

## Minsky, Fisher and the credit crisis

HANS VISSER<sup>1</sup>

### 1 ♦ Introduction

The credit crisis has catapulted Hyman Minsky from relative obscurity into the limelight, be it posthumously. The crisis has been called a *Minsky-moment*. The term seems to have been coined by a bond fund manager, Paul McCulley, when the 1998 debt crisis had broken out in Russia. It gained currency when a staff member of the Swiss bank UBS, George Magnus, published a research paper in 2007 titled 'The Credit Cycle and Liquidity: Have We Arrived at a Minsky Moment?' (Whalen, 2008, p. 249) which was immediately followed by an article on the front page of *Wall Street Journal*, titled 'In Time of Tumult, Obscure Economist Gains Currency' (Whalen, 2007, pp. 8, 17).] In this article, I will explain Minsky's theory and its roots in Irving Fisher's 1933 *Econometrica* article in which he set out his debt and deflation theory of great depressions (Fisher, 1933). I start with a brief overview of Minsky's life and will wind up with a few comments on the lessons that Minsky teaches us.

---

1. Emeritus Professor of Money and Banking and International Economics, VU University, Amsterdam. This article is the slightly revised text of a guest lecture delivered in the Department of Economics, University of Trento, Italy, on March 15th, 2011.

## 2 ❖ Who was Hyman Minsky?

Hyman Minsky was born in 1919 and died in 1996. He studied at Chicago and Harvard and taught economics at Brown University and the University of California at Berkeley. In 1965 he became a full professor at Washington University, St. Louis and when he retired in 1990 he became associated with the Levy Economics Institute of Bard College in Annandale-on-Hudson, some 90 miles North of New York City, as one of its distinguished scholars (CV Minsky, 2010). The Levy Institute is a meeting place for Post-Keynesians and institutionalists, think of Jan Kregel, Philip Arestis and James Galbraith. Post-Keynesians are an ill-defined set of economists who are critical of mainstream, equilibrium-oriented economics. Many attempts at defining Post-Keynesianism have been made (for a survey see Kerr, 2005). An early attempt at such a definition, or rather description, was made by Eichner and Kregel (1975), summarised by Kerr as follows: 'First was the importance it attached to growth and dynamics, its method being to model the economy in historical time and in disequilibrium. Second was its emphasis on the distribution of income between wages and profits. Third, its subject was a monetised production economy, in which financial institutions were central, money and real wages were independent of each other, and the distinction between discretionary and non-discretionary expenditure was crucial. Fourth was its distinct conception of a microeconomic base which led to a set of mark-up theories of pricing' (Kerr, 2005, p. 476). If people are led by this rather motley list into thinking that Post-Keynesians are a group that does not follow some strictly defined methodology, they are probably right, but one thing is certain: Post-Keynesians are opposed to neoclassical economics, where markets clear and money may cause inflation but does not otherwise ever disrupt things. In other words, they do not think that the timeless Walrasian general equilibrium model provides a useful framework for analysing the real world.

Institutionalism in its turn we can loosely describe as the view that institutions matter, that you cannot study economic processes fruitfully while abstracting from institutions. New institutional economics, as practised by the likes of Oliver Williamson, distinguishes itself from old institutionalism, associated with such people as Thorstein Veblen, J.R. Commons and W.C. Mitchell, by subjecting institutions themselves to economic analysis (Williamson, 2000).

Minsky called himself a financial Keynesian and also considered himself a Post-Keynesian, emphasising the first and third points of Eichner and Kregel's characterisation of Post-Keynesianism, in particular the focus on dynamics and disequilibrium and the

importance of money, the interrelatedness of monetary and real developments in the economy. He further saw himself as an institutionalist because he believed that the functioning of the economy was determined by the shape and the development of its institutions. It is the instability of the economy that took centre stage in his research and his publications (see, e.g., Minsky, 1982b). During his life he was something of a voice crying in the wilderness, not really taken seriously by the mainstream (see the devastating comments by J.S. Flemming, R.W. Goldsmith and J. Melitz in Kindleberger and Laffargue (eds), 1982, on Minsky, 1982b). This may partly have been due not to his views, but to his not very exact, somewhat intuitive reasoning, which used very little mathematical formalisation, and to his verbosity. But his message was not very welcome either. He had little time for general equilibrium theory nor, implicitly, for such popular notions as the Rational Expectations Hypothesis at a time when their adherents ruled the roost in the economics profession (Minsky, 1995). There was one notable exception among the mainstream, however: Charles P. Kindleberger paid homage to him in his widely acclaimed *Manias, Panics, and Crashes; A History of Financial Crises*, where he was bracketed with Irving Fisher (Kindleberger, 1978).

