wiiw

Wiener Institut für Internationale Wirtschaftsvergleiche

The Vienna Institute for International Economic Studies

Working Papers | 65 | May 2010

Amit Bhaduri

A Contribution to the Theory of Financial Fragility and Crisis

wiiw Working Papers published since 2005:

No. 65 A. Bhaduri: A Contribution to the Theory of Financial Fragility and Crisis. May 2010

No. 64 L. Podkaminer: Why Are Goods Cheaper in Rich Countries? Beyond the Balassa-Samuelson Effect. April 2010

No. 63 K. Laski, J. Osiatynski and J. Zieba: The Government Expenditure Multiplier and its Estimates for Poland in 2006-2009. March 2010

No. 62 A. Bhaduri: The Implications of Financial Asset and Housing Markets on Profit- and Wage-led Growth: Some Results in Comparative Statics. February 2010

No. 61 N. Foster and R. Stehrer: Preferential Trade Agreements and the Structure of International Trade. January 2010

No. 60 J. Francois and B. Hoekman: Services Trade and Policy. December 2009

No. 59 C. Lennon: Trade in Services: Cross-Border Trade vs. Commercial Presence. Evidence of Complementarity. November 2009

No. 58 N. Foster and J. Pöschl: The Importance of Labour Mobility for Spillovers across Industries. October 2009

No. 57 J. Crespo-Cuaresma, G. Doppelhofer and M. Feldkircher: The Determinants of Economic Growth in European Regions. September 2009

No. 56 W. Koller and R. Stehrer: Trade Integration, Outsourcing and Employment in Austria: A Decomposition Approach. July 2009

No. 55 U. Schneider and M. Wagner: Catching Growth Determinants with the Adaptive Lasso. June 2009

No. 54 J. Crespo-Cuaresma, N. Foster and R. Stehrer: The Determinants of Regional Economic Growth by Quantile. May 2009

No. 53 C. Lennon: Trade in Services and Trade in Goods: Differences and Complementarities. April 2009

No. 52 J. F. Francois and C. R. Shiells: Dynamic Factor Price Equalization and International Convergence. March 2009

No. 51 P. Esposito and R. Stehrer: Effects of High-Tech Capital, FDI and Outsourcing on Demand for Skills in West and East. March 2009

No. 50 C. Fillat-Castejón, J. F. Francois and J. Wörz: Cross-Border Trade and FDI in Services. February 2009

No. 49 L. Podkaminer: Real Convergence and Inflation: Long-Term Tendency vs. Short-Term Performance. December 2008

No. 48 C. Bellak, M. Leibrecht and R. Stehrer: The Role of Public Policy in Closing Foreign Direct Investment Gaps: An Empirical Analysis. October 2008

No. 47 N. Foster and R. Stehrer: Sectoral Productivity, Density and Agglomeration in the Wider Europe. September 2008

No. 46 A. Iara: Skill Diffusion by Temporary Migration? Returns to Western European Work Experience in Central and East European Countries. July 2008

No. 45 K. Laski: Do Increased Private Saving Rates Spur Economic Growth? September 2007

No. 44 R. C. Feenstra: Globalization and Its Impact on Labour. July 2007

No. 43 P. Esposito and R. Stehrer: The Sector Bias of Skill-biased Technical Change and the Rising Skill Premium in Transition Economies. May 2007

No. 42 A. Bhaduri: On the Dynamics of Profit- and Wage-led Growth. March 2007

No. 41 M. Landesmann and R. Stehrer: Goodwin's Structural Economic Dynamics: Modelling Schumpeterian and Keynesian Insights. October 2006

No. 40 E. Christie and M. Holzner: What Explains Tax Evasion? An Empirical Assessment based on European Data. June 2006

No. 39 R. Römisch and M. Leibrecht: An Alternative Formulation of the Devereux-Griffith Effective Average Tax Rates for International Investment. May 2006

No. 38 C. F. Castejón and J. Wörz: Good or Bad? The Influence of FDI on Output Growth. An industry-level analysis. April 2006

No. 37 J. Francois and J. Wörz: Rags in the High Rent District: The Evolution of Quota Rents in Textiles and Clothing. January 2006

No. 36 N. Foster and R. Stehrer: Modelling GDP in CEECs Using Smooth Transitions. December 2005

No. 35 R. Stehrer: The Effects of Factor- and Sector-biased Technical Change Revisited. September 2005

No. 34 V. Astrov, Sectoral Productivity, Demand, and Terms of Trade: What Drives the Real Appreciation of the East European Currencies? April 2005

Amit Bhaduri is Professor Emeritus, Jawaharlal Nehru University and Visiting Professor, Council for Social Development, New Delhi, India.

Financial support from Fonds zur Förderung der wissenschaftlichen Forschung (FWF), Vienna for this project (No. P18419-G05) at the Vienna Institute for International Economic Studies (wiiw) is gratefully acknowledged.

Amit Bhaduri

A Contribution to the Theory of Financial Fragility and Crisis

Contents

Abstract

Three interrelated aspects typical of most financial crisis of domestic origin are brought together in a model in this paper. The first aspect is debt financed consumption boom supported by rising asset prices which ultimately leads to credit crunch and debt deflation as lenders lose confidence in borrowers. This is related to the second aspect tracing gradual evolution towards Ponzi finance. This is accompanied by fragility of the financial sector itself and its insolvency as an inevitable outcome of unregulated economic expansion. The paper concludes with comments on how these three aspects interact in the real world of possible extensions.

Keywords: *capital gains, consumers' debt, debt-driven fluctuations, effective demand, financial fragility, liquidity preference*

JEL classification: *D84, E12, E21, E32, E41, E44, E51, G12, G18, G24, N22*

*Amit Bhaduri**

A contribution to the theory of financial fragility and crisis*

I Introduction

Each financial crisis reminds one of the saying of an ancient Greek philosopher, 'It is never possible to step into the same river twice' (Heraclitus, circa 544 B.C). Yet the ever changing river has some relatively unchanging attributes that make it possible to recognize it as the same river. Each financial crisis too has recurring features that remain similar, along with its historical specificities that make each crisis different. The purpose of theory is to isolate these necessary characteristics, even if they might not be sufficient to describe adequately any particular crisis. Formal models are not historically accurate, but try to isolate the central mechanism that precipitates many financial crises.

