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Financial Market Crisis as a Phenomenon of Stock Market Overshooting

A Theoretical Analysis

A theoretical model sets out to explain how, in an interplay between money, equity and goods markets, an overly expansionary monetary policy stance (notably in the USA) fuelled stock market speculation developing a bubble that burst after prices had overshoot their long-term equilibrium. The subsequent collapse of share prices triggered a recession on the goods. This theoretical explanation of the financial market crisis by means of a three-market-model may also contribute towards a better understanding of the mortgage boom and the following subprime crisis on the US housing market and how this led to a global crisis. Abstracting from the more complex origins of the current financial market and economic crisis, the main focus is set on the influences from the monetary policy side.

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Most international observers (European Commission, IMF, OECD), in their respective short-term forecasts of last autumn, already announced an end to the "Great Recession" (Krugman, 2009). In anticipation of the gradual recovery of the real economy, stock markets bounced back vigorously as from spring 2009. Since the middle of 2007, the financial market crisis that originated in the USA had tightened its grip on the world economy, causing output (real GDP) losses of 4 percent in the EU, 2.5 percent in the USA and 1.2 percent on a global scale (European Commission, 2009C)¹.

The extent of the current financial market and economic crisis is without precedent in post-war history. The crisis nevertheless shares many features with previous recessions that had been triggered by developments on financial markets². Before it broke, there was a long period of strong credit growth, coupled with low risk premia, abundant liquidity, speculation with high leverage, swiftly rising financial asset prices and the build-up of bubbles in the real estate sector, particularly in the USA. With high-leverage speculation spreading, financial market institutions became highly vulnerable when financial market excesses were to be unwound. In the end it only took a reversal in the US housing market boom and rising interest rates in a relatively small part of the financial system (subprime market) to destabilise the entire financial

Causes of the world-wide financial market and economic crisis

¹ The dimension of the crisis had not been foreseen by the major international institutions (European Commission, IMF, OECD), as the growth forecasts for the euro area differed from the actual outcome by 4 to 6 percentage points (European Commission, 2009C, p. 8). It was only in early 2009 that the fall of economic activity into a deep recession became adequately reflected in the forecasts. In particular the collapse of Lehman Brothers on 15 September 2008 and the ensuing loss of trust between banks led to the spreading of the real estate, banking and financial market crisis from the USA to financial markets and real economies worldwide; the accompanying slump in global trade hit most severely Europe and Asia, but much less Latin America.

² A comprehensive investigation into common traits and differences between past financial market and economic crises is offered by Reinhart – Rogoff (2009).

market architecture. Such events were observed already in the past (e.g., in Japan, Finland and Sweden in the early 1990s or the "Asian crisis" in the late 1990s). However, the current crisis is of world-wide dimension and shows many similarities with the causes and developments of the Great Depression of 1929 (*European Commission, 2009B*).

It is still too early for a final and comprehensive assessment of the causes of the crisis. Yet, there are approaches in the literature trying to understand the phenomenon of global financial market crisis (e.g., *Larosière Report, 2009, European Commission, 2009B, Pisani-Ferry, 2009*; A. Schwartz in "*Neue Zürcher Zeitung*", 2009). On the one hand one may interpret the present "Great Recession" as extraordinary event occurring at the probability of a rare constellation of planets, leading once every fifty or sixty years to the collapse of the financial market and economic system. This, however, does not explain why the system has collapsed exactly at the present time. Undoubtedly, the coincidence of several factors played a role (like it did in the Great Depression)³ for a national crisis (in the USA) to be able to take on a global dimension. *Pisani-Ferry (2009)* distinguishes between micro- and macroeconomic factors and unexplained systemic weaknesses ("black swan"), without attributing relative weights. Among the micro factors is the failure of banks' risk management, lacking financial market supervision, incompetent rating agencies and more generally regulation and even market failure. Among the macro reasons are, i.a., a misguided monetary policy as well as the escalation of current account and thus exchange rate imbalances in a global context. For Anna Schwartz (*Neue Zürcher Zeitung, 2009, p. 13*), the co-author (together with Milton Friedman, 1963) of the standard opus on the "monetary history of the USA", three major events in the USA were decisive:

