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THE RIPPLE STARTS HERE

1694-2009 Finishing the Past

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SYNOPSIS

This paper offers a definitive statement of economic activity to replace Keynesianism and Monetarism. It shows why both the main economic theories of the twentieth century have failed and what to do about the world financial situation. The work amends the Fisher equation of exchange (MV=PQ) to allow for structural changes in the financial system that took place after the Bank of England was set up in 1694. An economic debt "model" demonstrates the underlying mechanics of private debt-based banking and the relationship between the productive and investment sectors. The "model" is definitive in that it describes actual economic activity. It is used to provide an historical profile of the New Zealand economy between 1978 and 2008 but it can be used, with appropriate data and calibration, to define macro economic outcomes in real time.

INTRODUCTION

There has long been a substantial theoretical disconnect between financial and monetary policy and economic behaviour in the real world. Recent world events show how limited economists' understanding of the mechanisms underlying the monetary policy has been and still is. The basic mechanisms at the heart of the "modern" financial system itself have never successfully been put into a logical framework that is robust enough to allow the underlying relationships to be quantified.

One effort to do so was provided by Irving Fisher in 1911[1] in his well-known equation of exchange that takes the form:

$$MV = PQ \qquad (1)$$

or $$M = PQ/V \qquad (2)$$

Where: M = the amount of money in circulation

[1] Irving Fisher "Elementary Principles of Economics" 1911. The Fisher equation has been very widely discussed in relation to the economic difficulties arising from the sub-prime mortgage defaults in the US 2007-2009. Fisher's work followed on JS Mill 1848 and S Newcombe 1885 and preceded L von Mises "The Theory of Money and Credit" of 1912

V = the speed of circulation of that money; the number of times M is used over a given period T

P = the price level of goods and services an economy produces during time T

Q= the monetised quantity of goods and services an economy produces during time T.

The product PQ is what is known today as Gross Domestic Product or GDP. At first sight, the Fisher equation seems to be self-evident. People have to be able to produce and exchange goods and services. To the extent money is used to do this, the total produced must bear a relationship to the amount of money and the frequency with which it is used.

Verifying the Fisher equation of exchange, until now, has been difficult. A few people have tried to do it[2]. The main difficulties have been to work out reliable estimates for the variables. Historically, only the price level P has been known within a reasonable margin of error, despite the fantastic work done by researchers around the world[3].

The relationship presented here began with an attempt to address a psychological question. "*Has people's hoarding behaviour changed over time*?" The question is crucial to understanding the Fisher relationship. For a given quantity of goods and services Q, does the price P change when the amount of money M changes, or does the speed of circulation of that money, V, change? Or do P and V both change?

The crude estimate of V in England for the period 1300-1900 made by the author of this paper is about 2.5. The number itself is not as important as the hint that it may have been reasonably constant throughout that time despite major inflation during the late Tudor period, the Napoleonic wars at the end of the eighteenth century, and a host of plagues, wars, famines and changes in society and technology[4]. The idea that V may have been more or less constant over six centuries is radical because it runs contrary to some previous academic thinking[5]. This paper will demonstrate the equivalent value for the Fisher V is still in the same general order today[6].

The speed of circulation, V, appears to have been reasonably constant[7] because it essentially represents a hoarding function. At any given time, most money was "saved".

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[2] For example, Nicholas Mayhew in England and Keith Rankin in New Zealand

[3] Such as Martin Allen "The Volume of the English Currency, 1158-1470," Economic History Review, LIV,4 (2001),pp595-611; but also Nicholas Mayhew, John Munro, C.E.Challis, Phelps Brown & Hopkins, among many others

[4] Starting with a price index of 100 in the year 1300, the price level reached just 120 by 1525. It then rose from 120 to 410 through the late Tudor monetary expansion. Around the end of the 18th century during the Napoleonic wars it doubled again to reach 935, then fell through the nineteenth century. In 1900 the price index stood at 635. Prices had increased just six times in 600 years.

[5] For example: Rolnick Arthur J, Velde Francois R, Weber, Warren E, "The debasement puzzle: an essay on medieval monetary history" Federal Reserve Bank of Minneapolis Quarterly review, 22/9/1997.

[6] The Fisher V is perhaps comparable to Vcd as defined later in this paper.

[7] There is no suggestion here that the original Fisher V was invariable; it may have "wobbled" around an "average" figure depending on the state of the economy.

It can be surmised that V is a structural rather than a dynamic component in the Fisher relationship. The immediate response to a change in the money supply M will be a change on the production side of the equation PQ. If the change in M is rapid, the response will be a change in prices P until production and demand adjust to compensate for the change in the money supply. That's different from what happens with fresh produce in the supermarket after bad weather. In that case the money side of the equation remains unchanged and prices rise because production falls. That happens in the shops regularly and from season to season.

The speed of circulation on the other hand appears to require a change in people's behaviour toward money, or changes in the way the financial system works.

THE BANK OF ENGLAND

Changes in the economy began with structural changes in the money supply M made possible through the creation of new money as debt. When the Bank of England was established in 1694, the money supply, for the first time, became relatively independent of the supply of gold and silver.

When a bank issues a new loan, the loan amount becomes an asset in the accounts of the bank. From the bank's point of view it's an asset because the borrower has to repay his debt to the bank. The new loan asset is offset by an equal liability for the bank in the form of a money deposit. Money has been created "out of nothing" by way of a bookkeeping entry. Of course, the loan has to be repaid over time. As it is repaid, the outstanding loan is reduced. Once the loan is fully repaid there is no loan remaining and no residual deposit. The loan and the new money have both been cancelled out of existence.

The bank gets nothing from the process itself. As long as the loan and deposit remain the same there is no profit to the bank and no way for the bankers to become rich. Instead, the Bank of England shareholders became rich because they charged interest on their loans.

Interest has been paid on loans ever since the use of money became widespread thousands of years ago. People would loan their hoarded savings to someone else and expect their savings to increase by the amount of interest they received. The borrowers would usually borrow in the expectation that doing so would increase their productivity or their fortune in some other way. For example, buying an ox or workhorse might dramatically increase production from a farmer's land. The increased production created by using the ox or the workhorse would more than offset the interest on the loan. Both parties were better off as a result of the investment made by using the borrowed money.

The operative word in all this is "investment", the use of money to increase production. The problem with the Bank of England in 1694 was twofold. First, the loans it made to the government were not to increase production but to help pay the war debts of the

crown. Secondly the Ways and Means Act[8] that authorised the Bank of England provided for a perpetual fund of interest charged on ships' "tunnage" and liquor duties. Not only was the loan for current spending instead of investment, it would never be repaid. The interest would have to be funded from taxes forever. Since then, governments have found it very easy to borrow perpetual debt in this way and its use has increased steadily over time. Britain generated huge public debts during the Napoleonic wars and World Wars I and II. More recent spectacular examples have been US debt borrowed to fund the Vietnam war that forced the US off the gold standard in 1971, and Iraq war.

STRUCTURAL CHANGES IN THE SPEED OF CIRCULATION V

Establishing banks that create money, the so-called banks of issue like the Bank of England, structurally altered the financial system by providing a mechanism for the speed of circulation, V, to change over time.

That mechanism allowed the creation of a non-productive pool of "unearned" interest income from deposits.

Unearned income from deposit interest is a structural part of the debt system. It has nothing at all to do with production and accumulates solely because new money is created as an interest-bearing debt. It forms the basis of the investment sector as distinct from earned savings. The investment sector is characterised by trading and speculative investment in existing wealth rather than creating new production and new wealth. Other things being equal, prices for that existing wealth keep rising because the pool of unearned income grows as more and more interest is added to it[9].

The banking sector relies for increased profits on the total money supply M increasing as fast as possible, thereby allowing the pool of unearned interest to grow quickly. That's the main reason the money supply has expanded so quickly**.** Profit arising from the bank spread or margin, the difference between the interest borrowers pay on their loans and the interest banks pay depositors on their deposits, is a direct function of the money supply M and is, most people would be surprised to know, largely independent of interest rates. When M goes up bank profits rise. Bank profits fluctuate with interest rates only when, as a result of perceived lending risk, they alter their spread, the difference between the interest they charge on loans and the interest they pay their depositors; or with changes in the number and size of defaults by borrowers. Such banking activity is part of the productive sector, but the unearned interest paid by banks on bank deposits is not.

There is an inherent conflict of interest between the debt-based banking system and the productive sector. Capitalism is fundamentally profit-seeking. Banks seek to increase M

[8] 5 & 6 William and Mary C.20

[9] There is a significant R^2 correlation between accumulated unearned interest and house and share prices. In New Zealand 1978-2008 the correlation was 0.95 with the house price index and 0.8 with the share price index. While there is a reasonable trend correlation, other factors like population flows and household formation also affect house prices, while business confidence, and economic and political uncertainties also affect share prices in the short to medium term.

to get the greatest profit, while the productive sector receives a decreasing share of wealth because unearned income shifts money away from the productive sector to the investment sector. In aggregate, over time, this drives up asset prices, creating the all too familiar investment bubbles and an overemphasis on capital gains. Prices are likely to increase until the point is reached where the expectations of the investment sector overwhelm the productive economy. This paper will show that the divergence between capital gains and productive incomes has been increasing exponentially, guaranteeing future economic collapse unless the financial system itself is adapted to take account of the mechanics of interest-bearing debt.

AMENDING THE FISHER EQUATION OF EXCHANGE

The foregoing discussion suggests the money supply M in the Fisher equation of exchange can be conceptually divided into two parts. Money used for production could be called Mp and the unearned income interest component of M could be called Ms so the Fisher equation can be written as.

M= Mp+Ms	(3)
Mp*Vp = PQ	(4)
M = PQ/Vp +Ms	(5)
PQ = (M-Ms)*Vp	(6)
Mp=M-Ms	(7)

Where Mp is the money used for production,
M is the total money supply,
Ms is the accumulated unearned income from interest on bank deposits,
Vp is the speed of circulation of Mp,
P is the price level,
Q is total output of goods and services.

The unearned income Ms circulates outside the production cycle so it has no impact on PQ. Hoarding in times gone by did not structurally increase the money supply M, but the continual addition of interest on all interest-bearing debt to Ms produces a structural change in the money supply M and hence, in the original Fisher equation (Mp+Ms)V=PQ, a structural change in V. That structural change in V has nothing to do with changes in human hoarding behaviour. It is a mechanical feature of the interest-bearing debt system. That may be why so many people have had so much difficulty working with the Fisher equation of exchange in the past.

In the interest-bearing debt system, all the loans included in M can never be repaid. The productive money supply Mp from which they must be repaid is necessarily less than M because M=Mp+Ms. The debt supporting the unearned income Ms remains forever a burden on the productive sector.

In equation (4) Mp*Vp = PQ, if Mp, the productive part of the money supply, is not to actually shrink, either the total money supply M =(Mp+Ms) must grow by at least the

amount added to Ms, or else the speed of circulation, Vp, of Mp must rise. If Vp is reasonably constant, as is suspected, then the money supply M must grow faster than Ms if PQ is to grow.

Since the amount added to M as unearned income from deposit interest Ms is a percentage of M, the financial system is locked into exponential growth at least equal to the interest rate on the unearned deposits. The only way to reduce that exponential growth of M is to reduce or eliminate the interest rate on deposits.

Conceptually, the effect of unearned interest on deposits is to transfer claims on the real wealth of the nation from those who produce the economic output PQ to those in the investment sector who produce nothing. Houses and other assets become more expensive in terms of the inflated prices in the investment sector but must be bought using the less inflated money of the productive sector.

Unless inflation in the investment sector and the productive sector are equalised, there must be an ever-widening gap between debt-bound wage and salary earners on the one hand and the participants in the investment sector with net deposits in the banking system on the other hand. At the moment there is a kind of dual exchange rate operating in favour of investors. Wage and salary earners have to use the less inflated money they earn to buy assets "priced" in the inflated dollars of the investment sector.