At least two features typically recur in a crisis. The first is loss of confidence either in or by the financial sector. Since the system of credit money and the entire edifice of financial institutions function largely on the basis of mutual confidence among the players in the market, this leads to abrupt changes in lenders' behaviour as the proximate cause of the crisis. The second feature is the transmission of the crisis from the financial to the real economy through aggregate demand. In usual Keynesian analysis this operates typically through a sudden decline in real investment. However, at least in the recent financial crisis (starting in 2007) it seems more the fragility of private consumption played the more crucial role. Thus, for simplicity of exposition we focus mostly on greater consumption expenditure sustained by rising asset prices (including housing) to examine the pattern of interaction between financial fragility and aggregate demand.[1]

Section II of the paper outlines a schematized model explains how capital gains might drive debt financed consumption expenditure resulting in fluctuations in both output and debt. Section III extends the argument to show how similar fluctuating patterns prevail under more plausible assumptions about lending behaviour of financial firms and banks which takes into account borrowers' ability to meet debt obligations from their current income. A simplified one period version of Ponzi finance is postulated to set the limit in this case. Section IV sets the argument in the context of financial fragility arising from increasing internal liquidity problem faced by the financial system itself. Its 'fragility' is an expression of its inability to cope with the challenges of even relatively small unanticipated defaults by

* Without implicating them in my errors I wish to record my intellectual debt to Ariel Wickerman, Duncan Foley, Dimitri Papadimitrieu, Joanilio Teixeira, Martin Fitzbein, Massimo Riccottilli, Rune Skarstein and Servaas Storm. An earlier version of this paper is available in the Working Paper Series (2010) of Levi Institute of Economics, Bard College, USA.

[1] Evidence accumulated especially from the United States on how debt financed consumption expenditure becomes fragile over time, with some commentators sending early warning (Baker, 2006; Campbell and Cocco, 2006; Dayan and Maki, 2000; Maki and Palumbo, 2001; Godley, 2001; 2002; Gross, 2004).

means of the liquidity available within the system leading to a reinterpretation of Keynesian liquidity preference. In the present context it relates more to financial firms than to the general public (i.e. households and firms in the real sector). Section V concludes by bringing together different aspects of the argument. It explains how recurring liquidity problem and loss of confidence arise as a surface phenomenon of the deeper evolving relation between the financial to the real sector in developed market economies. To avoid misunderstanding, it also comments on some additional complications that are important in many crises, but not treated adequately in the paper.

II A model of fluctuations driven by capital gains and debt-financed consumption

From the expenditure side, gross national product (GNP) consists of

$$GNP = Y = C + I + U. \quad (1)$$

Consumption C is assumed to be partly autonomous, and partly induced by income. However, increase in wealth and the stock of inherited debt also influence the level of consumption, captured by

$$C = c_1 Y + c_2 (dW/dt) - c_3 \rho D + K_1, \quad (2)$$

with arbitrary constants $c_1, c_2, c_3 > 0$, K_1 = autonomous part of consumption, W = wealth of the private consumers. Note that the wealth effect is shown as operating through rising asset values, and capital gains rather than the stock of wealth.[2] While the conventional real balance effect depends on the stock wealth, the emphasis here is on the increase in wealth on the assumption (substantiated by recent experience) that both higher borrowing as well as lending are particularly facilitated by rising asset prices. Borrowers can meet their debt repayment obligations without difficulty from their capital gains, while the lenders too lend more leniently with a more comfortable balance sheet caused by rising asset prices. The increase in wealth (dW/dt) occurs mostly through higher prices of assets (including housing and real estates). In a macroeconomic sense, this is notional increase in so far as it cannot be realised on a macro scale without setting off strong bearish tendencies in the market. However, on the micro scale higher wealth makes each individual wealth owner more credit worthy in the eyes of the lending institutions, while expanding simultaneously the credit base of individual lending institutions through increase

[2] The assumption of continued capital gains based on information provided by an 'efficient' capital market was indeed the essence of the model of 'great moderation'. On this basis the Federal Reserve System (FED) refused to intervene in a situation of continuously rising asset (housing) prices and consumption led boom financed by rising indebtedness of households, until the very end marked by financial meltdown (staring around September, 2007). This story is not unfamiliar. '.. in the 1920s, convinced that skilled monetary management at the Federal Reserve and the rise of new professionally run investment trusts had reduced the riskiness of markets, Irving Fisher declared on 15 October that stock prices have reached 'what looks like a permanently high plateau''. This was just before the Great Crash leading to the severest depression of the last century (Fox, 2009; also Time, 2009, pp. 44-45).

in the value of their assets on balance sheets. This results in expansion of actual credit against notional capital gains. Nevertheless, the stock of inherited debt D exerts a negative influence on consumption through the repayment burden. With ρ as the repayment coefficient, this explains its negative sign in equation (2).

Persistent current account deficit (U) is covered by increased foreign debt (D_F) as liabilities to foreigners denominated in the same, assumed to be stable domestic currency. For simplicity of exposition we assume current account deficit is partly autonomous (K_2), and the rest induced by net import as a function of GNP, i.e.

$U = (dD_F/dt) = n_1 Y + K_2$, (3)

where $n_1 > 0$ is the net import propensity.

Similarly, keeping the exposition simple investment (I)is assumed to have an autonomous part (K_3) and the rest induced by income,

$I = n_2 Y + K_3$, $n_2 > 0$. (4)

The critical feature of the debt driven economy is a positive relation between increasing (notional) wealth and increasing (actual) debt financed consumption. We assume for expositional simplicity strict proportionality,

$(dW/dt) = w(dD/dt)$, $w > 0$, a positive constant. (5)

Using (2), (3), (4) and (5) in (1), we obtain the time behaviour of Y governed solely by the dynamics of the flow and the stock of debt and an autonomous term K, i.e.

$Y = a(dD/dt) - mrD + mK$, (6)

where $a = mc_2 w > 0$, $r = c_3 \rho$, and $m = (1-c_1 - n_1 - n_2)^{-1} > 0$; $K = (K_1+K_2+K_3)$ = an autonomous term, assumed for simplicity to be a time independent positive constant.

The transmission mechanism from debt to income generation in the real economy through effective demand is outlined by focusing first on a highly simplified case of lending behaviour by financial institutions. We postulate that there is an arbitrarily given ceiling E to the stock of debt such that

$(dD/dt) = A > 0$ for $D < E$, and, $(dD/dt) = 0$ for $D = E$. (7)

On these assumptions, with positive borrowing supported by a steady flow of debt at the constant rate $A > 0$, Y would be at its maximum value when debt repayment burden is at its minimum D=0, to yield from (6)

$Y_{max} = aA + mK$ and $D_{min} = 0$ (8)

A minimum value of Y is reached on the other hand when debt repayment burden is at its maximum,

$Y_{min} = aA + mK - mr.E$ and $D_{max} = E$ (9)

Under these assumptions the economy fluctuates abruptly between the maximum and the minimum value of Y in a two dimensional plane of the stock of debt (D) and income(Y). With the stock of debt initially assumed to be at zero, $D_{min} = 0$, Y starts at its maximum, Y_{max} with no repayment burden of debt in (8). However, as the flow of debt continues at a steady rate A, the stock of debt accumulates over time to reach the ceiling $D_{max} = E$ over $t_1 = (E/A)$ periods. At that maximum debt repayment burden with debt at its ceiling E, Y is reduced to its minimum value Y_{min} in (9) with an abrupt switching off of all lending according to (7).