- Monetary policy in the USA was too expansionary, notably during the period from 2002 to 2005 when interest rates were far below those required by the Taylor rule. This policy made loans cheaper and gave rise to speculation on stock markets.
- The administration under President Clinton exerted strong influence on housing policy and intervened directly in favour of poorer families via the public mortgage institutions Fannie Mae and Freddie Mac. The slump in house prices and a rise in interest rates created the problem of subprime credits, i.e., mortgage loans with low or no collateral.
- The financial sector developed ever more sophisticated products without risk management being entirely sound. Mortgage risks for different products were pooled together and diversified into a large number of Collateral Debt Obligations (CDOs). Such "toxic" financial assets were sold on a global scale. In addition, control of financial markets via supervisory boards and rating agencies appears to have failed world-wide.

The crisis of 2007-2009 started in the USA as mortgage, banking and stock market crisis, spilling over to Europe and Asia after the collapse of Lehman Brothers on 15 September 2008 as a banking and financial market crisis and to Eastern Europe as balance of payments crisis (see *EBRD, 2009*), calling for rescue action by the IMF, the EBRD and the EU. In the euro area, the common currency provided a protective shield insofar as disorderly currency devaluation in the Internal Market could be avoided. The collapse of interbank lending due to loss of confidence in the wake of the bankruptcy of Lehman led to a credit squeeze with negative consequences for the real economy. World trade volumes shrank by one-fifth until the middle of 2009.

³ In economics, there is no generally accepted definition of a depression. *The Economist* (2009, p. 57) suggests two criteria to distinguish a depression from a recession (which, according to the NBER, is characterised by a fall in GDP over two consecutive quarters): a slump in GDP by more than 10 percent overall, or a decline in GDP lasting for more than three years (Harry Truman: "It's a recession when your neighbour loses his job. It's a depression when you lose yours"). *Krugman (2009)* refers to the current economic crisis as "Great Recession", as different from the "Great Depression" of 1929. The term "Great Depression" was coined by *Robbins (1934)*.

On the basis of theoretical considerations, this article focuses mainly on monetary policy as one facet of the macroeconomic causes. Seeking the explanation for the overshooting on stock markets until 2007 mainly in an excessively accommodating monetary policy neglects many other aspects in the bundle of macro- and micro-economic causes for the crisis. The improvement of cross-border regulation and governance for the financial sector is being discussed in the forum of the G-20 for the world economy as a whole, as efforts to this end are being made also at the national level. For the EU, the European Commission has made several proposals for decisions to be taken by the Council (ECOFIN, 2009, European Commission, 2009A).

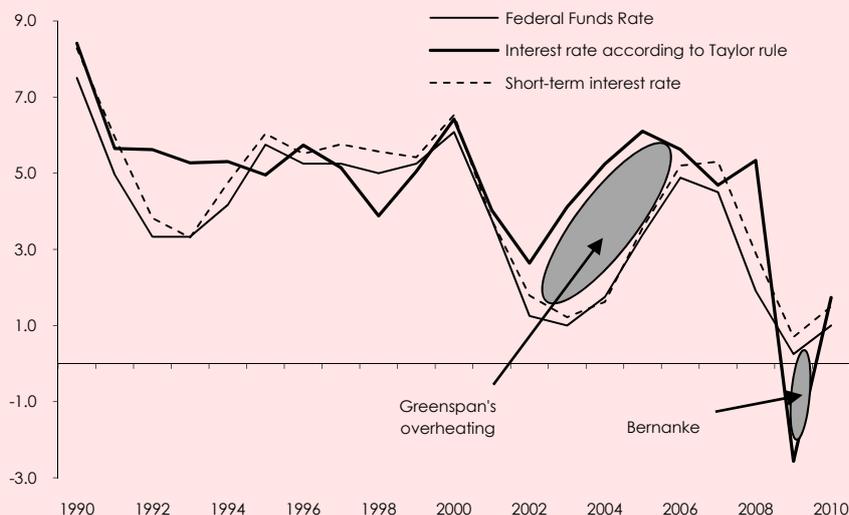
An overly expansionary monetary policy stance adopted by the Federal Reserve System (Fed) under Alan Greenspan over the years from 2002 to 2005 has evidently led to cyclical overheating in the USA. In particular, the low level of interest rates led to a price bubble on real estate markets which, coupled with the extension of poorly asset-backed credits (subprime credits) and the development of sophisticated financial products, set speculation on financial markets in motion (Larosière Report, 2009, p. 7). Taylor (2009) also cited the low-interest-rate policy as major cause of the financial market crisis. The Federal Funds Rate and short-term interest rates in the USA between 2002 and 2005 were indeed far below the respective levels predicted by the Taylor rule. For the recession year 2009, the latter would even produce negative values (Figure 1).