The original Fisher equation took no account of the investment sector unearned income Ms. Nor did it take into account offshore borrowings. Countries owing money offshore have to pay interest on those offshore loans even though the corresponding money (foreign debt) does not appear in any domestic bank account.

Interest on the accumulated foreign debt, like interest on the domestic debt, has to be funded from the productive economy. Unearned interest payments being made on foreign accounts have to be included in unearned income Ms if it is to truly represent the whole of the investment pool of unearned income, as well as the interest on domestic accounts. The domestic money supply is no longer the sole "base" of the "money" supply as it used to be. Distortions caused by omission of foreign debt would have been minor for most countries in the early twentieth century when Fisher first proposed his equation of exchange. They are often more significant today because some countries like New Zealand have very large current account (foreign) debts while others like Japan have large current account (foreign) surpluses.

DEBT IS MONEY

Until the Bank of England was established in 1694 virtually all money in circulation was coin. From 1694 until perhaps the middle of the nineteenth century much of the money in circulation was made up of bank notes and coins. That changed through the 19th century.

For example, in New Zealand, by 1900, there were just 1.3 million pounds of notes in circulation against 21.5 million pounds in deposits at financial institutions[10].

By July 2008, 99% of the New Zealand money supply arose from bank debt. Much of the remaining 1% (NZ$3 billion in July 2008) undoubtedly circulates in the unofficial "black" economy. The product from the "black" economy is not counted in the gross domestic product, GDP, (price P times output Q in the Fisher equation). In addition, some of the notes and coin supposedly in circulation will also have been lost or accidentally destroyed. No allowance is made for this in the GDP either. For all practical purposes it can be said the whole money supply now arises from bank debt and that throughout the developed world, ***debt is money***.

If ***debt is money***, the variables in equation 7 can be restated:

Debt for production Mp= (***Total Debt***) Md- (***Debt supporting unearned income***) Ms.

With this in mind, the original Fisher equation can be further reformulated so the speed of circulation V becomes a function of the productive debt Mp only. This will be called Vp. The justification for this is that unearned income derived from Ms produces nothing, though it remains a valuable measure of the concentration of wealth in the economy.

Since the Total Debt Md= debt for production Mp + debt supporting unearned income Ms, (equation 3) and Mp=Md-Ms, (equation 7) the newly revised form of the Fisher equation (5) using just the speed of circulation Vp of the productive debt Mp becomes:

$$M(d)=PQ(d)/Vp +Ms \qquad (8)$$

Where:
Mp = debt used for production
Vp = speed of circulation of debt used for production
M(d) = total debt
Ms = debt held by productive sector to fund unearned income on the total debt,
P = prices
Q(d) = quantity or output of production produced by Mp

PQ(d) does not include any contribution to a nation's GDP resulting from cash transactions.

The three main components of the total debt Md are the domestic debt, the foreign debt and central bank reserves. In this work the domestic debt is taken to be the Domestic Credit while the foreign debt is taken to be Accumulation of all the Current Account deficits over time. The reserves, R, held by the central bank, must be subtracted when

[10] NZ Official Year Book 1910.

calculating Md because they represent debt included in Domestic Credit that is not in circulation[11]. R is small compared with Md.

A national current account deficit really means a country is consuming production created by money circulating abroad instead of using local money to generate the whole of its economic product locally. From the point of view of the new Fisher equation (8), debt circulating in a foreign country is no different from debt circulating locally. Likewise, the interest being paid on offshore borrowing is unearned income and its corresponding debt forms part of Ms in the revised version of the Fisher equation (8) described above. It is conceptually no different from other unearned income supported by Ms.

When considering the new Fisher equation in the context of the modern economy the total debt Md in equation (8) Md=PQ(d)/Vp+Ms has to include the foreign debt and the debt Ms arising from unearned income has to allow for the interest paid on foreign debt as well as the deposit interest paid on domestic debt.

The accumulated national current account debt will be called Dca and the domestic credit component will be called Ddc. Central bank reserves will be called R. These are the three main components of total debt Md. The sum (Dca+Ddc-R) is therefore for practical purposes the same as total debt Md.

There is one further variable to be considered. It is the debt, to be called Mv in this work, directly borrowed to support speculative investment. It belongs with Ms in the investment sector and is likely to be associated with rapid expansion of debt during an investment boom.

Mv is, literally, the investment "bubble" that inflates with booms and decays with busts. The revised Fisher relationship enables it to be identified and quantified.

Mv appears to have been especially prominent in the "wild west" days in New Zealand during the mid 1980's, during the dotcom boom in the late 1990's and apparently from 2005 to 2009 when there was a substantial new debt bubble. Mv has almost certainly played a significant role in the US boom and bust during 2003-2009. Mv is believed to be especially vulnerable to downturns in the investment markets and is likely to be retired or written off quickly during major recessions as property and equity prices fall.

The revised Fisher equation (8) can be rewritten as:

$$Md = (Ddc+Dca-R) = PQ(d)/Vp + (Ms+Mv) \quad (9)$$

Or, since from equation (7) Mp= (Md-Ms),

$$Mp = (Ddc+Dca-R) - (Ms+Mv) \quad (10)$$

[11] Domestic Credit and Current Account data are regularly published by the central bank and/or department of statistics in most countries. Central Bank data on reserves is also readily available.

where:
Dca = accumulated current account debt,
Ddc = domestic credit,
R = central bank reserves[12],
Vp = speed of circulation of debt used for production,
Md = total debt,
Ms = debt held by productive sector to fund the unearned income on the total debt,
Mv = debt borrowed for speculative investment rather than production
P = prices,
Q(d) = quantity of production produced by debt Mp,
Mp = debt used for production = (Md-Ms).

The debt that supplies the investment pool Ms is always "owned" by the productive sector, not the investment sector. It is a structural part of the total debt Md but its monetary equivalent in the form of unearned income resides outside of and is separate from the productive sector. In bad times when there are "losses" in the investment sector, the debt Ms remains numerically intact whatever happens in the productive economy. It is theoretically unrepayable unless debt-free money is introduced into the financial system or unless there is a negative deposit interest rate. Actual investment sector losses (write downs) must come either from the investment sector debt Mv or from the productive sector funding Mp, reducing the financial system liquidity as was apparent in the US in 2007-2009. They do not reduce Ms.

When investors lose their shirts, their unearned income deposits (their share of deposits arising from Ms) are merely shifted to someone else. They are still unearned income deposits. At the end of the day, were all of the investment sector debt Mv and the productive sector funding Mp to be eliminated, people in the productive sector would still be left with the debt Ms. Another, presumably different, group would hold all of the corresponding unearned income deposits. That is a conceptual endpoint of the present financial system. Hunger, despair, riots and even revolution would presumably lead to a change in the financial system long before such a conceptual endpoint is reached.

AN ECONOMIC REVOLUTION FROM THE NEW FISHER EQUATION

Take the revised form of the Fisher equation of exchange:

$$Md= (Ddc+Dca-R) = PQ(d)/Vp + (Ms+Mv) \quad (9)$$

$$Mp = (Ddc+Dca-R) –(Ms+Mv) \quad (10)$$

In each production cycle part of Mp arises from the creation of new debt in the production phase. In general that new debt is subsequently cancelled in the consumption

[12] In this preliminary work the "capital reserve" has been used despite it being on the liabilities side of the Reserve Bank balance sheet.

phase. There are literally millions of these cycles continuously superimposed one on the other.

This leads to a startling conclusion that reflects the beauty of devising a debt model of the economy. In aggregate, the speed of circulation Vp of the productive debt Mp must theoretically be 1 when used in the new form (9) of the Fisher equation of exchange[13]. Each tranche of new debt Mp is notionally repaid as its product PQ(d) is consumed. Each tranche of debt is used just once. It is impossible to spend the money arising from a loan more than once. To spend more means borrowing more. The shortfall, amounting to the unearned interest income transferred to Ms in each production cycle, has to be borrowed in addition to the tranche needed to fund the next production cycle. Much, if not most, of increased productivity in the productive sector is immediately "lost" to the investment sector.

The debt Mp in the productive economy must grow if the economy is to grow. That is the fundamental source of the exponential growth imperative in all modern debt based economies.

Equations (9) and (10) are debt based. If Vp in equation (9) is 1, it follows that the speed of circulation of the monetary equivalent of Mp must also be 1 if equation (9) is to hold when expressed in monetary terms. That the monetary "footprint" of Mp can be used only once in generating the nation's GDP at first appears to be surprising, remembering that the historical value of the speed of circulation V in the original Fisher equation in England appears to have been something like 2.5[14]. Conceptually, each production cycle is separate. The debt for production is borrowed and the corresponding money is first used and then repaid as goods and services are production and consumed. The money is re-borrowed and repaid again during the next cycle. In aggregate, intermediate productive transactions are a "pass the parcel" exercise, accumulating and retiring debt through the production and consumption process.

Table1[15] (p.13) shows an indicative model for the New Zealand economy 1978-2009 (March years). The figures are subject to errors in the statistical databases. One source of error lies in the calculation of the accumulated unearned income Ms. In Table 1, the adjustment for the ever reducing cash contribution to GDP and the calculation of Ms have been done together on a "best fit" basis pending improvement in the accuracy of the statistical databases. Table 1[16] gives all the data needed to satisfy the revised Fisher equation[17]:

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[13] Vp would be rather similar to V in the original Fisher equation except that PQ(d) now includes (Dca-R) from equation (10). In the original Fisher equation (Dca-R) was implicitly zero.

[14] Unpublished estimate by the author, the relevant point being that the psychology of hoarding does not seem to have changed dramatically over time.

[15] A full description of how Table 1 is derived is available from the author. The data is for the year ending 31st March.

[16] Reserve bank reserves R = Column 2+ Column 3 - Column 9.

[17] PQ(d) has to be known or estimated if Mv is not equal to 0. PQ(d) in Table 1 is already known.

Md= (Ddc+Dca-R) = PQ(d)/Vp + (Ms+Mv) (9)

It solves the equation for the speed of circulation in the productive economy, Vp, by restating equation (9) as:

Vp = PQ(d)/[(Ddc+Dca-R)-(Ms+Mv] (11)

Figure 1 (p.15) shows the speed of circulation Vp of the productive debt Mp used to generate the debt derived portion of GDP, PQ(d). It is plotted directly from Table 1[18]. Vp less than 1 indicates the presence of a "bubble", that is, speculative investment Mv is greater than zero.

In New Zealand, as a result of methodological changes, there have been significant revisions of the official GDP figures over time. In 1996, as in other countries, the System of National Accounts (SNA) was changed from SNA68 to SNA93. This resulted in data "smoothing" of discontinuities created by the changes. There has been multiple updating of published data too. For example, the New Zealand Official Year Book 2000 gives the 1999 gross domestic product GDP as $98.91b and the 1998 GDP as $98.03b. In the NZYB 2002 the corresponding figures for 1999 and 1998 are 101.19 and 99.63; in NZYB 2004 101.95 and 100.74; in NZYB 2006 103.43 and 101.59. Such variations might at first sight appear to be quite small, but they can have a powerful impact on macro-economic statistics. More accurate statistics would allow better calibration of the Fisher model for New Zealand.

Despite the evident data limitations Table 1 is believed to give a reasonable first approximation of the application in New Zealand of the revised Fisher equation Vp = PQ(d)/[(Ddc+Dca-R)-(Ms+Mv] (11).

The new version of the Fisher equation of exchange (9) can be applied at any point in time, in principle providing macro economic data in real time if the debt and interest rate numbers are available. Were interest on bank deposits to be reduced to zero, the pool of unearned income Ms would remain constant at its present level. With the speed of circulation Vp=1, the increase in GDP would become a direct function of the Total Debt Md-Mv.

The effect of applying the modified Fisher equation (11) Vp = PQ(d)/[(Ddc+Dca-R)-(Ms+Mv)] in the modern economy can be stated as follows:

In a cash-free debt based economy with zero interest rates on deposits the increase in GDP (PQ) equals the increase in the total debt Md less any change in direct speculative investment Mv.