Y_{min} in (9) marks the beginning of a recession when positive wealth effect also ceases due to switching off of all credit flows to the private consumers. However, the situation can get worse; because all lending stops at D = E, but the obligation for repayment on accumulated debt with its depressing effect on consumption continues. Repayment obligation would generally be met largely through forced sale of assets under distress. A gradual reduction of debt begins as (dD/dt) turns negative. This is the classic case of debt deflation as the economy slides into a deepening recession (Fisher, 1933). Y falls even below its minimum level (Y_{min}) given in (9), as the flow of debt (dD/dt), and its associated wealth effect on consumption turn negative. However, the inherited stock of debt (D) also begins to decrease, and the repayment burden on debt begins to falls gradually. This process continues until debt reaches a sufficiently low value for lending to start again, and recovery begins.[3]

The possibility of debt deflation is incorporated in the formal analysis by assuming that the economy switches instantly to a debt retirement mode at the rate B as soon as all flow of debt stops at the debt ceiling, i.e.

$(dD/dt) = - B, B > 0$ at $D = E$. (10)

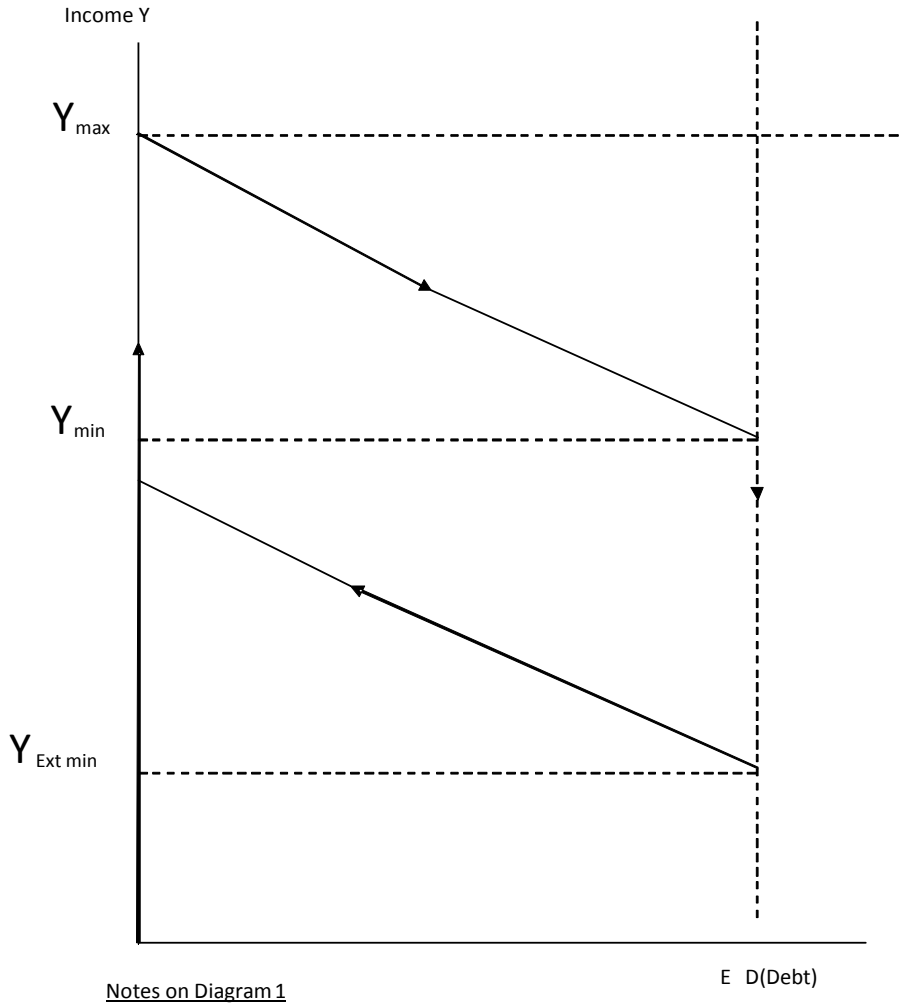
Combining (6) and (10) it is easy to see that Y falls even below its earlier specified minimum value in (9) due to the operation of a negative wealth effect to yield an even lower minimum value, which lies below Y_{min} in (9), and is given by,

$Y_{Ext\,min} = mK - aB - mrE$. (11)

[3] With forced sale asset prices might continue to fall making the debt repayment burden increasingly heavier, and recovery more difficult. In more extreme cases recovery becomes impossible without government intervention. This point is discussed at length in section 4 on financial fragility.

However, as the stock of debt also begins to fall at the rate B, and the repayment burden gradually eases, and income begins to rise from that lowest level given by (11).

Diagram 1



Notes on Diagram 1

Y_{max} from (8) ; Y_{min} from (9) $Y_{ext.\ Min}$ is from (11); tan Z = - mn from (16)

The argument can be summed up algebraically. Using (7) and (10) we represent the increasing and decreasing phases in the stock of debt over time as

$D = tA$, for $t \leq t_1$, where $t_1 = E/A$, (12)

$D = (E-tB) =$ for $t \geq t_1$. (13)

From (6) we depict the time paths of Y as

$Y(t) = aA - mr(tA) + mK$, for $t \leq t_1$ (14)

$Y(t) = mK - mr(E-tB) - aB$, for $t \geq t_1$, with an instantaneous switch between the two modes at time $t = t_1$ at D = E. (15)

Since from (12) and (14), (dD/dt) =A and (dY/dt) = - mrA, whereas from(13) and (15), (dD/dt) = -B and (dY/dt) = + mrB, it follows from the chain rule of differentiation that both in the increasing and decreasing phase of the stock of debt, the same slope z obtains between D and Y, i.e.

$$(dY/dD) = z = -mr. \qquad (16)$$

The stock of debt increases for (E/A) = t_1 periods, and then it decreases for the next (E/B) = t_2 periods. Since in general, $A \neq B$, it follows $t_1 \neq t_2$, implying the duration of the two phases of increasing and decreasing in debt might differ.

Geometrically the analysis is summarized in Diagram 1. Starting initially at zero debt, the behaviour of debt and income over time can be seen by moving along the direction of the arrow on a two dimensional plane in D and Y.

III Some modifications of lending behaviour

Without pretence to realism the above model schematises a simple mechanism of fluctuations in debt and income based on a stock-flow approach. Higher positive flow of credit driven by capital gains stimulates consumption and income through higher aggregate demand, but at the same time exerts a depressing influence on demand through the repayment obligations on a higher stock of accumulated debt. This results in sustained oscillations similar to some earlier Keynesian models of endogenous business cycles, with the important difference that the present model emphases a mechanism working through consumption rather than of investment (cf. Kalecki, 1971; Kaldor, 1960; Goodwin, 1951; 1982).[4]

The model postulates a crisis of confidence of the lenders as borrowers become over indebted reaching a debt ceiling. However, a most obvious flaw of the model lies in assuming that this ceiling to the stock of debt is arbitrarily given (at E) without any reference to either the ability of the borrowers to repay or the risk faced by financial institutions which leads to such crisis of confidence. More plausibly the ceiling might be related to the ability of the borrowers to repay in relation to their income. In that case, the lenders face the risk of being caught in a debt trap, as the lending institutions fear that the borrowers can only service debt with further loans. When reduced to a single period