Such monetary stimulus led to overheating (overshooting) of stock markets. Like all speculative bubbles, such a phase never lasts for long. As soon as monetary policy turns more restrictive and expectations of price hikes are disappointed, the bubble bursts and stock market values adjust to their long-term equilibrium.

Stock market overshooting driven by overly expansionary monetary policy

Figure 1: Business cycle overheating induced by the Fed under Alan Greenspan

In percent



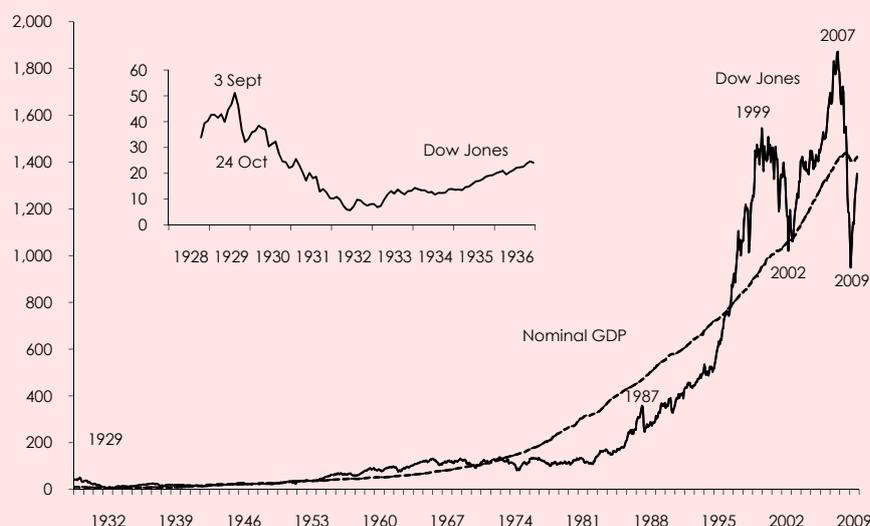
Source: European Commission, OECD, Federal Reserve Bank of New York. Calculation of interest rate i according to Taylor rule: $i = 2.0 + p + 0.5(p - 2.7) + 0.5(y - 2.5)$; the target values for the rate of inflation (p) and the growth rate of real GDP (y) are the averages for the period 1990-2010.

According to the General Equilibrium Growth Model developed by von Neumann (1945) as well as the Fisher Equation (Fisher, 1930), share prices converge over the longer term to the growth rates of the real economy (long-term equilibrium). In the long run, the Dow Jones Index and nominal US GDP actually exhibit similar annual

rates of growth (1970 to 2009 Dow Jones Index and nominal GDP +6.9 percent, 1950 to 2009 Dow Jones Index +6.6 percent, GDP +6.8 percent)⁴.

Figure 2: Dow Jones Industrial Index and nominal GDP in the USA

January 1970 = 100



Source: Bureau of Economic Analysis; Gordon (1986), Dow Jones Index: <http://de.finance.yahoo.com>.

In contrast to the restrictive stance of monetary policy during the "Great Depression", both the Fed and the ECB steered an expansionary course during the current financial market crisis⁵. Interest rates were slashed, in the USA earlier than in the euro area, by 5 percentage points (USA) and 3¼ percentage points (euro area) respectively. As soon as from September 2007, the Fed started lowering the Federal Funds Rate in several steps, from 5.25 percent to 0 to 0.25 percent in December 2008. The ECB, with a view to the inflation hike at the time, still raised the key refinancing rate in July 2008 by ¼ percentage point to 4.25 percent, turning to stepwise rate cuts only after the bankruptcy of Lehman Brothers in October 2008. Since May 2009, the key intervention rate has been held constant at 1 percent (Figure 3).