In the debt system, economics is primarily a matter of debt management.

[18] In practice, Vp cannot be greater than 1. Figures in Table 1 greater than 1 result from data and calibration error.

TABLE 1 MODIFIED FISHER APPLICATION NEW ZEALAND 1978-2008 USING AGGREGATE FIGURES

1	2	3	4	5	6	7	8	9	10	11	12	13
Year	CA*	DC*	I%*	GDP*	Mo	Vo	PQd*	Md*	%Md*	Ms	Vp'	Mv*
1978	4.8	9 (est)	8.7	15.3+	0.404	19	7.6	13.6	36	4.75	0.86	1.21
1979	5.3	9.8	7.0	17.4+	0.455	19	8.8	14.9	36	5.11	0.90	1.01
1980	6.1	11.2	8.0	20.3+	0.491	19	11.0	17.1	36	5.57	0.95	0.52
1981	7.0	12.9	9.0	23.6+	0.535	19	13.4	19.6	36	6.16	1.00	0.08
1982	8.6	15.9	9.0	28.7+	0.593	19	17.4	24.2	36	6.87	1.00	-0.07
1983	10.5	21.8	8.8	32.3+	0.650	19	20.0	32.0	36	7.77	0.82	4.31
1984	12.4	25.4	10.1	36.0+	0.652	19	23.6	37.5	36	9.03	0.83	4.88
1985	15.7	30.4	10.5	40.7+	0.718	18	27.8	45.8	36	10.60	0.79	7.43
1986	19.7	40.0	14.3	46.9+	0.831	17	32.8	59.4	36	13.31	0.71	13.31
1987	22.5	44.6	14.2	55.3+	0.868	17	40.5	66.8	36	16.54	0.81	9.71
1988	24.9	51.8	12.3	63.2+	0.861	17	48.6	76.4	42	20.24	0.86	7.58
1989	25.5	53.2	11.5	67.9+	0.953	17	51.7	78.3	53	24.95	0.97	1.70
1990	28.3	58.3	10.8	71.5+	1.075	17	53.2	86.2	64	30.84	0.96	2.38
1991	30.2	63.1	10.8	73.3+	1.120	17	54.3	92.9	67	37.12	0.97	1.55
1992	32.1	68.9	8.4	72.9+	1.024	17	55.5	100.6	70	42.81	0.96	2.32
1993	34.0	70.9	6.3	76.1+	1.082	16.8	58.0	104.5	72	47.46	1.02	-1.21
1994	35.9	77.9	5.4	80.9+	1.219	16.5	60.8	113.4	74	51.82	0.99	0.8
1995	40.0	82.5	5.8	86.3+	1.301	16	65.5	122.0	76	57.01	1.01	-1.14
1996	45.1	91.9	7.2	93.2	1.399	15.5	71.5	136.5	78	64.27	0.99	0.83
1997	51.0	102.0	7.3	98.0	1.503	15	75.5	152.5	80	72.70	0.95	5.04
1998	56.5	112.2	6.5	101.7	1.547	14.5	79.3	168.2	82	81.25	0.91	7.71
1999	60.9	122.5	6.4	103.4	1.682	11	84.9	182.9	84	90.69	0.92	8.51
2000	68.0	134.6	4.4	109.1	1.830	9	92.6	202.1	86	97.97	0.89	11.37
2001	73.2	143.9	5.4	116.0	2.044	7	101.7	216.5	88	107.9	0.94	6.86
2002	76.6	159.6	4.7	124.1	2.237	5	112.9	235.7	90	117.5	0.96	5.17
2003	81.6	170.6	4.6	131.0	2.289	3.5	123.0	251.6	92	127.8	0.99	0.76
2004	87.9	184.5	4.4	139.8	2.483	2.75	133.0	271.8	94	138.6	1.00	0.13
2005	98.2	209.9	4.8	149.1	2.686	2	143.7	306.5	95	151.8	0.93	10.84
2006	112.7	223.8	5.7	156.6	2.811	1.5	152.4	334.7	96	169.3	0.92	12.86
2007	126.4	249.7	6.2	165.1	2.945	1.0	162.2	374.5	97	190.6	0.88	21.34
2008	140.2	273.3	7.0	177.6	3.038	0.5	176.1	411.6	98	217.6	0.91	17.80
2009	155	292.9	6.49	183	3.44	0	183.0	444.1	99	245.9	0.92	15.93

* CA = accumulated current account deficit NZ$b; DC=Domestic Credit NZ$b; I%= annual average deposit interest rate; GDP = Official SNA GDP NZ$b; PQd=Column 5- Column 6 x column 7 NZ$b; Md=Column2 +Column3-RBNZ "capital reserves" NZ$b, %Md = estimated proportion of Md funded at deposit interest rate; Ms =Column 9 *x Column 10 x Column 4 accumulated NZ$b; Vp'=(Column 9-Column 11)/Column 8NZ$b; Mv =Column 9- Column 5-Column 11 NZ$b

+ GDP figures based on SNA 68.

Were Ms and Mv zero in the revised Fisher equation (11), it would essentially be returned to the form of the original Fisher equation (1) MV=PQ except that the debt-derived equivalent of M in the original equation is now expressed as (Ddc+Dca-R).

At the time Fisher first proposed the Fisher equation of exchange in 1911, most economic transactions were still cash transactions[19].

That is not to suggest for a moment there is no role for economic and monetary policy. The allocation of available human and natural resources and distribution of wealth are immensely important issues in modern societies. But there is no alchemy of economics and never was, any more than was the case in late medieval England. The most important macroeconomic data is mainly an accounting exercise.

Figure 1 (p.15) shows Vp plotted for New Zealand 1989-2009 from Table 1 before taking into account the speculative investment Mv. Mv is the debt needed to bring Vp back to 1.

Figure 2 (p.16) shows the Mv bubbles as a percentage of GDP that result when Vp is 1. Figure 2 suggests the dotcom bubble at the turn of the century and the property bubble 2005-2009 were both smaller than New Zealand experienced in 1983-1988[20]. The 2005-2009 bubble has not yet fully dissipated.

Mv bubbles dissipate through the repayment (or write-off) of the speculative debt. Speculative investors sell off assets to the holders of Ms unearned income deposits or those with earned savings forming part of Md. The bubbles dissipate because in the intermediate term expected capital gains can turn into capital losses. Speculative debt becomes too expensive to hold. Mv bubbles are an inherent part of the so-called "business cycle" arising from profligate bank lending during the "growth" stages of the cycle followed by severe lending constraints as the bubble begins to pop. Given a more appropriate financial architecture[21] there would be no need for the bubbles to appear in the first place.

BANKS AND BANKING

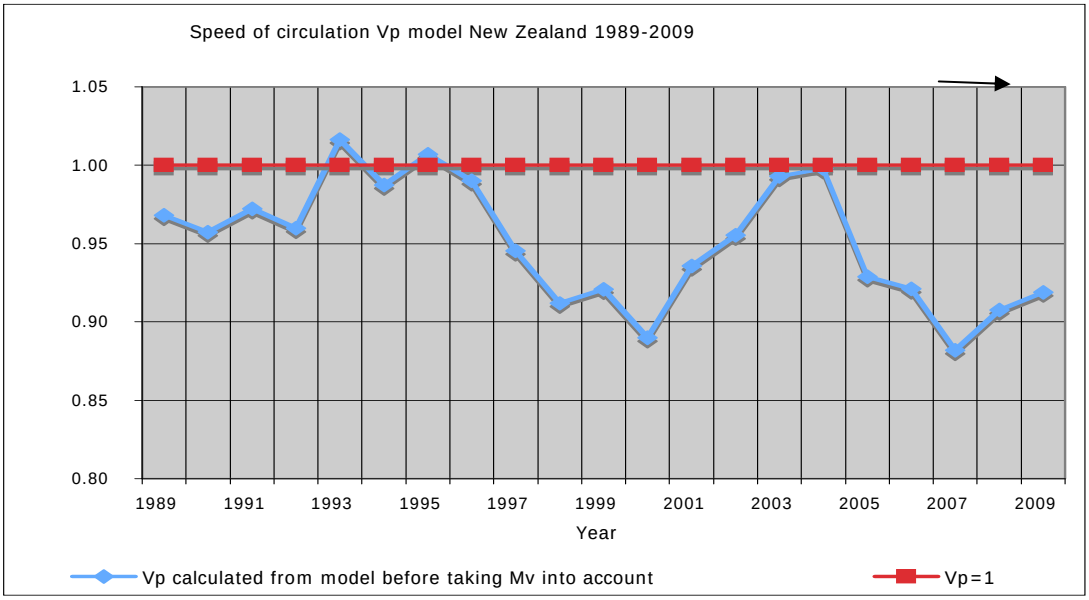
Generally speaking, the larger the Total Debt Md the more profit the banks make. Through automation of banking processes the banks have now all but eliminated cash from the productive sector making economic activity entirely dependent on interest-bearing bank debt. The system is inherently inequitable. The payment of funding interest (unearned income) on bank deposits continuously transfers wealth from the productive sector Mp to the investment sector through the investment pool Ms. Since the interest paid on deposits arising from newly issued debt remains in the system as unearned

[19] Significantly, the price index in England in 1911 was just over 600 (1300 AD=100) whereas by 2009 it was close to 60,000 illustrating the dramatic impact of modern debt-based banking.

[20] Care needs to be taken when considering the quantum of "Roger's hole" in Figure 2 because of calibration limitations in this preliminary analysis; but it does appear New Zealand's experience during this period was similar to the US collapse 2007-2009, both in cause and (quite possibly) extent.

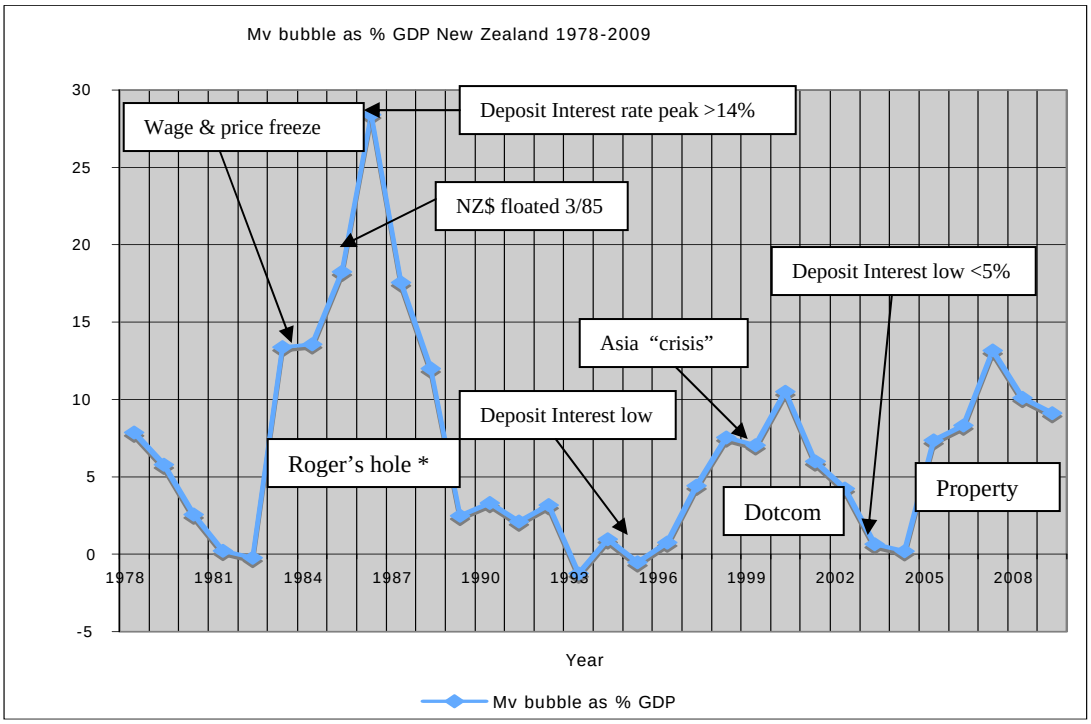
[21] Considered later in this paper

FIGURE 1: SPEED OF CIRCULATION Vp' OF PRODUCTIVE DEBT NEW ZEALAND 1989-2009 FROM TABLE 1*



Vp' greater than 1.0 arises from data and modelling error. Vp' is Vp before allowing for Mv. Mv is the sum needed to bring Vp back to 1,

FIGURE 2 BUSINESS CYCLE BUBBLES AS PERECENTAGE OF GDP



* Named after finance minister Douglas. Mv was substantial through this period of wild speculative expansion though it appears to have begun before 1985. Mv below 0 arises from data and modelling error

income Ms, the only way to fully repay that new debt is by creating yet more new debt on which yet more interest has to be paid. This ongoing process produces the exponential increase in total debt Md, (and therefore Ms), in the present financial system. Exponential trendlines can be overlaid on the historical curves for total debt Md, the investment sector Ms and the accumulated current account deficit Dca (1986-2009) from Table 1[22].