[4] In business cycle models in the tradition of Kalecki and Keynes, the positive impact on aggregate demand of the flow of investment through the multiplier mechanism is counteracted by the depressing effect of capital stock on investment. Mathematically they generate limit cycles (Arrowsmith and Place, 1982, ch. 5) or fluctuations from delayed response through mixed difference differential equations (Minorsky,1969, ch. 34). It might be mentioned in this context Lavorie and Godley (2000) made an interesting distinction between debt burdened and debt financed effective demand. A similar distinction operates here with the flow of new debt contributing positively while the stock of inherited debt contributing negatively to aggregate demand.

criterion for lending, the debt adjustment equation (7) can be reformulated defining a single period condition for Ponzi finance as the credit ceiling, i.e.[5]

(dD/dt) = θ(Y- ρ D), θ >0. (17)

In this simple one-period specification, the flow of credit continues to be positive, and adjusted to the extent of the gap between income and debt servicing obligation of each period, i.e. (Y – rD) > 0. However, when this gap dwindles to zero, credit reaches its ceiling. Accordingly, the flow of credit stops, and retirement of debt governed by the equation,

(dD/dt) = $\theta \left[Y - \rho \{ D\max - (dD/dt) \} \right]$ (18)

From (6) and (17) setting (dD/dt) =0, it can be seen that the maximum stock of debt is determined endogenously as

D = D_{max} =mK/(ρ + rm). (19)

Assuming that the initial stock of debt is minimum at zero, there is no repayment obligation. Consequently, the inflow of credit is maximum at that point, and (6) implies income is maximum at

Y = Y_{max} = mK/(1-θa),

when D = D_{min} = 0 at t = 0. For an economically meaningful solution,

Y_{max} > 0, implying (1 - θa) > 0. (20)

Inserting (6) in (17), the phase of increasing debt is seen to be governed by a first order differential equation,

(1- θa) (dD/dt) = -θ(rm + ρ)D + θmK , having a solution (21)

D = D_{max} (1-$e^{-\lambda t}$), where $\lambda = \theta(rm + \rho)/(1 - \theta a)$. (22)

Since in view of (20), λ >0 it follows that at t =0, D= 0, but as $t \to \infty$, $D \to D_{max}$.

Similarly inserting (6) in (18) the phase of decreasing debt is guided by the differential equation,

(1- θa - $\theta\rho$) (dD/dt) = - θrm D- $\theta\rho D_{max}$ + θmK , (23)

which reduces on simplification to

[5] Minsky (1975; 1986) introduced a perceptive distinction among three stages in the evolution of the financial structure of a firm, as it transits from hedge to speculative to finally Ponzi finance. Hedge finance allows firms to meet their repayment obligations from expected regular flow of anticipated revenue; in speculative finance, firms still meet their obligations mostly from anticipated revenue flows, but may need occasional injection of 'bridge finance' in some periods. In Ponzi finance, continuous outside financial injections would needed to meet obligations (Taylor, 2004, pp. 261-263). Note the distinction between speculative and Ponzi finance has been blurred in our one period formulation.

(dD/dt) = $\mu D - \mu D_{\max}, \mu = \theta mr / [\theta(a+\rho) - 1]$ (24)

Theoretically debt approaches asymptotically it maximum governed by (22). We approximate by assuming that for a sufficiently large value of t = t_1 debt is arbitrarily close to its maximum level, and the system then goes into its debt repayment mode according to (24), until at t=t_2 debt again reaches its initial minimum value D= 0. In this case the particular solution to (24) can be written as,

D= $D_{\max}$ [1- $e^{\mu(t-t_2)}$], $t_2 \geq t > t_1$. (25)

As t increases to t_2, the stock of debt D gradually decreases from its maximum to its minimum value of 0 at t = t_2 provided μ > 0, implying

θ(a+ ρ) > 1. (26)

Thus starting initially(t=0) at D=0, debt approaches asymptotically its maximum level $D_{\max}$, coming sufficiently close to it as t becomes arbitrarily large at t = t_1 when the phase of reduction in debt commences in conformity with (24) to return ultimately to the zero debt situation at t = t_2. Therefore, despite the postulated modifications in lending behaviour the qualitative the nature of the debt cycle remains similar to the simpler case depicted in Diagram 1 provided inequalities (20) and (26) are satisfied.[6]

These inequalities can be economically interpreted within the Keynesian framework of demand determined output. Given the magnitude of the multiplier (m), the parameter a (=c_2 w) captures the wealth effect operating through capital gains and increase in debt financed consumption, while θ governs the speed with which debt increases. Consequently the product term θa governs the increase in debt and consumption which has to be less than unity for the income generation process to be stable (condition 20). Similarly inequality (26), θ ρ > (1-θa) ensures that repayment has to exceed saving from the wealth effect on output for the process of debt reduction to be effective.

IV Financial fragility and crisis

During the alternating phases of expansion and contraction in economic activity depicted in the preceding sections, the financial institutions providing credit also undergoes simultaneous changes in their asset structures and balance sheets. Paradoxically, the fragility of the financial system tends to increase during the phase of expanding income and debt of the real sector paving the way to its contraction.

[6] The abruptness is still present at the switch point t = t_1 from increasing to decreasing mode of debt.

The expansionary phase encourages a general state of economic optimism, as 'conventions' (Keynes, 1937) gain ground that this is going to be the normal state of the economy that can be extrapolated into the future. Consequently actors in the economy become inclined to borrow and lend more freely. This tendency is strengthened further by rising asset prices accompanying economic expansion. During this process, not merely the financial position of firms and households in the real sector but even that of firms in the financial sector undergoes change, particularly because it becomes a wide spread practice to rely on sustained capital gains both for the expansion of credit and, for its repayment .[7] When unregulated, it might become in effect a process of transition towards Ponzi finance for many players in both the real and the financial sector (Minsky, 1986).[8] This evolution towards Ponzi finance involves both borrowers and lenders. Borrowers tend to over borrow in relation to their regular income because they hope to meet repayment obligations more easily out of capital gains. Financial firms too feel more solvent due to the rising value of assets on their balance sheet, and become more inclined to lend liberally by relaxing the standards of scrutiny. Interestingly, this process is sustained on a macro scale so long as most of the notional capital gains quoted in the market are not actually realized, but generate sufficient economic optimism for both borrowers and lenders to take increasingly fragile financial positions characterized by increased volume of lending on the one hand and indebtedness on the other.[9]

As the optimistic view of 'business as usual' continues, the fear of adverse negative shock in an uncertain future tends to recede to the background. In general less liquidity is held, and in particular financial firms hold less in reserve as precaution. This amounts to a downward shift of the (Keynesian) liquidity preference schedule, as less liquidity is demanded by financial firms themselves. It is this weakening preference for liquidity of financial firms, rather than that of the firms and households in the real sector that begins to make the financial system fragile at its core.

Financial firms unregulated by the monetary authority substitute liquidity typically with assets floated by other financial firms through various innovative arrangements. This leads

---

[7] As already stated (see note 2) the model of 'great moderation' of the FED was based on this assumption. For a critical summary view of this received wisdom see also Foster and Magdoff (2008). In a complex financial system, particularly non-bank financial firms like mutual funds, mortgage banks may increase leverage ratio, and hold securities issued by of other financial firms, guaranteed by credit rating agencies and insurance companies, in the capital base as close substitute for liquidity. At the end of 2007 Fannie Mae and Freddie Mac has astoundingly high leverage ratios of 65 times and 79 times respectively, while the leverage ratio of all the five big investment banks in the US (Merrill Lynch, Lehman Brothers, Bear Stearns,, Morgan Stanley and Goldman Sachs) hovered anywhere between 33 and 26 times (Chitale, 2008, p. 22).