Only the massive and early intervention of the major central banks (in particular the Fed and the ECB ensured sustained liquidity and cut interest rates to historical lows), together with the bank rescue operations and fiscal stimulus programmes adopted by most industrialised countries prevented economies from falling into a depression with output losses and unemployment levels of similar dimension as in the Great Depression 1929 to 1933 – "we have gone away with a 'Great Recession' (Krugman, 2009; see also Breuss – Kaniovski – Schratzenstaller, 2009). The "collateral damage" in the form of rising unemployment and extremely high public debt will weigh on the advanced economies for many years going forward. While governments, by rescuing banks via deposit guarantees, underwriting of financial operations and equity capital participation assumed the role of "lender of last resort", not least because

⁴ Between 1929 and 2009, annual average growth of nominal GDP of 6.3 percent was somewhat higher than that of the Dow Jones Index of 4.7 percent. The data base for the period of the Great Depression 1929 to 1933 was probably less than reliable for both series, hence the results may be somewhat distorted.

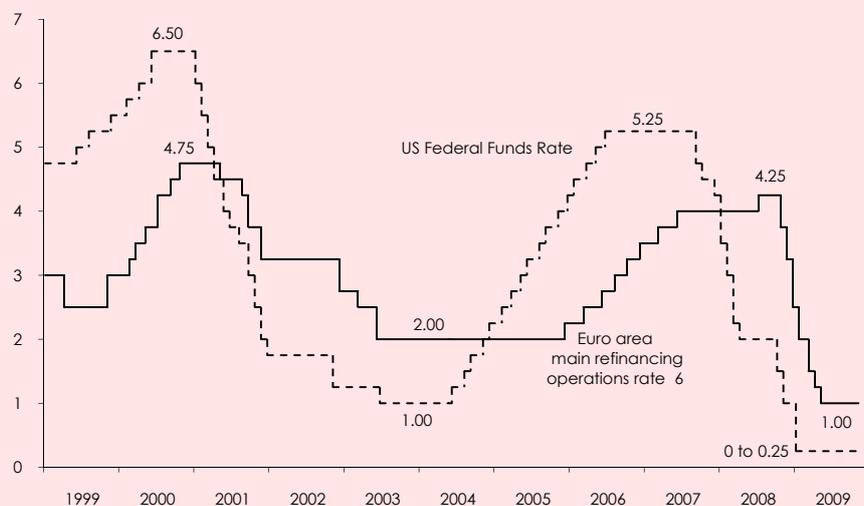
⁵ In this way, the mistakes that according to the Friedman-Schwartz hypothesis (Friedman – Schwartz, 1963) caused the Depression should be avoided. According to the Friedman-Schwartz hypothesis, a more accommodating monetary policy would have been able to mitigate the Depression in 1929 and the following years. This hypothesis has been confirmed by Christiano – Motto – Rostagno (2004) on the basis of DSGE model simulations using alternative Taylor rules for the US economy in the 1920s and 1930s. Bernanke (1983), for his part, emphasises the institutional factors as causes of the Depression. While monetary policy was an important explanatory factor of the crisis of 1930/1933, the major reason had been failures of banks and the whole financial sector, i.e., deficiencies in the quality of financial services.

Lessons from the "Great Depression"

many banks were deemed "too big to fail", they created a dangerous precedence for future crises, accepting "moral hazard" as normal strategy of banks.

Figure 3: Lessons from monetary policy during the "Great Depression" of the 1930s

In percent



Source: ECB, Federal Reserve Board.

As Figure 2 shows, the Dow Jones Industrial Index ratcheted up in several waves until overshooting in 2007, before caving in up to the beginning of 2009. From the early 1970s until the late 1990s, the Index had been below its long-term equilibrium (approximated here by the trend in nominal GDP). On 19 October 1987 ("Black Monday"), the Dow Jones Index precipitated by over 20 percent. In March 2000, the "dot-com bubble" burst. Since it was mainly the share prices of New Economy firms that slumped, this event is almost exclusively reflected in the NASDAQ Index. The collapse of share values (in many instances by over 90 percent) lasted until March 2003. In addition, the shock following the terrorist attack on the World Trade Center in New York in 2001 ("9/11") undermined confidence on US stock markets. Only in 1929 and in 2009, such events took on the dimension of a global financial market and economic crisis. The crises of 1987 and 2002 were confined to the US stock market. In the 1990s, a banking crisis in Japan led to economic stagnation lasting for a whole decade. Asia and Russia suffered a balance of payments crisis in 1997-98. Argentina also faced a balance of payments crisis in 1998. Local crises were the Tequila crisis in Mexico in 1994-95 and the savings-and-loan crises in the USA in the 1980s and early 1990s.