Not only are those debt trend curves exponential, they show clearly that the investment sector in New Zealand has been growing exponentially at about 11.2%, substantially faster than the total debt and current account which have each been growing at about 8.6% and 8.9% respectively. The rapid growth of Ms has very serious monetary policy implications because it means the productive debt Mp is shrinking as a proportion of total debt Md. As Ms expands quickly, the earned savings included in Mp are falling relative to the investment sector, demonstrating conclusively there is an ongoing and measurable transfer of wealth from the productive sector to the investment sector.

Monetary policy in the Western world has evidently and, one would like to hope, inadvertently, supported this stranglehold by banks over the economy. The only mechanism presently in use to manage the growth of total debt Md is the interest rate that in most countries is indirectly controlled by central banks like the US Federal Reserve. Many of those central banks are themselves powerfully influenced by the private sector.

Increasing interest rates to manage inflation has two immediate effects. First, it further increases the flow of money from the productive sector to the investment sector by increasing the unearned income pool Ms. Secondly it will tend to increase bank profits wherever, in response to higher perceived lending risks, the banks increase their spread or gross interest margin on their loans[23]. Raising the price of productive debt Mp squeezes demand for it. Jobs are lost. Ordinary people have less money to spend because more of their income is used to service (pay interest on) their existing debt. Home ownership becomes difficult if not impossible. This shift can be called the "transfer effect".

The transfer effect is the main reason the use of interest rates to manage the economy has now failed around the world. In New Zealand in March 2009 the total debt Md was about $444 billion while GDP was only about $183 billion. In the absence of increased lending a 1% increase in deposit interest rates, results in a 2.4% increase in GDP as $4.4 billion more is transferred to Ms[24]. Moreover, increasing interest rates reduces rather than increases the existing flow of new debt into the system because new debt becomes more expensive. The result is that small changes in deposit interest rates can have quite catastrophic effects on the productive economy. The more interest rate-induced boom and bust cycles the economy has endured, the worse the problem has become.

---

[22] R^2 for Md (1986-2009) is 0.9975 ($y=54.5*e^{0.0861x}$), for Ms it is 0.977 ($y=17.4*e^{0.1121x}$), and for Dca it is 0.9945 ($y=17.4*e^{0.0887x}$).

[23] Hence recent record profits made by the New Zealand banking system in the absence of any significant losses despite the world economic "meltdown"

[24] The interest is borrowed into the productive economy before being passed on to deposit holders.

The revised Fisher equation of exchange proves conclusively that the use of interest rates for economic management works, if it works at all, only at extraordinary human cost. The revised Fisher equations developed in this paper provide a compelling theoretical basis for changing the world's financial architecture.

LIQUIDITY AND CIRCULATING DEBT

The productive debt Mp is made up of a foreign component Dca, the accumulated current account deficit, and a domestic component Mcd which is equal to the domestic credit Ddc less the investment sector debt Ms less the central bank reserves R. Mcd can be called the "circulating debt".

$$Md=Mp+(Ms+Mv) = (Dca+ Mcd) + (Ms+Mv) = Dca+Ddc -R \qquad (12)$$

Other indicators can be readily developed using these simple relationships. For example, the "circulating debt" Mcd can be defined as

$$Mcd= (Mp-Dca) = Ddc-(Ms+Mv)-R \qquad (13)$$

where:
Dca is the accumulated national current account deficit,
Ddc is the domestic credit,
Mcd represents the debt actually available to be used in producing the domestic part of the gross domestic product produced by debt (PQ(d)),
Mp, Ms, Md. Mv and R are as previously defined.

The portion of the gross domestic product produced by domestic debt can be called PQ(dom). It can be defined as:

$$PQ(dom) = PQ(d)-PQ(ca) \qquad (14)$$

Where:
PQ (dom) is the domestic part of QP(d),
PQ(ca) is the contribution to PQ(d) resulting from the current account,
PQ(d) is as previously defined.

The speed of circulation Vcd of the "circulating debt" Mcd can be defined as :

$$Vcd = PQ(dom)/Mcd = PQ(dom)/(Ddc-(Ms+Mv)-R) \qquad (15)$$

Mcd is the debt actually available to produce the domestic component PQ(dom) of output PQ(d) because the foreign debt Dca is committed offshore and is not available for domestic production. It is the closest modern equivalent to the money supply M in the original Fisher equation of exchange MV=PQ (1) and is believed to be a very sensitive indicator of economic activity. In a world of instantaneous transaction settlement, most of Mcd represents earned savings plus transaction account balances.

The speed of circulation Vcd is believed to be comparable to the speed of circulation V of the money supply M in the original Fisher equation (1) though it is more virtual than real. In the interest-bearing debt system the speed of circulation, Vp, of Mp is 1. Because Dca is unavailable to the domestic economy except as debt in bank accounts the residual part of Mp, Mcd, appears to "work harder". Most of the earned savings that make up Mp belong to overseas savers when in a healthy economy those savings would be held in New Zealand. Were that so, Vcd would be the same as Vp and have a value of 1.

Figures 3 and 4 show Mcd and Vcd for New Zealand, 1978-2009.

They show that the speed of circulation Vcd increased steadily in New Zealand through the period 1979-2009. This is thought to be largely due to structural changes in the payment systems. While the comparison of Vcd, the speed of circulation of the circulating debt, Mcd, and V in the original Fisher equation needs to be treated with considerable caution the figures suggest it is still broadly of the same order as it is thought to have been centuries ago. Basic human hoarding behaviour might not have changed much in 700 years. Those who can, still save what they can even though in New Zealand's case most of the saving has been by foreigners. Because of substantial

FIGURE 3: NEW ZEALAND "CIRCULATING DEBT Mcd 1978-2009

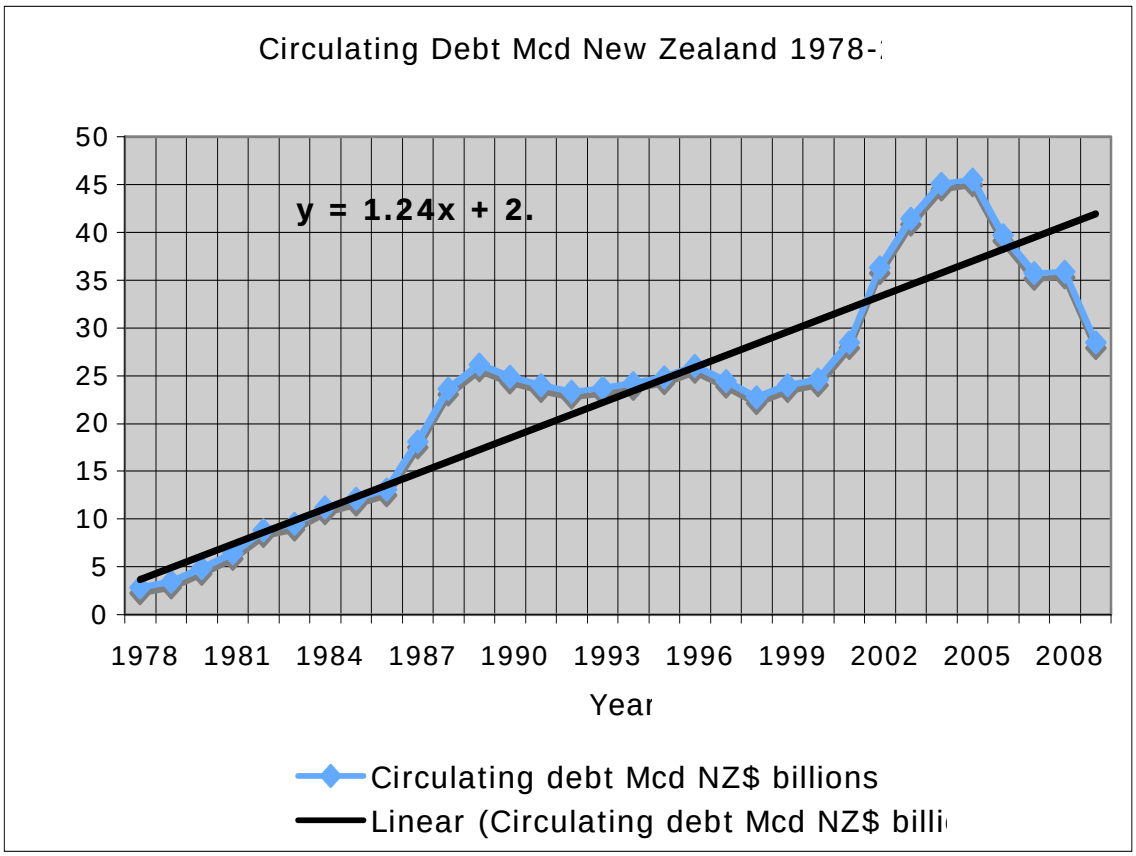
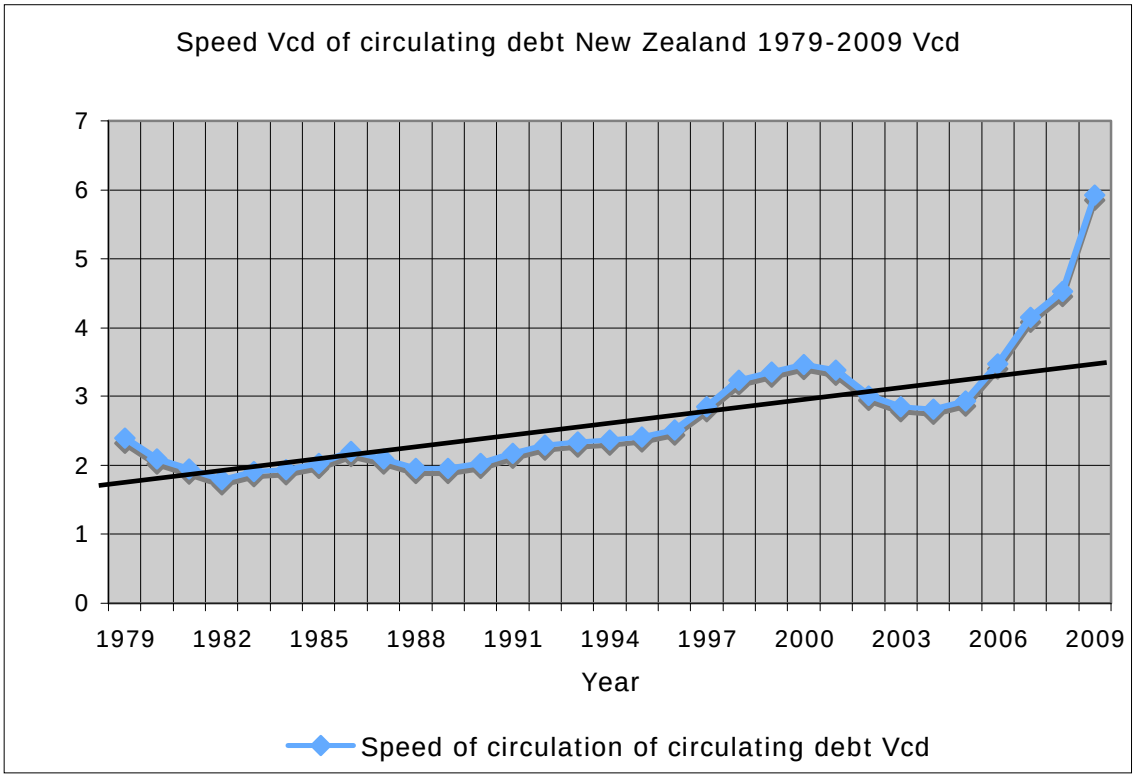


FIGURE 4: SPEED OF CIRCULATION Vcd OF CIRCULATING DEBT Mcd NEW ZEALAND 1979-2009[25]



fluctuation of the circulating debt for production Mcd during modern business cycles, Vcd is thought to be much less stable now than in past centuries.