[8] Minsky's explanation on this point runs mostly in terms of investment behaviour of firms in the real sector, and many formal modelling exercises followed similar routes (e.g. Taylor and O'Connell, 1985). However, the recent crisis made clear once more a pattern familiar from several past experiences. Financial crisis often precedes a crisis of the real sector suggesting that the fragility of financial firms might evolve faster than that of households and firms in the real sector. Chiarella and Flaschel (2000) in their otherwise sophisticated and disaggregate theoretical modelling of the financial sector ignores this particular aspect.

[9] Bhaduri, Laski and Riese (2006) emphasized this aspect in their model.

to increasingly interlocked assets and capital structures among financial firms characterized by mutual guarantees and various forms of private insurances without sufficient liquidity in reserve.[10] At the same time borrowers in the real sector become increasingly indebted in an easy credit regime in which innovative credit instruments are used as substitutes, while the probability of default on these loan arrangements increase in proportion. And the possibility of sudden financial collapse looms large below the surface of an expanding economy.

This state of affairs is driven by a growing divergence in the perception of risk. Each individual financial firm might feel safer, as they share or transfer risk to other financial firms through interlocking of insured asset structures, but the systemic risk tends to increase also on that very count. The failure to recognize or ignore this externality of systemic risk by private financial firms in pursuit of higher immediate profit paves the way to a crisis. It might get triggered off by even a relatively small unexpected default in relation to the total volume of credit advanced.

An unexpected default in such situations would force the concerned financial institutions which became less liquid during the phase of expansion to raise liquidity immediately, particularly to sustain the scheme of interlocked mutual guarantees with other financial firms. Paradoxically, a high degree of homogeneity of expectations among financial firms forged during good times tends to worsen the problem in bad times. Since most other firms with convergent expectations are similarly over-extended in terms of credit advanced in relation to liquidity held, there is a general unwillingness to part with liquidity. Thus the concerned financial firm trying to cover its obligations on defaulted loans is forced to sell assets immediately under distress in a market with relatively few takers.

We assume that a certain unanticipated fraction q of loan is defaulted resulting in immediate additional demand for liquidity L which is larger the greater is the extent of default (q) and the higher is the leverage of the firm (x). Given the state of uncertainty, a lower price of financial asset p helps to induce substitution in its favour against liquidity and strengthens interlocking and illiquidity among firms so that in case of default the amount of liquidity required tends to be inversely related to asset price in an interlocked system of finance. This is summarized as

$$L = \psi(\overset{+}{q}, \overset{+}{x}, \overset{-}{p}), \tag{27}$$

where sign over the relevant variable indicates the sign of its partial derivative .

[10] For instance an elaborate system of shadow banking populated by mutual funds, mortgage banks, brokerage institutions etc developed in the United States which provided credit substitutes without intermediation of banks. This shadow banking system has been described as having the characteristics of 'complexity' and 'tight coupling' (Bookstaber, 2007). The former relates to the mutual interlocking of balance sheets and assets, and the latter resembles production on an assembly line where little time is left for correction or slow adjustment of portfolios and capital structures, mainly because of the interlocked nature of the assets.

Assuming a composite asset for simplicity, the volume of that composite asset to be supplied to the market for sale is (L/p) where p = the price level of the composite asset. As a result of default the additional supply of assets(A_S) in the market for sale is given by

$$\Delta A_S = L/p. \quad (28)$$

A stylized representation of the demand for asset (A_D) in the market would typically include two types of traders —the 'value traders' who consider the current price level of asset (p) in relation to its long term value guided by 'fundamentals'(π), and the 'trend traders' who focus on the short term trend in the of price assets (dp/dt). Thus, if ($p-\pi$)>0, value traders consider assets to be over valued, and tend to be bearish. However, despite value traders' bearishness, price might continue to rise, if their bearishness is outweighed by the trend traders bullish sentiment that price would continue to rise in the near future.[11] When most value as well as trend traders share similar bullish or bearish sentiment, market sentiments appear relatively homogeneous; when divided, guessing the 'average' sentiment that prevails in the market becomes the central concern of traders in the stock exchange (Keynes, 1930; Keynes, 1964, ch. 12.).[12]

The demand for assets in the stock exchange is represented by the equation

$$A_D = F[(p-\pi), (dp/dt)], \quad (29)$$

where for reasons explained above the partial derivative of the first argument pertaining to value traders, $F_1 < 0$, and that of the second argument relating to trend traders $F_2 > 0$.

For simplicity of exposition we postulate (unrealistically) that the system has an equilibrium at $p=\pi$ (a constant) implying, $A_D = A_S$ at $p=\pi$. Thus, in the equilibrium state so defined, trend traders are inactive, and the value traders' demand price π for assets at discounted future profits equals the supply of assets A_S.Thus, in equilibrium the market trades without expectations of capital gains of losses at price π determined exclusively by fundamentals.

The movement in asset price around equilibrium depends on the excess demand and supply of assets created by default depicted by the asset price adjustment equation,

