Bedeutung dieser Resultate für monetäre Theorie, zukünftige Forschung und Wirtschaftspolitik.

Résumé

Vers un nouveau paradigme monétaire: La théorie quantitative du crédit désagrégé à l'exemple empirique du Japon

Trois «anomalies» importantes qui se sont produites dans les années 80 dans plusieurs pays, y compris en Scandinavie et au Japon, ont remis en question le modèle monétaire traditionnel: (1) un déclin de vitesse, suivi d'une instabilité de la fonction de demande monétaire, (2) des augmentations importantes des prix des actifs – on fait souvent allusion à des «bulles» («bubbles») – et (3) d'énormes sorties de capitaux du Japon dans les années 80 et un revirement soudain au début des années 90. Dans cet article, on propose un modèle simple qui incorpore la théorie traditionnelle et tente d'expliquer les trois anomalies principales. Il se centre sur un modèle de «théorie quantitative» de la circulation de la monnaie-crédit qui est désagrégée en «transactions réelles» et financières. Il est montré que la création excessive de crédit dans la «circulation financière» est responsable du boum des prix des actifs, du déclin de vitesse observé et, dans une économie ouverte, des investissements étrangers. L'évidence empirique du Japon soutient le modèle. On explore dans cet article les implications théoriques et politiques ainsi que celles au niveau de la recherche.

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Inhalt

Abhandlungen

Fortsetzung 3. Umschlagseite

Berichte

Buchbesprechungen

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