The circulating debt for production Mcd is thought to be an excellent (inverse) numerical measure of the liquidity of the financial system.

Figures 3 and 4 show the three boom and bust cycles (mid 1980's equities, late 1990's dotcom, 2005-2008 property) New Zealand has experienced since 1980 were not quite the same. Each of the three bubbles shown in Figure 2 involved a substantial build up of speculative investment Mv, but the dotcom bubble led to lower circulating debt Mcd (system liquidity) whereas the other two were accompanied by substantial increases in Mcd as the bubbles formed. Since Mcd, including transaction account balances, represents earned savings, it seems, on balance, that households may have reduced net debt in the dotcom boom whereas they were net savers during the other two events[26].

[25] By December 2008, in New Zealand, Vcd had increased to 4.9 as liquidity contracted with the 2008 economic downturn. By the end of March 2009, Mcd had plummeted about NZ$ 28 billion and Vcd had leapt to 5.9 because the banking system has failed to release enough new debt into the economy.

[26] Since transaction balances are readily available from central bank figures, earned savings (Mcd-transaction balances) can also be plotted against time.

THE DEBT MODEL

The revised Fisher equation of exchange Md= (Ddc+Dca-R) = PQ(d)/Vp + (Ms+Mv) (9) offers a very simple debt model of the economy.

It is shown in Figure 5 (p.21) where the total debt Md, and unearned income Ms plus speculative investment Mv, are plotted against time. PQ(d)/Vp (=Nominal GDP) is the difference between the two curves.

The dependence of gross domestic product (GDP) on the total debt Md and the interest rate on bank deposits in the modern cash-free economy has truly profound implications. The speed of circulation in the productive sector Vp is fixed at 1. Increases in unearned income arising from Ms depend directly on the deposit interest rate.

In the light of the worldwide financial chaos of 2007-2009 the first order debt model shown in Figure 5 provides a powerful argument in support of public control of a nation's financial system. The present system leaves the world economy at the mercy of privately owned institutions working for private profit by allowing irresponsible increases of the total debt, Md and its associated bubble formation.

It isn't possible to have a simpler model of the economy than:

Total debt Md=Nominal GDP (Mp)+Unearned Income Ms + speculative investment Mv.

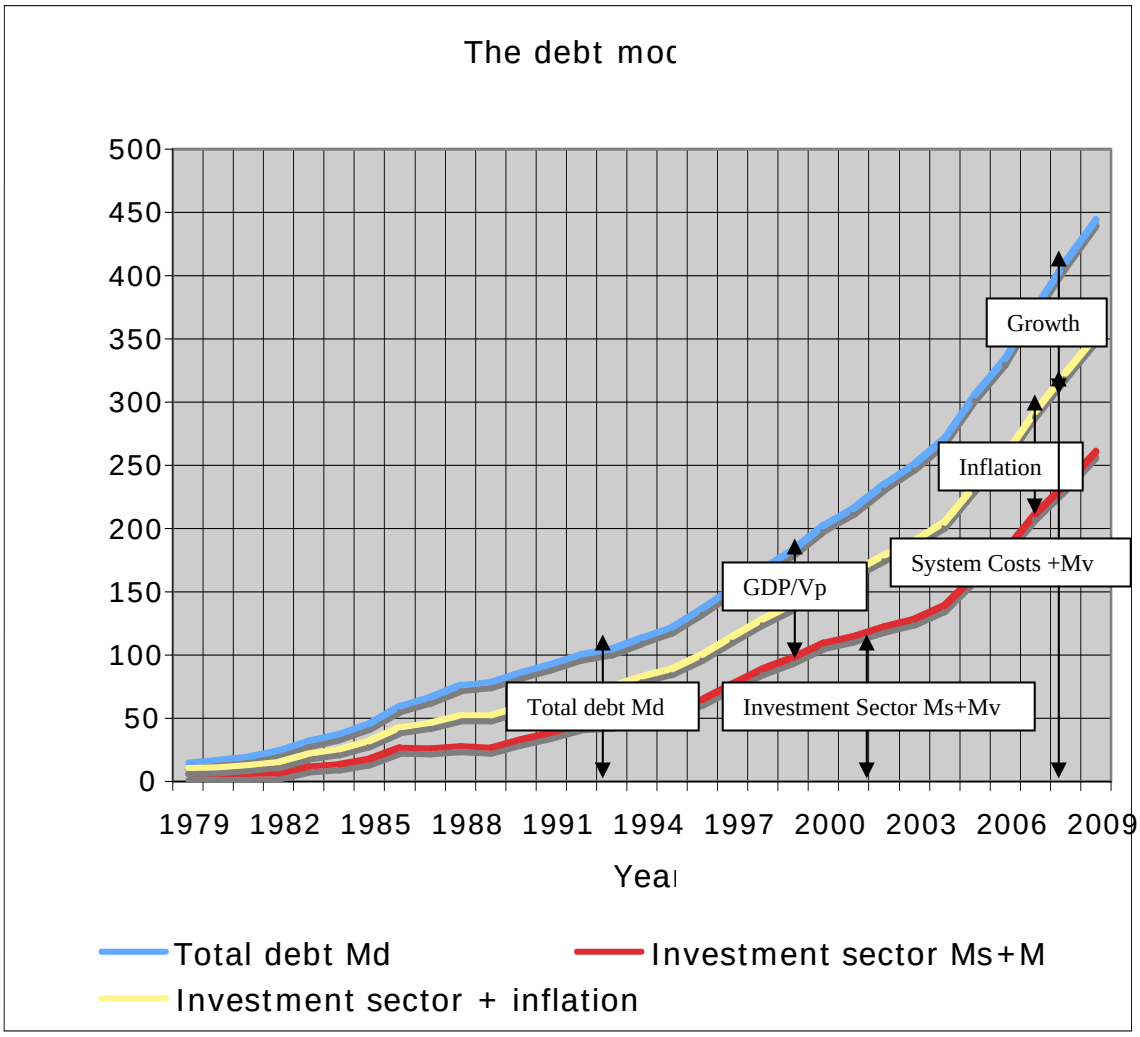
That is especially so when, with a simple reconfiguration of the financial architecture, Mv can be eliminated and Ms held constant. That would make the economy directly dependent on Md. That is how simple the modern cash free economy really is, as disclosed by the revised Fisher equations developed and discussed above.

Total debt, Md, in New Zealand has grown exponentially by an average of about 8.6% per year since 1986 while the unearned income investment sector as been expanding at the rate of 11.2% per year. Unless checked, the only possible outcome for the system over time is for the system liquidity (Figure 3) to be squeezed toward zero, producing fundamental economic collapse[27].

It is therefore imperative that liquidity be injected into the system urgently by increasing the domestic credit and largely eliminating the growth of the investment sector Ms. The model can be used to quantify the liquidity needed to utilise each nation's maximum growth capacity.

[27] On the long term trends for New Zealand in 2008, the liquidity Mcd would disappear by about 2013.

FIGURE 5: THE DEBT MODEL FOR THE NEW ZEALAND ECONOMY



DEPRESSIONS, RECESSIONS AND DIFFERENTIAL ANALYSIS

The revised Fisher equation (9)
Md= (Ddc+Dca-R) = PQ(d)/Vp + (Ms+Mv)

shows the relationships among the total debt Md, the total productive output PQ(d), the speed of circulation of the productive debt Vp, the debt arising from accumulated unearned income Ms and speculative investment Mv over time. Following basic differential methods the equation can also be written:

dMd/dt = d/dt (Ddc+Dca-R) = d/dt[PQ(d)/Vp + (Ms+Mv)] (16)
where:

over any small period of time dt, the change in the total debt Md = the change over the same time dt of PQ(d)/Vp +(Ms+Mv).

There is quite a lot more variability in the figures calculated this way compared with Table 1 because additional error is introduced by multiple subtractions of large numbers.

Using the differential approach allows the new debt model to show how the economy is performing in practice. With better data economic performance could be assessed monthly, or even, theoretically, in real time. The differential approach using annual data from Table 1 is shown in Figure 6. The recorded consumer price index (CPI) inflation has been added to demonstrate business cycle booms and busts. Figure 6 (p.23) is indicative only pending better model data and calibration.

Of particular interest in differential equations is what happens at maxima and minima, that is, at high points and low points. Referring again to equation (16),

When dMd/dt = 0, d[PQ(d)/Vp+ (Ms+Mv)]/dt = 0, so d/dt PQ(d)/Vp = -d (Ms+Mv)/dt

If there is no increase in the total debt, nominal economic output PQ(d)/Vp must contract by the amount of unearned income that has to be transferred to the investment sector and any increase in speculative investment Mv. For nominal economic output to increase at all, Md must increase by at least the amount transferred to Ms and invested in Mv. This provides, for the first time, an absolute definition of a depression, namely when dMd/dt is less than d(Ms+Mv)/dt.

A depression occurs when the change in the total debt over time is less than what is needed to service the unearned interest that has to be paid to the investment sector Ms plus any increase in speculative investment Mv, that is, when there is no provision for either inflation or growth.

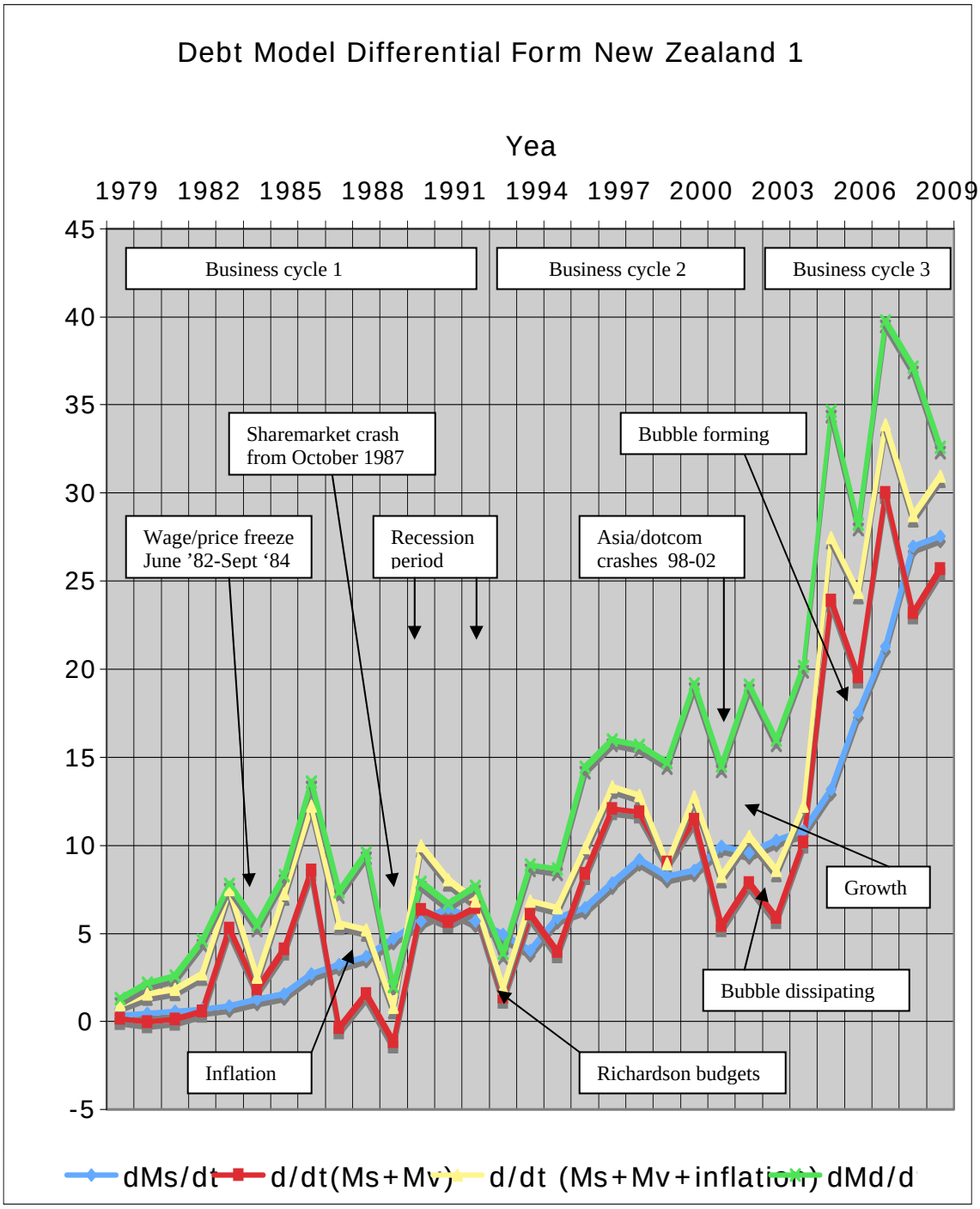
A similar, absolute, definition of a recession is when dMd/dt is less than d(Ms+Mv)/dt plus provision for inflation. Provision for inflation and unearned income can together be considered financial system costs. Economic growth occurs only when and to the extent that dMd/dt exceeds the financial system costs plus speculative investment Mv.