I will now first review Minsky's ideas and then go back to Fisher, because Minsky builds on Fisher.

### 3 ♦ Minsky's endogenous instability theory

Minsky's thesis was that capitalist market economies are characterised by endogenous instability. Instability is endogenous in the sense that the economy will exhibit cyclical behaviour even if no external shocks occur, such as technological breakthroughs, new discoveries of basic materials, natural disasters or wars. He based his theory on the analysis of individual economic units, in particular business firms. He distinguished between three types of such units: hedge-finance units, speculative-finance units and Ponzi-finance units, depending on the time structure of expected gross profits minus payment commitments. We denote anticipated gross profits or quasi-rents, that is after tax-revenues from sales or income from assets less running expenses, by  $AQ_i$ , with subscripts denoting periods. Expected payment commitments from the existing and expected future liability structure are denoted by  $PC_i$ . *Hedge-finance units* are characterised by the fact that expected gross profits exceed expected payment commitments due to debts in every relevant period, or

$$AQ_i > PC_i \text{ for all } i$$

Combining the formulas given in Minsky 1972 (as reprinted in Minsky, 1982a, p. 137) and Minsky, 1982b (p. 21), net worth  $NW$  of the economic unit is the capitalised value of anticipated gross profits minus payment commitments:

$$NW = \sum_{i=1}^n k_i (AQ_i - PC_i) / (1+r)^i$$

where

$r$  = risk-free interest rate for relevant period

$k$  = a correction factor reflecting uncertainty

The distinguishing characteristic of hedge-finance units is that net worth, if it was positive to start with, cannot become negative from a change in interest rates since  $AQ_i > PC_i$  for all  $i$ .

Next we have *speculative-finance units*. For a speculative-finance unit,  $AQ_i < PC_i$  at first, and only for later periods  $AQ_i > PC_i$ . The deficit of expected gross profits over payment commitments is a result of a portion of the principal on debt falling due in the near term. Debt-repayment exceeds the debt-repayment funds that are generated by a unit's assets.

The net worth of speculative-finance units is sensitive to interest rate movements. A rise in interest rates will reduce the positive contribution to net worth of far-away periods more than it reduces the negative contribution of the near term. A rise in interest rates therefore reduces the net worth of speculative-finance units. Solvency, that is, the degree to which debts can be paid off in case of liquidation of the firm, becomes endangered.

Another characteristic is that, whereas hedge-finance units are not heavily dependent on financial markets for their normal functioning, speculative-finance units frequently have to contract new debts and thus are to a high degree dependent on smoothly-functioning financial markets. Speculative-finance units include banks and other financial institutions, treasuries with floating debts, and ordinary business firms that roll over bank debt and commercial paper.

Finally, there is a special kind of speculative-finance unit, the *Ponzi-finance unit*. For Ponzi-finance units gross profits are critically insufficient even to pay interest on outstanding debt, possibly for a long period. As time goes by, Ponzi-finance units have to contract ever more debt, until in the end a concentrated large income stream comes in, which should permit the unit to pay off all debts.

Ponzi-finance is called after Mr. Charles Ponzi, an Italian who had emigrated to the U.S. and was unable to live without swindling people. He attracted deposits by offering depositors a high rate of interest and had to attract ever more deposits in order to fulfil his interest obligations (Minsky, 1977 as reprinted in Minsky, 1982a, p. 70; *Wikipedia* 2009). But not all Ponzi financing is necessarily of a dubious nature. Ponzi finance characterizes any scheme where interest is paid before revenues are generated and therefore is a normal feature of a large part of investment in progress, in particular investments with a long gestation periods. An extreme case is leveraged buy-outs where early-period interest payments are capitalised and added to the principal.

Ponzi-finance units are even more sensitive to interest-rate changes than normal speculative-finance units. A rise in the rate of interest makes the outstanding debt of the unit grow faster (unless it was contracted at a fixed rate of interest) and so does not much to reduce the value of future debt commitments, whilst the present value of the expected receipts in the far future, for instance from the sale of real estate, sharply falls, the more so as those receipts themselves may be inversely related to the rate of interest. All this makes the functioning of Ponzi-finance units even more dependent upon uninterrupted access to financial markets than normal speculative-finance units.