$$(dp/dt) = -\gamma [\Delta A_D - \Delta A_S], \ \gamma > 0. \quad (30)$$

Inserting (27), (28) and (29) in (30), and totally differentiating, we obtain

$$d(dp/dt)/dp = \gamma \{[F_1] + [L(1-\eta)/p^2]\} /(1-\gamma F_2), \quad (31)$$

---

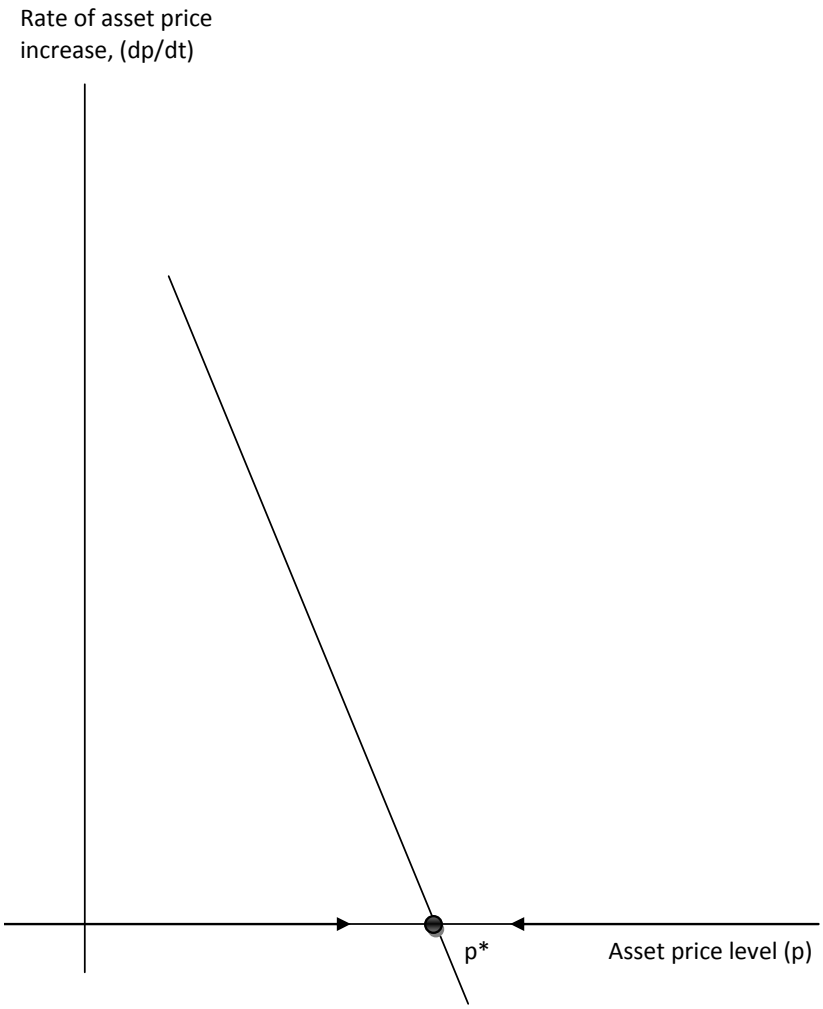
[11] Friedman (1953) ignored the role of trend traders in the market to claim that profitable speculation is always stabilizing.

[12] The averaging procedure followed by players in a market of divided expectations (according to Keynes) is analogous to guessing the winner of a 'beauty competition'. Each player chooses the prettiest face, not according to his own criterion, but by guessing what the 'average' voter would consider to be the prettiest face, and then, as further refinement guessing the average of this average and so on. Taylor (2004, pp. 152-159) provides a lucid account.

where $\eta = (p / L)(\partial L / \partial p) < 0$.

From the one variable phase diagram in (dp/dt) and p in Diagram 2 it is seen that stability requires expression (31) to be negative. Its slope on the left hand side measures the rate of change of price (dp/dt) in response to increase in the price level (p). Therefore, stability requires the rate of price rise to become more sluggish with increase in the level of price.

Diagram 2



Note on Diagram 2

The system is (locally) stable (unstable) at p* provided the slope at p* given by (31) or (35) is negative (positive)

It is plausible to assume that the speed of asset price adjustment γ in a modern stock market for assets is sufficiently high to make the denominator in the expression on the right hand side of (31) negative, i.e. $(1-\gamma F_2) < 0$. Consequently the asset market would be

stable around the postulated equilibrium at π provided the numerator of that expression is positive, i.e.

$$[F_1] + [L(1-\eta)/p^2] > 0 \quad (32)$$

Thus the necessary and sufficient condition for stability boils down to,

$$1 - \eta > -(F_1 p^2/L). \quad (33)$$

Since η is negative, the left hand side of (33) is unambiguously positive, and so is the right hand side because F_1 <0. However, other things held constant, the right hand side decreases as L becomes larger, i.e. higher demand for liquidity tends to destabilize the market. Since $(1/\eta) = ((\partial p / p)/(\delta L / L)$, this elasticity of asset price with respect to the volume of liquidity raised through distress sale of assets by financial firms provides an indication of the extent of interlocking as well as homogeneity of asset structures of financial firms. The stronger is such interlocking, the larger is the larger is the percent decrease in asset price due to a higher demand for liquidity, and greater is the absolute value of $(1/\eta)$, i.e. the smaller is the absolute value of η. Since a smaller absolute value of η makes the satisfaction of inequality (31) more difficult, stronger interlocking of assets would have a tendency to destabilize the market for financial assets.

V Summing up: models and reality

It was pointed out at the outset of this paper that loss of confidence of the financial sector almost invariably appears as the as the proximate cause of most financial crisis.[13] This is hardly surprising because trust and confidence are public goods essential for a smooth functioning of any modern financial system. This paper is an attempt to probe deeper into this general idea by investigating how loss of confidence might arise. We suggest this might take place along two analytically distinct routes. The simple model constructed in Sections II and III depict in some formal details how the financial sector might lose confidence in an over-indebted public's ability to repay debt. This indeed has been the generally received wisdom about how sudden tightening of credit by cautious financial institutions precipitates a crisis.

In contrast, the argument of Section IV of this paper proceeds along a different route which is probably more relevant for understanding how financial fragility develops in a modern and sophisticated but largely unregulated private financial system driven by the lure of short term profit. Paradoxically, its fragility has its root in economic prosperity that ultimately paves the way to a financial meltdown. The collapse of confidence takes place within

[13] This experience of collapse of confidence has repeated itself many times in different episodes (Rogoff and Reinhart, 2008).

rather than without a 'fragile' financial sector itself. Its interlocked asset structure and resulting illiquidity becomes increasingly incapable of coping with sudden requirements of liquidity due to default. In reality, these two routes (of Sections II and III on the one hand and Section IV on the other) are usually intertwined because over lending through various financial innovations of credit substitutes heightens the probability of default on the one hand while strengthening on the other hand the interlocking of assets among financial firms. Nevertheless for expositional clarity we considered it useful to separate analytically these two aspects.

It should be emphasized that within the narrow confines of the present paper we deliberately do not deal with loss of financial confidence in a currency which might arises from growing international indebtedness. Although in some ways the country concerned resembles an over indebted borrower (discussed in Sections II and III) to whom foreign credit might suddenly denied, it has several other dimensions lying beyond the scope of this paper. Even abstracting from various complications due to exchange rate speculation, international power relations etc, our argument would be affected by the fact that inflow and outflow of foreign portfolio capital would influence the behaviour of asset prices which plays a central role especially in the argument of Section IV.

By focusing only on the stimulating wealth effect of increase in credit, and the depressing debt servicing effect, the paper abstracts deliberately from complete discussions of other the economic forces governing aggregate demand and income. The limited debt financed consumption model developed here accommodates income growth mostly through the expansion of aggregate demand caused by credit expansion linked to capital gains moderated by the repayment obligation. For reasons of exposition, it abstracts from the role of credit, and the possible impact of the 'wealth effect' on investment. In so far as investment is influenced by changing asset values and expected capital gains or losses, the model is incomplete. Extension in this direction might be crucial for characterizing a financial crisis even of exclusive domestic origin. Because, over indebtedness has to defined in relation to his income, as barely hinted at in the discussion of Ponzi finance in Section III.. The model is inadequate without incorporating at least the impact of the wealth effect on investment which affects in turn income growth and ability to repay over time.[14] The list of issues left out of this model could no doubt be lengthened. Never the less, the usefulness of a limited model of this kind should perhaps be judged somewhat differently. As said at the outset, its intention is not to represent reality of particular even imperfectly, but to isolate analytically the working of some crucial mechanisms. The mechanism highlighted in this paper suggests that the fragility of the financial system emerges for the

[14] Valuation of real as well as financial assets influence investors' decision of acquisition versus physical investment in new capacity. This original suggestion by Keynes' 'two price theory of investment' was reformulated subsequently by Tobin (1969) but without complications arising from capital gains. Minsky (1975, 1986) reinterpreted it by accommodating the possibility of capital gains and changing expectations which in turn affect investment. The present analysis does not try to model investment behaviour in any serious way.

very prosperity of the real economy placing the real and the financial system of an unregulated market economy in a difficult relation. Financial collapse from time to time is a reminder of this deeper problem.