A recession occurs when the change in total debt over time is less than what is needed to service the financial system costs, being the unearned interest that has to be paid to the investment sector Ms plus inflation, plus speculative investment Mv.

The difference between a recession and a depression is that a recession provides for inflation but not growth, while a depression provides for neither growth nor inflation.

The model can be used to provide specific measurable monetary targets to avoid recessions and depressions. The targets can easily be identified in advance and new debt injected into the system to maintain growth.

FIGURE 6: INDICATIVE REVISED FISHER DIFFERENTIAL EQUATION (16) FOR THE NEW ZEALAND ECONOMY 1979-2009 SHOWING BUSINESS CYCLES*.

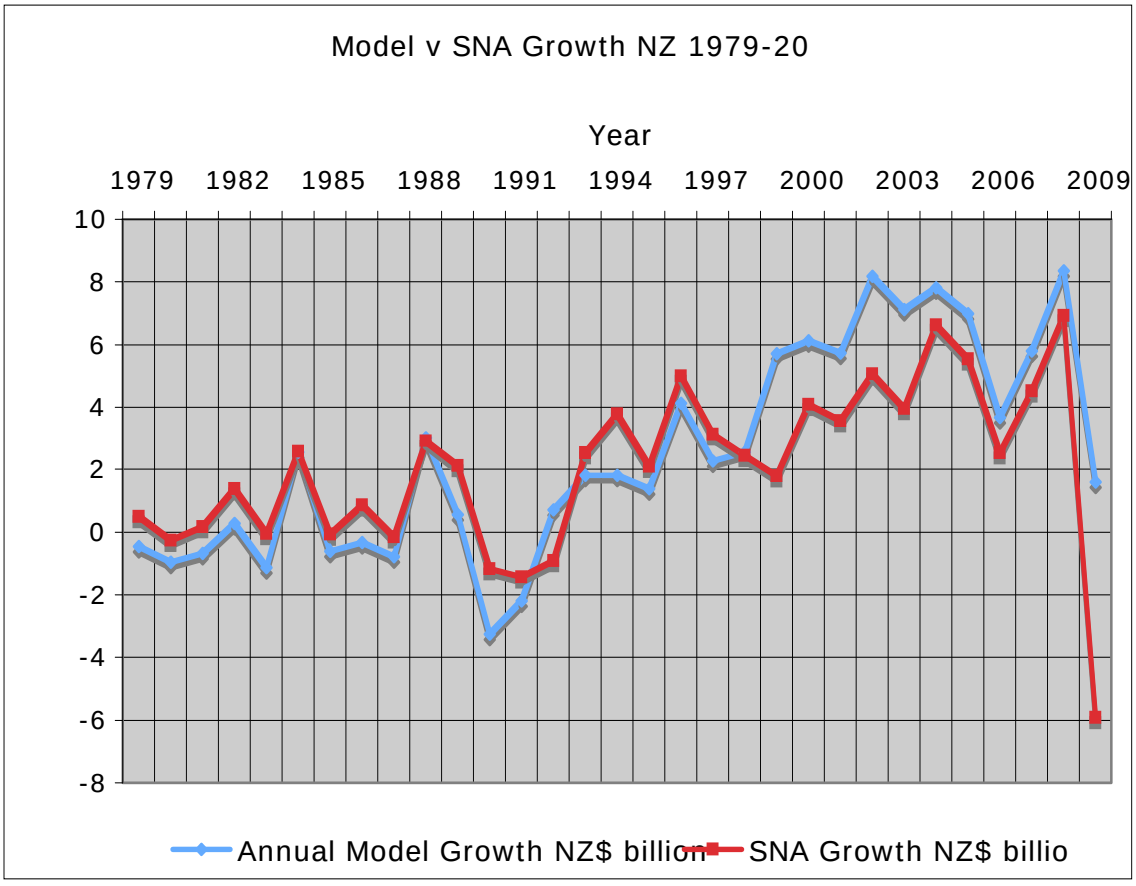


*Preliminary data only; March years: to show how the model works in practice. The chart applies only to PQ(d) the GDP produced by debt (see equation 16): it does not include GDP created through the use of cash whose significance declined throughout the period and which, by 2009, was negligible. The banking sector seized up in 1989 and 1993 much as it did in 2008-2009.

As long as private interest-bearing debt continues to fund economic activity, it is fundamental that the total debt dMd/dt continue to expand, no matter what else is happening in the economy. In the midst of a major economic downturn in New Zealand in 2008-2009 the total debt still increased by more than NZ$32 billion, or almost 8%!

Figure 7 shows the model growth from Figure 6 plotted against the measured SNA growth from 1979-2009. While Figure 7, like Figure 6, is only preliminary, the model pattern follows the SNA growth trend very well except for 1999[28]. The model growth figures tend, on the whole, to be lower than the SNA growth figures because they arise from the use of debt only. They do not include growth arising from cash transactions during the period prior to the rapid expansion of EFTPOS beginning in the March 1999 year.

FIGURE 7: MODEL GROWTH COMPARED WITH SNA GROWTH IN THE NEW ZEALAND ECONOMY 1979-2009[29]



[28] Some correspondence is probably to be expected because the model is calibrated on an overall "best fit" basis (see Table 1) to take into account the impact of cash transactions and changes in banking practice.

[29] From the debt model (Figure5) growth is defined as Md less the financial system costs (Ms+inflation) less speculative investment Mv.

THE GENERAL RESTATEMENT OF THE FISHER EQUATION OF EXCHANGE

A general economic model aligned to the original Fisher equation of exchange is

$$PQ = (Md-(Ms+Mv))Vp+ MoVo +EoVeo \qquad (17)$$

Where PQ is the GDP,

Md,Ms,Vp,Mv are as described elsewhere in this paper, (for example equation (9)):

Md is the total debt,

Ms is the debt representing unearned income on deposits,

Mv is the debt borrowed for speculative investment rather than production

Vp is the speed of circulation of Mp (Md-(Ms+Mv)),

Mo is the circulating currency contributing to output,

Vo is the speed of circulation of Mo,

Eo is circulating electronic debt-free currency,

Veo is the speed of circulation of Eo (and must be equal to Vcd).

This general revision of the original Fisher equation of exchange allows the model to apply to countries that are not yet cash-free, and countries where debt-free electronic cash or E-Notes are introduced to replace bank debt.

INFLATION

The debt model proposed in this paper offers radical new insights into the nature and causes of inflation.

The revised differential form of the Fisher relationship:

$$dMd/dt = d/dt\,(Ddc+Dca-R) = d/dt[PQ(d)/Vp + (Ms+Mv)] \qquad (16)$$

includes dMs/dt, the structural increase of unearned income in the debt system. Conceptually dMs/dt is borrowed into existence through each production cycle and is passed by way of interest on the total debt Md through the economy to deposit holders. Ms is unproductive and represents a structural cost of the debt system. As long as dMs/dt remains the same over time the same amount of new deposit interest is being passed through the productive system each cycle. At any point in time, the amount dMs/dt is

already included in the price structure PQ. However, should dMs/dt change over time the amount included in the price structure PQ must also change. The change over time of dMs/dt is called the second derivative of Ms. The second derivative of Ms[30] represents *systemic inflation* in the productive sector resulting from the debt system because it must be reflected in prices unless producers accept ever lower margins. Systemic inflation is inherent in any rise in total debt Md unless the impact of falling interest rates offsets the impact of rising debt.

Inflation in the debt system can be divided into three components:
(a) The structural *systemic inflation* d^2Ms/dt^2, the second derivative of Ms, representing the changes in dMs/dt^2 over time, and
(b) "*PQ*" inflation representing the price-quantity "swap", effectively the supply/demand curve of basic economics. PQ inflation happens when prices rise and the quantity consumed decreases more or less proportionately. Typical recent examples in New Zealand include the rapid increases in dairy and petrol prices during the March 2009 year.
(c) Non-systemic price changes to increase or maintain margins or profit, such as, for example, to offset wage and salary increases, tax adjustments and other compliance costs.

PQ inflation does not change the nominal GDP although it does change the relationship between inflation and growth within the nominal GDP. Non-systemic price changes are, like systemic inflation, inflationary. Aggregate price changes have their counterpart on the income side in increased wages and salaries, establishing a feedback loop as production costs then continue to increase[31].

Since Ms, dMs/dt and d^2Ms/dt^2 are readily available from Table 1, a first approximation for systemic inflation in New Zealand can easily be plotted against SNA inflation measured by the consumer price index (CPI). This is shown in Figure 8 (p.28) for the period1989-2009.

The plotted systemic inflation d^2Ms/dt^2 figures should always be less than the CPI figures because they do not include:
(i) "PQ" inflation
(ii) The inflation contribution from increases in the amount of cash in circulation and used to generate nominal GDP.
(iii) Other non-systemic price changes to increase or maintain margins or profits.

The contribution from (ii) is weighted towards the earlier end of the graph in Figure 8 because Ms was much smaller then and more cash was being used. In New Zealand, in recent years much inflation much of the time has been systemic, 2009 being a notable exception. "PQ" and non-systemic inflation seem to be concentrated towards recession troughs when systemic inflation is low. That is thought to be due in part to businesses

[30] The rate of change of dMs/dt. It is expressed mathematically as d^2Ms/dt^2

[31] In New Zealand there is a positive relationship between CPI inflation, and the total hours worked x the change in the average hourly income obtained from quarterly household work force surveys.

reflecting real or anticipated wage and salary increases instead of passing on the benefit of reduced interest rates in prices.

The introduction of the concept of *systemic inflation* leads to a truly radical conclusion;

Raising interest rates in a cash-free interest-bearing debt-based economy increases systemic CPI inflation instead of reducing it.

The effect of increasing interest rates is to starve the productive economy of productive debt as more of the total debt Md is shifted to Ms, while, at the same time, the demand for new debt is constrained by the higher interest rates. Under orthodox economic management, systemic inflation falls *after* interest rates begin to fall, that is, after the productive economy has already been slowed or forced into recession by high interest rates[32]. The rising systemic inflation is masked, as interest rates are increased, by discounting inventory and by lower business profitability. To reduce CPI inflation figures when interest rates are rising, non-systemic inflation must fall faster than systemic inflation rises, driving the economy into recession.