Let us now start from a situation where hedge-finance units dominate in the economy. According to Minsky, it appears profitable in such a situation to contract short-term debt, because such debt is relatively cheap. The lower cost of borrowed funds leads to an increase in the demand for capital assets. The price of capital assets rises and investment demand increases. Increased investment leads to increased profits and higher profits give a further boost to speculative finance. The ratios of debt to income and of debt to liquid assets rise. Hedge-finance units turn into speculative-finance units and more economic units become dependent upon recurrent recourse to financial markets in order to finance their assets. The financial structure becomes fragile instead of robust. A financial system is called fragile when 'modest changes in cash flows, capitalization rates, and payment commitments adversely affect the ability of private units to meet their financial commitments' (Minsky, 1982b, p. 24). A financial system is robust when this is not so. This process is accelerated because, as investment increases, safe projects become scarce and the risk of projects turning sour increases. With increased debt-income and debt-liquid assets ratios, disappointing gross profits or cash flows will make it more difficult for the unit to meet its payment commitments from its normal income sources or its cash balance. Besides, as the demand for credit increases and lending becomes more risky, the rate of interest rises. Higher interest rates increase the cost of

production of investment goods with long gestation periods. At the same time, they lower their demand price.

All economy is now heading for a reversal of the boom. Disappointing profits and higher interest rates make the demand for capital goods fall. Business firms have difficulty selling their goods and a number of speculative and Ponzi units are confronted with the need for *distress selling*, they have to sell off assets in order to meet their payment requirements (Minsky, 1992, p. 13). That puts additional pressure on asset prices. Financial institutions are at least as likely as other business firms to yield to the temptation of contracting large volumes of debt and develop into speculative or even Ponzi units (Minsky, 1992). If asset prices start falling and it becomes more difficult to roll over debt, they will have to shorten their balance sheets, not only by selling assets, but also by cutting back on their lending. This leads to lower spending on consumption and investment, and consequently to lower profit and wage income, contributing to a further increase in the financial fragility of the non-bank sector (Minsky, 1995). The economy is in danger of slipping away into a recession or depression.

After the Second World War, the authorities can be trusted to intervene if the economy falters. They will resort to expansionary fiscal and monetary policies in order to head off a collapse, but this will come at a cost. The interventions by the authorities reduce the fear of a fall in profits and economic units react by not reducing their willingness to debt-finance their assets (Minsky, 1980). In this way, even poorly chosen investment projects are validated, which leads to stagnating labour productivity and inflation. Moreover, in a full-employment economy, wages will rise more than is warranted by productivity growth and quasi-rents will fall (Minsky, 1976, p. 140). The cost, thus, is inflation.

So much for Hyman Minsky for the moment. We now go further back in history. Minsky built, as he himself emphasised, on Keynes and, specifically, on Irving Fisher's debt-deflation theory. What exactly was this debt-deflation theory?

#### 4 ♦ Irving Fisher

In the depth of the Great Depression, Irving Fisher set out his debt-deflation theory in an article in the first volume of *Econometrica* (Fisher, 1933). It should be noted that the debt-deflation theory is a theory of debt and deflation, or debt followed by deflation, and not a theory of debt deflation, as some commentators seem to think. Fisher's article was meant as a

concise rendering of the theory developed in his *Booms and Depressions*, which had appeared in the preceding year. According to Fisher, great depressions typically see large-scale reductions of debt, followed by deflation. Why did large volumes of debt exist? A cyclical upswing starts with optimism and expectations of high profitability, thanks to new inventions and innovations, the rise of new industries, the development of new resources and the opening up of new markets (Fisher, 1933). In other words, what sparks the upswing is Schumpeterian 'neue Kombinationen', new combinations, though Fisher did not mention Schumpeter. After all, Schumpeter's *Theorie der wirtschaftlichen Entwicklung*, published in 1911, only became available in an English translation as *The theory of economic development* in 1934 (Schumpeter, 1969). Credit is amply available and entrepreneurs increase their investment spending, at least partly financed by debt, as expected returns on investments are attractive, given the interest rates. Investors become euphoric and expect to profit from sizeable increases in the price of financial assets. However, as investment spending increases, new investments become more risky. Profits stop rising or start falling and so do asset prices. Entrepreneurs become cagey and postpone investments. Borrowers now have difficulty servicing their debt and see themselves forced to load off assets. Buyers, however, are few and far between and asset prices fall. We see, again, the phenomenon of distress selling.