In analogy to developments on foreign exchange markets (*Dornbusch, 1976*), stock market behaviour may be interpreted as overshooting phenomenon. The model of an economy which consists of three markets – money, stocks and goods⁶ – with different speed of adjustment (*Breuss, 2009*) can explain some of the major aspects of the financial market and economic crisis which had its origin in loose monetary policy in the USA that triggered a recession. This model focuses on a monetary interpretation of the crisis, abstracting from other and more complex causes.

The goods market adjusts much less rapidly to price changes than the money market and the stock market. The characteristics of each of the three markets may be summarised as follows (a formal presentation is reproduced in *Breuss, 2009*):

⁶ The empirical "three-market barometer" (i.e., indicators for the stock market, the goods market and the money market) of the Austrian Institute for Business Cycle Research (WIFO), introduced by F.A. von Hayek in Austria along the lines of the Harvard Barometer, predicted relatively well the crisis of the 1930s (*Tichy, 1973*, pp. 61-62).

A model of overshooting

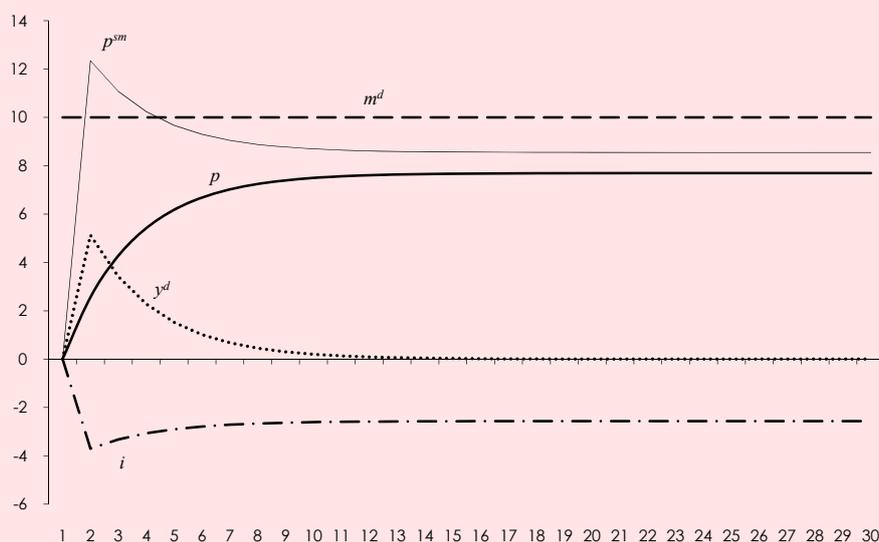
- The *stock market* is connected with the money market insofar as an addition to liquidity (increase in money supply) with accommodating monetary policy pushes interest rates below their long-term level. This imbalance fuels an expansion on stock markets by enabling speculation with cheaply borrowed money. This can lead to stock market overshooting once the speculative bubble bursts. This pattern is reflected in the model by an error correction mechanism and an adjustment parameter.
- The real demand for money (*money market*) depends (negatively) on the interest rate and (positively) on real income, matching in equilibrium the real money supply. By allowing for an error correction mechanism on stock markets, a link is established between the two markets. In addition, a relation may be derived between goods market prices and stock market prices.
- The *goods market* reacts but slowly to disturbances triggered by monetary policy interventions. In the model, it is represented by two equations: one for price changes (Lucas supply equation) and one for aggregate demand. Demand for goods and services (real GDP) is determined by long-run potential output, government expenditure and interest rates (influence of monetary policy; external financing of consumption and, more importantly, of investment). In addition, real share prices (deflated by the prices of goods) enter the model. In this way, the option of investment financing through the issuing of shares (wealth effect) is taken on board and a link between the stock market and the goods market is established. If real exchange rates as a determinant of net exports are neglected (as is done here in a first approach), the original model of Dornbusch is reduced to one for a closed economy.

If the theoretical model for a closed economy (e.g., the USA) is calibrated with plausible parameters (Breuss, 2009), the inter-relations described above can be simulated for 30 periods (Figure 4).