Bibliography

Arrowsmith, D. K. and C. M. Place (1982), *Ordinary Differential Equations*, Ch. 5, Clapham and Hall, London.

Baker, D. (2006), 'The menace of unchecked housing bubble', *Economists' Voice*, Berkley Electronic Press, www.bepresscom/ev, March, pp. 1-5.

Bhaduri, A., K. Laski and M. Riese (2006), 'A model of the interaction between the real and the virtual economy', *Metroeconomica*, Vol. 57, No. 3, pp. 412-427.

Campbell, J. and J. Cocco (2006), 'How do house prices affect consumption? Evidence from micro data', *NBER Working Paper* No.11534, February.

Chiarella, C. and P. Flaschel (2000), *The Dynamics of Keynesian Monetary Growth*, Cambridge University Press, Cambridge.

Chitale, M. (2008), 'Seven pillars of the US financial crisis', *Economic and Political Weekly* (Mumbai), 1 November, pp. 20-24.

Dayan, K. E. and D. M. Maki (2000), 'Does stock market wealth matter for consumption?', Mimeo, Board of Governors of the Federal Reserve System.

Fisher, I. (1933), 'The debt deflation theory of great depressions', *Econometrica*, Vol. 4, No. 3, pp. 337-357.

Foster, J. M. and F. Magdoff (2008), 'Financial implosion and stagnation', *Monthly Review*, Vol. 60, No. 7, pp. 1-29.

Fox, J. (2009), *The Myth of the Rational Market*, Harper, New York.

Friedman, M. (1953), *Essays in Positive Economics*, University of Chicago Press, Chicago.

Godley, W. (2001), 'The developing recession in the United States', *Banca Nazionale del Lavoro Quarterly*, Vol. 54, No. 219, pp. 417-25.

Godley, W. (2002), 'The case for a severe recession', *Challenge*, Vol. 45, No. 2, pp. 27-51.

Goodwin, R. M. (1951), 'Non-linear acceleletor and the persistence of the business cycle', *Econometrica*, Vol. 19, No. 1, pp. 1-17.

Goodwin, R. M. (1982), *Essays in Economic Dynamics*, Macmillan, London.

Gross, D. (2004), 'The next shock: not oil but debt', *New York Times*, 5 September.

Kaldor, N. (1960), 'A model of the trade cycle' in his *Essays on Economic Stability and Growth*, Duckworth, London.

Kalecki, M. (1971), *Selected Essays on the Dynamics of the Capitalist Economy*, Cambridge University Press, Cambridge.

Keynes, J. M. (1937), 'The General Theory: fundamental concepts and ideas', *Quarterly Journal of Economics*, Vol. 51, No. 1, pp. 1-15.

Keynes, J. M. (1964), *The General Theory of Employment, Interest and Money*, Harcourt Brace Jovanovich, New York and London.

Lavoie, M. and W. Godley (2000), 'Kaleckian models of growth in a stock-flow monetary framework: a neo-Kaldorian model', Jerome Levy Economics Institute, Bard College, Annandale-on-Hudson, N.Y.

Maki, D. M. and M. G. Palumbo (2001), 'Disentangling the wealth effect: a cohort analysis of household savings in the 1990s', Board Document, Board of Governors of the Federal Reserve System.

Minorsky, N. (1962), *Nonlinear Oscillations* (translated from Russian), Van Nostrand, New York.

Minsky, H. P. (1975), *John Maynard Keynes*, Columbia University Press, New York.

Minsky, H. P. (1986), *Stabilising an Unstable Economy*, Yale University Press, New Haven, Conn.

Rogoff, K. and C. Reinhart (2008), 'This time is different: a panoramic view of eight centuries of financial crisis', *NBER Working Paper* No.13882, April.

Taylor, L. (2004), *Reconstructing Macroeconomics*, Harvard University Press, Cambridge,Massachusetts.

Taylor, L. and S. A. O'Connell (1985), 'A Minsky crisis', *Quarterly Journal of Economics*, Vol. 100, No. 4, pp. 671-684.

Time (2009), 'The myth of the rational market: the path of a powerful idea', Vol. 173, No. 24, 22 June, pp. 43-46.

Tobin, J. (1969), 'A general equilibrium approach to monetary theory', *Journal of Money, Credit and Banking*, Vol. 1, No. 1, pp. 15-29.

Short list of the most recent wiiw publications (as of May 2010)

For current updates and summaries see also
wiiw's website at www.wiiw.ac.at

A Contribution to the Theory of Financial Fragility and Crisis

by **Amit Bhaduri**

wiiw Working Papers, No. 65, May 2010
18 pages including 2 Figures
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

---

wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2010: FDI in the CEECs Hit Hard by the Global Crisis

by **Gábor Hunya**. Database and layout by **Monika Schwarzhappel**

wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe
wiiw, Vienna, May 2010 (ISBN-978-3-85209-018-4)
107 pages including 86 Tables
hardcopy: EUR 70.00 (PDF: EUR 65.00), CD-ROM (including hardcopy): EUR 145.00

---

wiiw Monthly Report 5/10

edited by **Leon Podkaminer**

- European energy security: a concern common to both the EU and Russia
- The current state and prospects of the Russian energy sector
- Short-run projections of patterns of job contraction in the Czech Republic, Hungary, Slovakia and Slovenia
- Statistical Annex: Selected monthly data on the economic situation in Southeast Europe, Russia and Ukraine

wiiw, May 2010
26 pages including 13 Tables and 5 Figures
(exclusively for subscribers to the wiiw Service Package)

Why Are Goods Cheaper in Rich Countries? Beyond the Balassa-Samuelson Effect

by **Leon Podkaminer**

wiiw Working Papers, No. 64, April 2010
19 pages including 2 Tables and 6 Figures
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

---

wiiw Monthly Report 4/10

edited by **Leon Podkaminer**

- Getting back to business in emerging Europe
- The crisis of the euro area and the need for a structural reform
- Real convergence and price levels in the enlarged European Union
- Hungary after the elections
- Statistical Annex: Selected monthly data on the economic situation in Central and Eastern Europe

wiiw, April 2010
28 pages including 10 Tables
(exclusively for subscribers to the wiiw Service Package)

The Government Expenditure Multiplier and its Estimates for Poland in 2006-2009

by **Kazimierz Laski, Jerzy Osiatynski and Jolanta Zieba**

wiiw Working Papers, No. 63, March 2010
15 pages including 2 Tables and 1 Figure
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

---

wiiw Monthly Report 3/10

edited by **Leon Podkaminer**

- Public debt developments in the CEE countries
- China's quest for oil abroad: between state and market
- Regional development in Bulgaria
- Statistical Annex: Selected monthly data on the economic situation in Southeast Europe, Russia and Ukraine

wiiw, March 2010
32 pages including 16 Tables, 5 Figures and 1 Map
(exclusively for subscribers to the wiiw Service Package)