Borrowers now use the proceeds of the sold assets to amortise debts. This makes the money supply decline. As debt to non-bank creditors is also paid off, the velocity of money may fall as well. Aggregate spending on goods and services decreases. The drop in spending in conjunction with the distress selling affects the net worth of firms. The number of bankruptcies increases, resulting in rising unemployment and a further decline in aggregate production. This is a self-reinforcing process, as expectations get pessimistic. The downward movement is, moreover, reinforced by a reluctance on the part of the banks to provide credit, as they feel the crunch themselves.

To pile on the agony, if prices fall, real debt, that is the nominal debt divided by the price level, may not fall at all. That will put further downward pressure on spending. This is because debtors do their utmost to reduce their debt, but see their efforts fail, in real terms, which forces them to cut spending even more. Creditors, who get richer in real terms if the price level falls, will not increase their spending, as they will correct their increased real wealth for the risk that debtors default.

All we can do, according to Fisher, is to try and prevent the price level falling. If debt is followed by deflation, the economy is in for a protracted period of low spending and high unemployment. If deflation is prevented through government intervention, we still have a depression, but it will be less severe and shorter.

## 5 ♦ Comment

Minsky owes much to Fisher. Minsky, however, goes much more into microeconomic detail and he is more elaborate, though less systematic and less tidy. First, a downturn for Minsky does not depend on absolute falls in the price level, though falls in asset prices are essential features. We may not always see a crisis develop exactly as Fisher described it. Thanks to government and central bank interventions, deflation may be prevented, but even then, as Minsky argued, interest rate hikes may have similar effects (Wolfson, 1996). The banks will increase their rates when debtors default and banks themselves find it difficult to roll over their debt. Further, Minsky is closer to the present, perhaps over-developed, financial sector in focusing on the constant need for the rolling over of debt in speculative units, with an ever stronger and more explicit focus on the fragility of the financial system.

Both Fisher and Minsky have a disconcerting message: the economy, and the financial sector in particular, is a very unstable system, but Minsky's is even more pessimistic than Fisher's. In Fisher's version the cycle starts with an exogenous shock: mainly a wave of innovations. Minsky makes the cycle completely endogenous. Quiet times carry the seed of their own destruction. If the economy is nicely humming along and firms and private persons have low debt levels, people become over-optimistic and increase spending and investment, and get into debt. A Schumpeterian innovation wave might help, but is not essential. We all, or nearly all, suffer from a kind of collective myopia. People delude themselves into thinking that 'This time is different', to quote the title of Carmen Reinhart and Kenneth Rogoff's (2009) authoritative and extremely broad-ranging study of financial crises. The sub-title is 'Eight Centuries of Financial Folly'. It is true that during the run-up to the credit crisis both the BIS and *The Economist* newspaper had been sounding the alarm bell over developments in the real estate sector. Also, the OECD and the Bank of England warned against excessive credit growth. But bankers, politicians and the general public refused to listen. Nouriel Roubini, of New York University, who was quite alarmist, was nicknamed Dr Doom. Such prominent economists as Larry Summers, Ben Bernanke and Eugene Fama, the father of the efficient market hypothesis, found it all blatant nonsense (Kamalodin, 2011, p.13). The renowned late-19th century economist and editor of *The Economist*, Walter Bagehot, remarked in his famous book *Lombard Street* (Bagehot, 1920) that 'Men of business have keen sensations but short memories', but it is not only men of business, it is consumers, politicians and supervisors of the financial system as well that suffer from short memories. Minsky deserves credit for, like Cassandra, sounding the alarm bell when hardly anybody cared to listen.



That over-indebtedness, the culprit in the stories of Fisher and Minsky, is a common phenomenon in the run-up to a financial crisis is corroborated by empirical research. Carmen Reinhart and Victor Reinhart (2010) examined fifteen severe post-World War II financial crises in advanced and emerging economies and three global crises: the 1929-1933 Great Depression, the first oil crisis, of 1973, and the present crisis starting with the 2007 U.S. subprime collapse. Invariably debt of the private sector as a percentage of GDP increased during the decade before the crisis and fell over a period of roughly seven years after the crisis. This does not bode well for the coming five years or so, as debt repayments go hand in hand with low spending, low investments, low growth and modest growth in employment.