Simulations

Figure 4: Model of stock market overshooting in a closed economy

Deviation from equilibrium solution in percentage points



Source: WIFO. – p^{sm} ... share prices, m^d ... money supply, y^d ... real GDP, i ... interest rate.

An increase of money supply m^d by 10 percent leads to an immediate decline in interest rates i . As predicted by the theoretical model, a boom is initiated on stock markets, i.e., an increase in share prices or stock market values p^{sm} that is stronger than the increase in money supply ("overshooting"). The stock market boom creates the impression on goods markets that real financial wealth has increased, thereby

stimulating domestic demand (investment and consumption). Growth of real GDP y^d exceeds potential growth, i.e., a business cycle upswing is set in motion. The gradual adjustment of goods prices p takes the goods market in the longer run back towards equilibrium, implying a decline in GDP (cyclical downturn). The inherent correction mechanism leads to an adjustment on stock markets: share prices fall until they reach their long-term equilibrium. In the longer run, each of the three markets converges towards its equilibrium.

The erroneous projections of most international institutions in the face of the "Great Recession" 2009 show that economic wisdom (conventional models used) is unable to correctly assess recessions of such dimension. The academic economic community is thus called upon to review the models hypothesising economic agents of largely rational behaviour. Approaches in this regard have been made at a rather early stage, e.g., the theory of cyclical overheating by Hayek (1929), and most recently; thus, De Grauwe (2009) distinguishes between top-down and bottom-up models. The first group includes models used so far (e.g., DSGE models) with agents having perfect information and rational expectations; the second group assumes that economic agents have imperfect information and acquire their economic understanding via a search process (Hayek, 1945).

The model presented here (for details see Breuss, 2009) is also an attempt to better understand the major repercussions of excesses on stock markets (and, by way of generalisation, also on the US housing market) which have led to the crisis on financial markets and in the real economy. The basic model can be expanded in several directions. Thus, the phenomenon of overshooting on stock markets and foreign exchange markets may be represented for an open economy by taking on board the original concept of exchange rate overshooting by Dornbusch. Furthermore, the model may be extended to include the transmission of a financial market crisis between countries, by introducing the transmission channels of external trade or cross-border financial transactions.

Finally, the model is able to demonstrate that an erratic course of monetary policy – expansionary at first and then restrictive – may generate boom-bust cycles in the real economy. Indeed, the extended period of low-interest-rate policy in the USA (since December 2008) may give rise to the next credit-financed speculative boom with a possible subsequent collapse. In addition, the currently observed carry trades⁷ may contribute to the build-up of a "mega bubble" (Roubini, 2009) that may produce a spectacular crash once policy-controlled interest rates in the USA start heading up.

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⁷ Investors incur debt in dollar and invest the money in countries with prospects of high return, such as Australia, New Zealand, South Africa and other emerging markets. They benefit on the one hand from the interest rate differential vis-à-vis the USA, and from the decline in the dollar exchange rate on the other which lowers the debt burden.

Expansions

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Financial Market Crisis as a Phenomenon of Stock Market Overshooting: A Theoretical Analysis – Summary

Inspired by Dornbusch's model of exchange rate overshooting we develop a theory of stock market behaviour. The idea is that stock prices overshoot and undershoot their long-run equilibrium values which are determined by the development in the real economy. The overshooting is triggered primarily by a loose monetary policy. The simple macro model consists of three markets – the money market, the stock market and the goods market – interacting at different speeds of adjustment. The goods market slowly adjusts relative to the money and the stock market. This model can explain some of the major features of the global financial crisis, having its origin in the loose monetary policy in the USA. The three-market model could also help to understand the emergence and consequences of the sub-prime crisis in the US housing market. Due to the globalised financial investment business the US crisis spread across the whole world, especially Europe and Asia.

The model focuses primarily on the monetary interpretation of the present crisis leaving aside the complex interactions of the real estate bubble in the USA and the innovation of new financial instruments, which were sold all over the world in the hope of dispersing the risks involved with it. Nor does this model deal with the institutional aspects of the financial crisis (banks' mistakes, the banking crisis, unregulated financial markets, etc.). These are issues of better international regulation and governance of the financial industry which are dealt with under the auspices of the G 20 at the global level and by the European Commission as well as the Council at the European level.