Since wage and salary increases often occur in response to price increases they have to be substantially absorbed by productivity gains or reduced business margins whenever systemic inflation is similar to measured CPI inflation, as has been the case during much of the period shown on Figure 8. This raises the possibility that aggregate productivity gains in the economy could be larger than is generally acknowledged.

GROWTH AND TRADE

In the revised Fisher equation (16):

$$dMd/dt = d/dt\,(Ddc+Dca-R) = d/dt[PQ(d)/Vp + (Ms+Mv)]$$

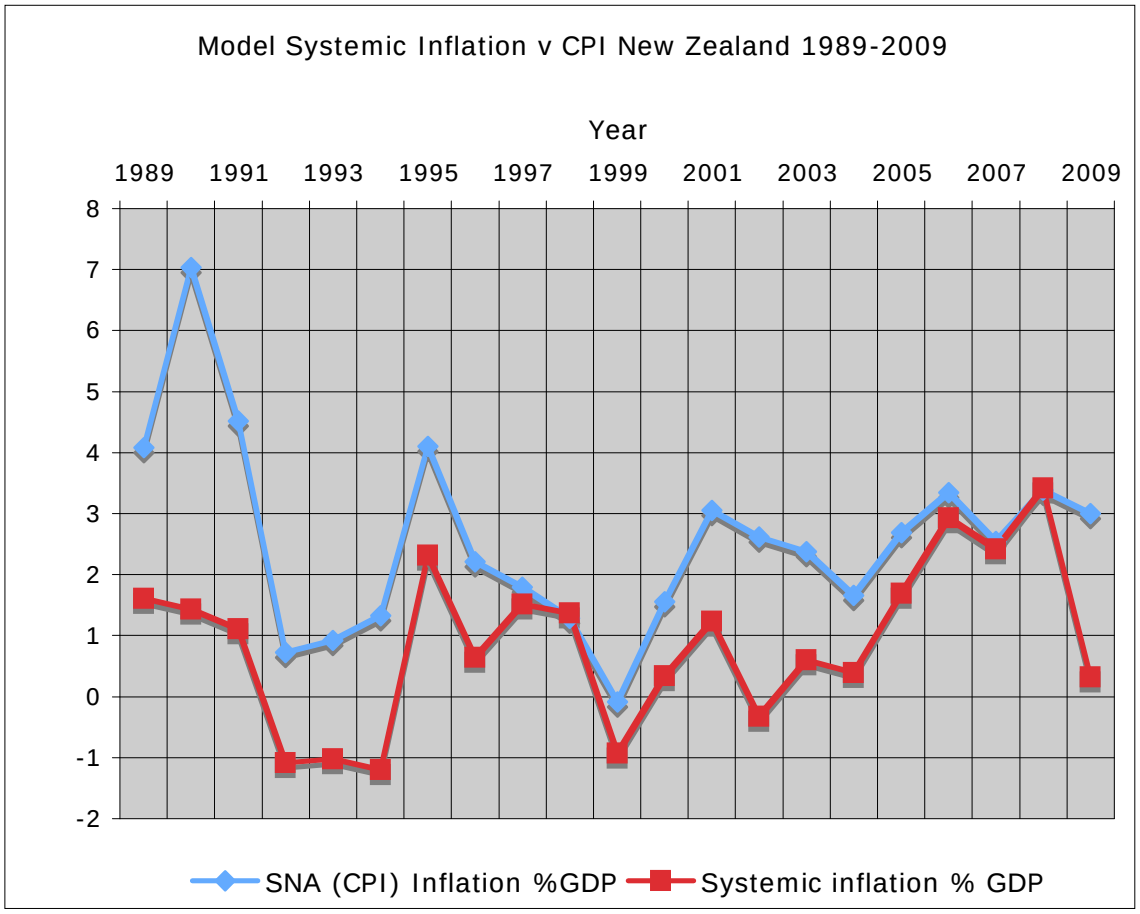
for the change in GDP, PQ(d), to remain the same through a given period, assuming the other variables R, Ms and Mv remain the same, Ddc and Dca are interchangeable. If New Zealand had not "sold off the family silver" in the 1980's and early 1990's[33], other things being equal, Domestic Credit in New Zealand would be about NZ$100 billion higher than it was in March 2009 and the accumulated current account deficit Dca about $100b lower. As a matter of public policy, New Zealand chose, in effect, to replace domestic debt with foreign debt[34].

[32] Neglecting the minor impact of reduced new debt formation

[33] Sale of public banks utilities and corporations and deregulation of the financial sector

[34] The intent was "economic efficiency", forcing NZ to compete directly with Asian production costs and low living standards, the so-called 'race to the bottom" that few, if any, other countries chose to follow. The accumulated current account growth is fundamentally unsustainable and will have to be progressively domesticated if New Zealand is not to become another Iceland.

FIGURE 8: MODEL SYSTEMIC INFLATION V CPI INFLATION NEW ZEALAND 1989-2009



GDP growth in New Zealand in recent decades has been something akin to a mirage because it has been imported. Figure 9 shows the change in the accumulated current account deficit plotted against ***nominal*** GDP from 1988-2009. All the nominal GDP growth including inflation has been borrowed every year for the past 20 years or more.

In terms of the revised Fisher equations (10) and Figure 5, economic growth in a cash-free debt-based economy is defined as:

Growth = Total debt Md – Unearned income Ms- Speculative Investment Mv - Inflation

More importantly, since from equation (13),

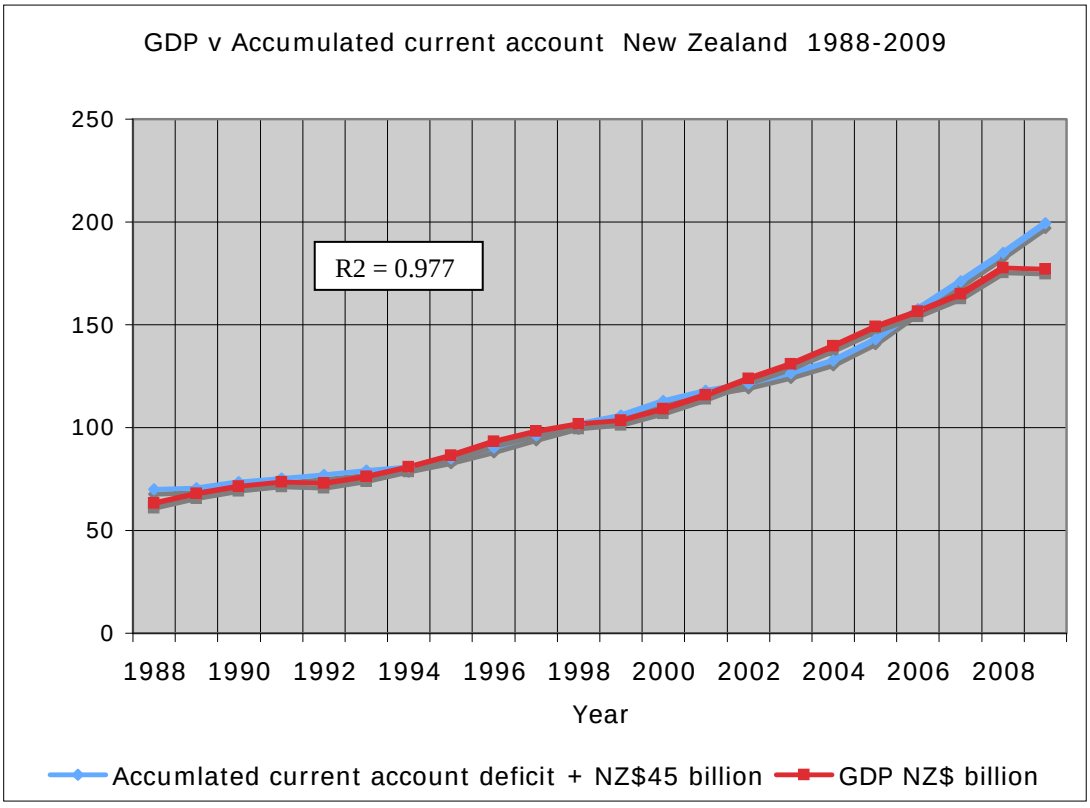
Mcd= (Mp-Dca) = Ddc-(Ms+Mv)-R

Mcd would be up to NZ$100 billion dollars higher than it is.

The accumulated current account deficit Dca is the underlying source of New Zealand's lack of savings.

Had Dca not accumulated the way it has, there would be no savings problem in New Zealand even if some of the extra NZ$ 100 billion had been used to retire domestic debt[35]. Any such debt retirement would have meant the total debt Md and the circulating debt Mcd would each have been reduced by the same amount. While this would have reduced the GDP[36], new domestic lending would probably have offset any domestic debt retirement.

FIGURE 9: INCREASE IN GDP v INCREASE IN ACCUMULATED CURRENT ACCOUNT NEW ZEALAND 1988-2009



Greater savings Mcd would have been likely to stimulate more productive investment, expanding the productive economy. The country's "wealth" would be NZ$100 billion greater than it is because the deposits corresponding to the additional debt Ddc would be held in New Zealand instead of offshore. As things stand, New Zealand is substantially locked into a foreign debt spiral. The imperative to service foreign debt, the long-term price of foreign ownership of the country's business and banking, has left it vulnerable to

[35] Some of it undoubtedly would have been used to reduce debt

[36] Assuming d(Ms+Mv)/dt in equation 16 remains constant.

the demands of foreign lenders. Consequently, New Zealand has effectively lost control of its monetary policy. The debt model shows the accumulated current account deficit is unlikely to be effectively addressed by "export led" growth because the problem is not primarily about trade but about the underlying mechanisms of the debt system itself.

The debt model described in this paper discloses the importance of the current account being balanced. In practice, the revised Fisher equations show New Zealand has a substantial savings problem because it has used the savings of other countries instead of generating its own savings. One of the few practical ways out of the present predicament would be to reduce the current account deficit by imposing an automatically collected variable foreign exchange surcharge whenever New Zealand dollars are exchanged for other currencies. To ensure the process is fiscally as well as GDP neutral, the proceeds from the surcharge would need to be used to offset domestic taxation[37].

On the face of it, Japan faces the opposite problem. It has persistently lent its savings to the rest of the world through its vast current account surplus. To maintain production and induce growth the Japanese Government has had to inject about a trillion US dollars into the Japanese economy in recent years. The debt model described in this paper demonstrates conclusively, for the first time, why Japan's economy stagnated for so long through the 1990's and why the injection of new debt was needed.

Applying the revised Fisher equation (16) to Japan:

$dMd/dt = d/dt\ (Ddc+Dca-R) = d/dt[PQ(d)/Vp + (Ms+Mv)]$

there have been no bubbles since 1990, so dMv/dt is effectively zero. Deposit rates have also been practically zero so dMs/dt is also close to zero. R is very small compared with Ddc and Dca and Vp is 1, leaving, as a first approximation:

$dPQ(d)/dt\ [Japan] = d/dt(Ddc+Dca)\ [Japan].$

Table 2 (p.31) gives the key current account data for Japan in recent years[38]. The Japanese have had to replace negative Dca of about US $914 billion with new Ddc of about US$ 1 trillion to maintain the country's GDP and modest growth[39]. Table 2 shows that the injection of domestic credit was roughly twice the entire nominal GDP growth over the same period. The Japanese economy stagnated because it was starved of productive debt, forcing the government to inject roughly US$ 1 trillion to offset the "loss" of US$914 billion through the current account[40].

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[37] Further information on this concept will be available in a forthcoming paper by the author.

[38] The data is sourced from World Economic Outlook country reports (Japan), published by the International Monetary Fund (IMF).