Perhaps a financial crisis no longer unfolds exactly as Minsky described it, but that is because circumstances and the institutional setting change all the time, just as Minsky always emphasised. In Minsky's time connectedness between financial institutions and markets had not yet as explosively grown as during the present century and banks were the main providers of credit (Ertürk and Özgür, 2009). This connectedness and the idea that any risks could be shifted to other institutions led to careless lending, or moral hazard, on an hitherto unknown scale. Credit had become much more readily available. Further, if one financial institution gets into hot water, other financial institutions immediately get into trouble as well. Expected future gross profits or cash flows may fall or even tumble, but whether interest rates rise or not is hardly important, it's the sudden unavailability of funding that brings the institutions on their knees. Whether firms were speculative units or Ponzi ones hardly mattered. Minsky thought that rolling on debt would become difficult at the moment cyclical upswings ended, and he remarked that 'Disruption of financing channels, such as occurs when banks fail, can adversely affect speculative financing units', but he did not foresee such a sudden and complete drying up of liquidity as occurred in 2008. Further, neither Fisher nor Minsky, nor anybody else perhaps, was prepared for the mind-boggling sums involved in bailing out financial institutions, which may, for some countries, first of all America, but also Ireland, make the path to economic recovery even more arduous. Bailing out one insurance company, AIG, cost the American taxpayer no less than \$182 billion, or some 10% of Italy's GDP. The Irish government as of early 2010 had spent and committed itself to spend a sum equal to one half of annual GNP on the rescue of the country's banks, with more to come (Kelley, 2010, p. 4).

Even if a crisis no longer exactly follows Minsky's scenario, the message still stands: credit growth and falling capital-asset ratios form an endogenous process, making the system crisis-prone. The message of these stories is, I'm afraid, that we can never trust mar-

kets to look after themselves, least of all financial markets, or, after a shock, to automatically return to some form of equilibrium at a reasonably quick pace. We should not harbour any illusion either, though, that supervision can ever be able to prevent crises erupting again in the future every now and then. The best we can hope for is that their severity can be mitigated.

Another message is that we should take financial factors seriously. This means that we better not base our analysis on the Walrasian general equilibrium system, which always has had trouble incorporating money and has no place for the havoc which a collapse of the credit system may wreak. With a Walrasian auctioneer, there simply is no role for money. Transaction costs are zero and money thus cannot serve to reduce transaction costs (see for a survey Visser, 2002). Introducing transaction costs in a general-equilibrium model is, too say the least, technically challenging and anyhow not very satisfactory. Even such a leading advanced text as *Lectures on Macroeconomics* by Blanchard and Fischer (1990, Chapter 4) resorts to such solutions as including money in the utility function, without specifying what its utility could possibly be, postulating a cash-in-advance condition, without telling us why payments for goods should be made in money in the first place, or make borrowing and lending between generations in an overlapping-generations model dependent on money transfers between the generations, sidestepping the issue of money as a means of transactions and without solving the issue why interest-bearing debt is not preferred over money. Other advanced texts hardly fare any better (see, for instance, Heijdra and van der Ploeg, 2002, Chapter 2). It probably is impossible to base a meaningful macroeconomics on any elegant general-equilibrium microeconomic foundation. Money is simply too messy for that.

## Summary

The credit crisis brought Hyman Minsky's name to the fore. He spent his professional life warning that the financial system has an endogenous tendency to cyclical behaviour, but his warnings were largely neglected. This article traces the roots of Minsky's views in Irving Fisher's debt-deflation theory and contrasts them with the dominant equilibrium view of economics.