The Implications of Financial Asset and Housing Markets on Profit- and Wage-led Growth: Some Results in Comparative Statics

by **Amit Bhaduri**

wiiw Working Papers, No. 62, February 2010
14 pages
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

Crisis Is Over, but Problems Loom Ahead

by **Vladimir Gligorov, Peter Havlik, Michael Landesmann, Josef Pöschl, Sándor Richter et al.**

wiiw Current Analyses and Forecasts. Economic Prospects for Central, East and Southeast Europe, No. 5, February 2010
170 pages including 45 Tables and 27 Figures
hardcopy: EUR 80.00 (PDF: EUR 65.00)

---

wiiw Monthly Report 2/10

edited by **Leon Podkaminer**

- China's oil policy: facing the challenge of rising oil demand
- Efficiency improvements in Russian gas-fired heat and power generation
- The Russian labour market: whence stability?
- Statistical Annex: Selected monthly data on the economic situation in Central and Eastern Europe

wiiw, February 2010
32 pages including 11 Tables and 9 Figures
(exclusively for subscribers to the wiiw Service Package)

---

wiiw Monthly Report 1/10

edited by **Leon Podkaminer**

- Twenty years of transition
- Vertical integration of trade with China
- FDI-related profits in the EU: do host countries lose due to FDI?
- Statistical Annex: Selected monthly data on the economic situation in Southeast Europe, Russia and Ukraine

wiiw, January 2010

34 pages including 17 Tables and 8 Figures

(exclusively for subscribers to the wiiw Service Package)

Carbon Capture and Storage: Selected Economic and Institutional Aspects

by **Edward Christie**

wiiw Research Reports, No. 360, December 2009
48 pages including 10 Tables and 10 Figures
hardcopy: EUR 22.00 (PDF: free download from wiiw's website)

Models of BRICs' Economic Development and Challenges for EU Competitiveness

by **Jayati Ghosh, Peter Havlik, Marcos P. Ribeiro and Waltraut Urban**

wiiw Research Reports, No. 359, December 2009
73 pages including 5 Tables, 9 Figures and 1 Box
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

Foreign Direct Investment Flows between the EU and the BRICs

by **Gábor Hunya and Roman Stöllinger**

wiiw Research Reports, No. 358, December 2009
38 pages including 12 Tables, 13 Figures and 3 Boxes
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

---

wiiw Monthly Report 12/09

edited by **Leon Podkaminer**

- Albania: good quarters, bad quarters
- Bosnia and Herzegovina: moderately depressed economy in a climate of political uptightness
- Montenegro: foreign investment continues
- Serbia: fiscal doubts
- Kazakhstan: first signs of recovery
- Statistical Annex: Selected monthly data on the economic situation in Southeast Europe, Russia and Ukraine

wiiw, December 2009

28 pages including 13 Tables

(exclusively for subscribers to the wiiw Service Package)

Trade in Goods and Services between the EU and the BRICs

by **Peter Havlik, Olga Pindyuk and Roman Stöllinger**

wiiw Research Reports, No. 357, November 2009
46 pages including 12 Tables and 24 Figures
hardcopy: EUR 8.00 (PDF: free download from wiiw's website)

wiiw Service Package

The Vienna Institute offers to firms and institutions interested in unbiased and up-to-date information on Central, East and Southeast European markets a package of exclusive services and preferential access to its publications and research findings, on the basis of a subscription at an annual fee of EUR 2,000.

This subscription fee entitles to the following package of **Special Services**:

– A free invitation to the Vienna Institute's **Spring Seminar**, a whole-day event at the end of March, devoted to compelling topics in the economic transformation of the Central and East European region (for subscribers to the wiiw Service Package only).

– Copies of, or online access to, ***The Vienna Institute Monthly Report***, a periodical consisting of timely articles summarizing and interpreting the latest economic developments in Central and Eastern Europe and the former Soviet Union. The statistical annex to each *Monthly Report* contains, alternately, country-specific tables or graphs with monthly key economic indicators, economic forecasts, the latest data from the wiiw Industrial Database and excerpts from the wiiw FDI Database. This periodical is not for sale, it can only be obtained in the framework of the wiiw Service Package.

– Free copies of the Institute's ***Research Reports*** (including ***Reprints***), ***Current Analyses and Forecasts***, ***Country Profiles*** and ***Statistical Reports***.

– A free copy of the ***wiiw Handbook of Statistics*** (published in October/November each year and containing more than 400 tables and graphs on the economies of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Russia, Serbia, the Slovak Republic, Slovenia and Ukraine)

– Free online access to the **wiiw Monthly Database**, containing more than 1200 leading indicators monitoring the latest key economic developments in ten Central and East European countries.

– **Consulting**. The Vienna Institute is pleased to advise subscribers on questions concerning the East European economies or East-West economic relations if the required background research has already been undertaken by the Institute. We regret we have to charge extra for *ad hoc* research.

– Free access to the Institute's specialized economics library and documentation facilities.

Subscribers who wish to purchase wiiw data sets **on CD-ROM** or special publications not included in the wiiw Service Package are granted considerable **price reductions**.

For detailed information about the wiiw Service Package
please visit wiiw's website at www.wiiw.ac.at

To
The Vienna Institute
for International Economic Studies
Rahlgasse 3
A-1060 Vienna

- ○ Please forward more detailed information about the Vienna Institute's Service Package
- ○ Please forward a complete list of the Vienna Institute's publications to the following address

Please enter me for

- ○ 1 yearly subscription of *Research Reports* (including *Reprints*) at a price of EUR 120.00 (hardcopy, Austria), EUR 135.00 (hardcopy, Europe), EUR 155.00 (hardcopy, overseas) and EUR 48.00 (PDF download with password) respectively
- ○ 1 yearly subscription of *Current Analyses and Forecasts* a price of EUR 150.00 (hardcopy, Austria), EUR 155.00 (hardcopy, Europe), EUR 170.00 (hardcopy, overseas) and EUR 120.00 (PDF download with password) respectively

Please forward

- ○ the following issue of *Research Reports* .....
- ○ the following issue of *Current Analyses and Forecasts* .....
- ○ the following issue of *Working Papers* .....
- ○ the following issue of *Research Papers in German language* .....
- ○ the following issue of *wiiw Database on Foreign Direct Investment* .....
- ○ the following issue of *wiiw Handbook of Statistics* .....
- ○ (other) .....

.....

Name

.....

Address

.....

Telephone Fax E-mail

....

Date Signature

Herausgeber, Verleger, Eigentümer und Hersteller:
Verein „Wiener Institut für Internationale Wirtschaftsvergleiche“ (wiiw),
Wien 6, Rahlgasse 3
Postanschrift: A-1060 Wien, Rahlgasse 3, Tel: [+431] 533 66 10, Telefax: [+431] 533 66 10 50
Internet Homepage: www.wiiw.ac.at

P.b.b. Verlagspostamt 1060 Wien