[39] The current account deficit is expressed in US$ so the change in GDP is also expressed in US$ to limit skew introduced by exchange rate conversion yen/US$

[40] Richard Werner (see reading list at the end of this paper) perhaps gets closest of current academics in applying Fisher: "The cause of Japan's recession has been the reduction in credit creation that began in 1992"

TABLE 2: CURRENT ACCOUNT DEFICIT JAPAN 2004-2008

	2004	2005	2006	2007	2008	Total
Current account deficit US$b	-172	-166	-170	-213	-193	-914
Nominal GDP change %	2.7	1.9	2.4	2.1	1.4	
CPI%	0	-0.3	0.3	0	0.6	
Growth%	2.7	2.2	2.1	2.1	0.8	
Nominal GDP change US$b	114	100	96	92	35	437

The Japanese US$ current account surpluses could theoretically have been sold for Yen. Doing so would have substantially increased the Yen/US$ exchange rate making Japanese products more expensive. The Japanese decision not to allow the orthodox exchange rate mechanism to work to "self correct" the current account deficit was a public policy decision[41].

The revised Fisher equations presented in this paper demonstrate how inappropriate the present world financial architecture is. Current account imbalances and their associated capital flows cause economic dislocation in the case of surplus as well as deficit. The message from this work is that free trade could be fine as long as current accounts remain balanced. Existing large imbalances are causing major disruption throughout the world economy. The unilateral use of a mechanism like the foreign exchange surcharge referred to above could be seen as an interim measure pending the introduction of a mutually agreed international mechanism to maintain neutral current account balances[42].

SAVINGS

In the revised Fisher equations (9) and (16) traditional "savings" stand outside the accumulated unearned income Ms and speculative investment Mv. They represent earned income that is not spent and are included in the "circulating debt" for domestic production Mcd shown in Figure 3[43]. They form part of Mp, the debt used for production, rather like the money supply M of hundreds of years ago referred to in the original Fisher equation (1) MV=PQ.

While traditional savings from earned income form part of the debt for production Mp, they are still deposits in the banking system like all other deposits. The unearned income on them is also derived from debt so it forms part of the investment sector Ms.

Superficially, the speed of circulation Vcd of the circulating debt Mcd, assuming Mcd is equivalent to M in the original Fisher equation MV=PQ (1), is still of the same order as V is thought to have been about 700 years ago. It seems at first glance, that human hoarding behaviour may not have changed substantially over time. That is not necessarily so because the mechanics of the debt system have produced immense changes in banking

[41] For many years joint US-Japan policy was to hold the Yen/US$ exchange rate within a narrow range.

[42] Along the lines, for example, of that proposed by J.M.Keyenes at Bretton Woods in 1944. Consideration of the theory of comparative advantage needs to be broadened to include current account imbalances.

[43] Remembering that in New Zealand, Mcd also includes actual transaction account balances of around NZ$20 billion as of January 2009. [Source: rbnz statistics Table C3]

and accounting through the centuries. In the modern debt system in New Zealand, Vcd would be 1 were it not for the accumulated current account deficit Dca. The speed of circulation Vcd has become entirely structural and will remain so as long as the financial system remains wholly dependent on debt.

The level of earned savings Mcd is defined primarily by the debt system mechanics rather than by individual savers.

That's why, from equation (13), Mcd= (Mp-Dca) = Ddc-(Ms+Mv)-R, the savings level in Japan is so high. The accumulated current account *deficit* is hugely negative because Japan has such a massive current account surplus. That dramatically increases Mcd and hence earned savings, especially where changes in Ms and Mv are moderate or absent.

Encouraging wage and salary earners to "save" means increasing the circulating debt Mcd[44]. The speed of circulation Vcd of Mcd is an excellent measure of *domestic* saving or hoarding[45]. The lower the speed of circulation Vcd the more domestic saving there is.

The decline in domestic household saving has long been a concern in countries like New Zealand. The increase in the speed of circulation of circulating debt Mcd in Figure 4 shows the *domestic* savings rate has been declining for decades. This is thought to be due partly to changes in the payments system through the study period, first by the introduction of computer technology, and more lately, by the introduction of instant transaction settlement through ESAS (the Exchange Settlement Account System)[46]; but it is predominantly due to the unsustainable growth of the accumulated current account deficit which has replaced domestic savings with foreign savings.

There should be widespread concern that *domestic* hoarded savings can no longer be used for productive investment as much as they used to be[47]. In the present debt system, debt typically borrowed for productive investment migrates to savings accounts once spent. Apparently, new debt precedes more savings in the production cycle. More hoarding requires either higher net incomes or a lower standard of living, both of which have considerable policy implications; but in New Zealand, above all, it depends on managing the country's accumulated current account deficit so domestic savings can be increased as a proportion of GDP.

In economic downturns many households prefer to reduce debt rather than hold savings deposits. Holding debt costs more than is "earned", after tax, from the interest on deposits. Such debt retirement (repayment) reduces the total debt Md as well as the debt

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[44] One way to do this would be to domesticate or retire the accumulated current account deficit.

[45] Alternatively, (Mcd – cheque transaction balances) could also possibly be used.

[46] Unpublished work by the author hints that the original Fisher speed of circulation V may have fallen from the mid 19th century to the mid 20th century as a result of the rapid expansion of banking and bank debt through the industrial period before recovering after World War II with bank automation and deregulation.

[47] As of March 2009 Mcd had fallen to about 15% of GDP and earned savings excluding transaction account balances to just 5% of GDP (Mcd NZ$28b less cheque transaction accounts NZ$20b) .

for production Mp and the circulating debt Mcd. That means it also decreases the nation's gross domestic product, GDP. In the absence of tax or other incentives to encourage traditional savings there is an inherent conflict between the national interest of increased productive output, GDP, and the interests of households still holding debt. Avoiding increases in the debt supporting the unearned income Ms by removing interest on deposits would help restore economic growth but it would also tend to further reduce the incentive to save. Just about everyone would choose to repay his debt unless the interest rates on bank loans are held below 2-3%. This would produce tension between traditional savings and the payment of interest on deposits as well as between savings and debt. Perhaps the only way to resolve the tension between savings on the one hand and debt repayment and interest rates on the other hand may be to restrain or remove the interest-bearing debt system itself. This is a powerful argument in support of reserving to the government and people of New Zealand the issue of new debt. Public issue of money and debt can ensure inflation is maintained at very low levels so savings retain their full value over time even when the interest rate is very low.

Since some sectors in the community presently rely quite heavily on unearned income, government issue of new debt at very low or zero deposit interest could be accompanied by compensatory tax changes, such as making a first tranche of income free from income tax.

CONCLUDING REMARKS

1. Debt modelling can be used to provide insights into the mechanics of the traditional interest-bearing debt-based financial system.

2. The economy can be represented by a debt model derived from the Fisher equation of exchange (Mv=PQ) .

3. The general form of the debt model is:

$$PQ = (Md-(Ms+Mv))Vp+ MoVo +EoVeo \qquad (17)$$

Where PQ is the GDP, Md is the total debt, Ms is the debt representing unearned income on deposits, Mv is the debt borrowed for speculative investment rather than production, Vp is the speed of circulation of Mp (Md-Ms), Mo is the circulating currency contributing to output, Vo is the speed of circulation of Mo, Eo is circulating electronic debt-free currency, Veo is the speed of circulation of Eo (and must be equal to Vcd).

This general revision of the original Fisher equation of exchange allows the model to apply to countries that are not yet cash-free, and countries where debt-free electronic cash or E-Notes are introduced to replace bank debt.

4. A recession occurs when the change in total debt over time is less than what is needed to service the financial system costs, being the unearned interest that has to be paid to the investment sector Ms plus inflation, plus speculative investment Mv.

(dMd/dt < d/dt(Ms+Mv+Inflation) A depression occurs when the growth of the total debt Md falls below what is needed to provide for all the increase in the investment sector Ms in addition to Mv. (dMd/dt<d/dt(Ms+Mv)

5. When interest rates fall, the rate of increase of the total debt Md tends to rise because borrowing becomes more affordable. In that case, in the revised Fisher equation, both the productive sector debt Mp and the growth of nominal GDP, (PQ) are likely to rise.

6. The speed of circulation Vp of the productive debt Mp in the revised Fisher equation is 1.

7. Once the bubble variable Mv is eliminated, nominal GDP growth is immediately available by solving the modified Fisher equation of exchange over any desired time span.

8. The investment sector debt Ms, in the revised forms of the Fisher equation (9,17), is generated solely by deposit interest (unearned income) on the total debt Md.

9. A new measure of the debt system liquidity, the circulating debt Mcd, is provided as a sensitive indicator of the financial health of the domestic economy.

10. The debt model introduces the concept of "systemic" inflation as a structural component of the debt system that increases when interest rates rise and is a major component of CPI inflation.

11. The level of domestic earned savings in New Zealand has been largely determined by the current account deficit.

12 Western world economies have become almost entirely dependent on "good" debt management. Unfortunately, there has been no effective debt management for decades. That is why economic policy has failed to prevent the boom and bust cycles in the modern economy. This paper demonstrates why that has happened and how such cycles can be avoided in future.

CLOSING

The Bank for International Settlements recently wrote of the current turmoil in the world's financial centres: " A powerful interaction between financial market innovation, lax internal and external governance and easy global monetary conditions over many years has led us to today's predicament"[48]

That is only part of the story. The financial system itself is structured to not only allow, but to encourage those human and institutional failings to which the BIS properly refers.

[48] BIS 78th Annual Report p 137

Those failings are largely driven by self-interest and greed that are part of human nature. Since human nature is unlikely to change, the world financial architecture needs to be remodelled to keep sticky human fingers out of the global money pot.

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Brief Selected Background Reading List[49].

Ashton, T.S Ed, "An Economic History of England" Methuan, London, 1955-1961

Bank for International Settlements, 78th Annual report, especially Sections V1,V11, & V111

Clapham, Sir John, "The Bank of England: A History", 1944; 1958 Edition 2 Volumes, Cambridge University Press.

Collins Shaun, Thorp Clive and White Bruce "Defining money and credit aggregates: theory meets practice " Reserve Bank of New Zealand Bulletin Vol. 62 No 2

Cosgrove Michael and Marsh Daniel, "Why the Quantity of Money Still Matters" Journal of Business and Economics Research, Vol 3 No 2, February 2005

Crowder, William J "International Evidence on the Fisher Equation" University of Texas, Arlington, Nov 24 2003.

Federal Reserve Bank of Chicago, Public Information Centre "Modern Money Mechanics" [Internet document apparently last revised February 1994]

Fisher, Irving "Elementary Principles of Economics", 1911

Fisher, Irving " The Purchasing Power of Money", 1911

Fisher, Irving "Booms and Depressions" 1932

Fisher, Irving "The Debt-Deflation Theory of Great Depressions" Econometrica, 1933

[49] This paper is believed to represent new thinking except for the original Fisher equation of exchange. Much material was obtained from official websites (www.stats.govt.nz, www.rbnz.govt.nz, www.bis.org, www.worldbank.org, and official New Zealand Year Books. The presence of the works in the background reading list in no way presupposes support by the author of the material they contain.

Friedman Milton & Schwartz Anna “A Monetary History of the United States, 1867-1960”, Princeton University Press, 1963

Friedman Ed, “The Quantity Theory of Money”, Vol 4, 1987 University of Chicago Press

Keynes, JM “A Tract on Monetary Reform” London, 1928

Keynes, JM “The General Theory of Employment Interest and Money” London, 1936

Mayhew, Nicholas, “Population, Money Supply and the Velocity of Circulation in England, 1300-1700” Economic History Review” 48:2 May 1995, pp 238-257

Trevelyan, G.M “English Social History”, Longmans, 1944

Von Mises, Ludwig, “The Theory of Money and Credit”, 1912

Werner, Richard A, “Why Has Fiscal Policy Disappointed in Japan? -Revisiting the Pre-Keynesian View on the Effectiveness of Fiscal Policy”, Sophia University of Tokyo and University of Southampon, UK January, 2004.

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