## Bibliography

- Bagehot, Walter, 1920, *Lombard Street*, 14<sup>th</sup> edition, London: John Murray.
- Blanchard, Olivier Jean, and Stanley Fischer, 1990, *Lectures on Macroeconomics*, Cambridge, Mass.: MIT Press, 4th printing.
- CV Minsky, 2010, <http://www.bard.edu/library/archive/minsky/>, retrieved June 1, 2010.
- Eichner, Alfred S., and J. A. Kregel (1975), 'An Essay on Post-Keynesian Theory: A New Paradigm in Economics', *Journal of Economic Literature* 13:4, 1293-1314.
- Ertürk, Korkut, and Gökcer Özgür, 2009, 'What is Minsky all about, anyway?', *real-world economics review*, issue no. 50, 8 September, 3-15, <http://www.paecon.net/PAEReview/issue50/ErturkOzgur50.pdf>
- Fisher, Irving, 1933, 'The Debt-Deflation Theory of Great Depressions', *Econometrica* 1:4, 337-357.
- Heijdra, Ben J., and Frederick van der Ploeg, 2002, *The Foundations of Modern Macroeconomics*, Oxford: Oxford University Press.
- Kamalodin, Shahin, 2011, *Asset bubbles, financial crises and the role of human behaviour*, Rabobank Economic Research Department, [www.rabobank.com/kennisbank](http://www.rabobank.com/kennisbank).
- Kelly, Morgan, 2010, *Whatever Happened to Ireland?*, CEPR Discussion Paper no. 7811.
- Kerr, Prue, 2005, 'A history of post-Keynesian economics', *Cambridge Journal of Economics* 29:3, 475-496.
- Kindleberger, Charles P., 1978, *Manias, Panics, and Crashes; A History of Financial Crises*, London: Macmillan.
- Minsky, Hyman P., 1972, 'Financial Instability Revisited: The Economics of Disaster', *Reappraisal of the Federal Reserve Discount Mechanism*, Washington, D.C.: Board of Governors of the Federal Reserve System, reprinted in abridged form in Minsky 1982a.
- Minsky, Hyman P., 1976, *John Maynard Keynes*, London: Macmillan.
- Minsky, Hyman P., 1977, 'The Financial Instability Hypothesis: An Interpretation of Keynes and an Alternative to 'Standard' Theory', *Nebraska Journal of Economics and Business* 16:1, 1977; reprinted in Minsky 1982a.
- Minsky, Hyman P., 1980, 'Finance and Profits: The Changing Nature of American Business Cycles', in *The Business Cycle and Public Policy, 1929-80*, Joint Economic Committee, Congress of the United States, Washington, D.C.: U.S. Government Printing Office, reprinted in Minsky 1982a.

- Minsky, Hyman P., 1982a, *Can "It" Happen Again? Essays on Instability and Finance*, Armonk, N.Y.: M.E. Sharpe.
- Minsky, Hyman P., 1982b, 'The financial-instability hypothesis: capitalist processes and the behavior of the economy', in Charles P. Kindleberger and Jean-Pierre Laffargue (eds), 1982, *Financial Crises; Theory, History, and Policy*, Cambridge: Cambridge University Press.
- Minsky, Hyman P., 1992, *The Capital Development of the Economy and The Structure of Financial Institutions*, Working Paper No. 72, The Jerome Levy Economics Institute of Bard College.
- Minsky, Hyman P., 1995, 'Financial Factors in the Economics of Capitalism', *Journal of Financial Services Research* 9:3/4, 197-208.
- Reinhart, Carmen M., and Vincent R. Reinhart, 2010, *After the Fall*, NBER Working Paper w16334.
- Reinhart, Carmen M., and Kenneth Rogoff, 2009, *This Time Is Different: Eight Centuries of Financial Folly*, Princeton: Princeton University Press.
- Schumpeter, Joseph A., 1969, *The Theory of Economic Development*, Oxford: Oxford University Press. First published in 1934 in the Harvard Economic Studies Series.
- Visser, Hans, 2002, 'Neutrality of Money', in B. Snowden and H.R. Vane, eds, *An Encyclopedia of Macroeconomics*, Cheltenham: Edward Elgar, 526-533.
- Whalen, Ch.J., 2007, *The U.S. Credit Crunch of 2007: A Minsky Moment*, Public Policy Brief No. 92, The Levy Economics Institute of Bard College, on [www.levy.org](http://www.levy.org).
- Whalen, Ch.J., 2008, 'A Minsky Moment: Reflections on Hyman P. Minsky (1919-1996)', *Journal of Economic Issues* 42:1, 249-253.
- Wikipedia, 2009, 'Charles Ponzi', [http://en.wikipedia.org/wiki/Charles\\_Ponzi](http://en.wikipedia.org/wiki/Charles_Ponzi), last revised 5 February 2009.
- Williamson, Oliver E., 2000, 'The New Institutional Economics: Taking Stock, Looking Ahead', *Journal of Economic Literature* 38:3, 595-613.
- Wolfson, Martin H., 1996, 'Irving Fisher's debt-deflation theory: its relevance to current conditions', *Cambridge Journal of Economics* 20:3, 315-333.