Structural financial instability and cyclical fluctuations

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Abstract

This paper introduces and discusses an heuristic model meant to clarify why and how economic instability may play a crucial role in a modern sophisticated monetary economy. In this model economic instability is specified in terms of structural instability rather than in the usual terms of dynamic instability. This different view of instability implies a different approach to the analysis of the dynamic behaviour of the economic system and of its structural changes. In particular, the qualitative changes in the economic behaviour of the economic system are seen not as purely exogenous as in the received view but as essentially endogenous. This approach is applied to the analysis of financial crises and of their impact on the fluctuations of a sophisticated monetary economy. The crucial variable, the degree of financial fragility of the economic units, is specified in terms of structural instability, and this implies that, beyond certain thresholds of its value, the qualitative characteristics of their dynamic behaviour change radically in such a way to produce cyclical, though fairly irregular, fluctuations. The interplay between these microeconomic fluctuations is sufficient to produce cyclical macroeconomic fluctuations whose characteristics and implications for policy are briefly examined. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

A prima facie unstable behaviour of crucial economic variables is often observed in the real economies but is rarely taken seriously by economic theory. As we have tried to argue elsewhere (Vercelli, 1991), this depends not only on the prevailing emphasis on equilibrium of contemporary economics but also on its one-sided understanding and treatment of instability that is exclusively conceived in terms of dynamic instability without a due consideration of structural instability which in my opinion plays a crucial role in modern sophisticated monetary economies\(^1\). Therefore, in the traditional view, the observed unstable processes are interpreted either as temporary deviations from equilibrium that do not affect the basic equilibrium trends of the economy, or as disequilibrium paths in proximity of a stable equilibrium which may exert an influence on the quantitative features of equilibrium trends but not on their qualitative characteristics.

There is a tradition of thought rooted in the contributions of authors such as Keynes, Schumpeter, Hicks, Goodwin and Minsky that has taken economic instability as a basic structural feature of a sophisticated monetary economy that crucially affects its behaviour (Vercelli, 1997). However the impact of this vision has been severely limited by the conceptual and analytic specification of instability in terms of dynamic instability which has clouded its structural implications. In this paper the pre-analytic vision that gives a crucial role to economic instability is specified in terms of structural instability in order to show its impact on the dynamic behaviour of the economic system and on its structural changes.

The usual, purely dynamic, approach to the analysis of economic instability sharply separates the analysis of the dynamic behaviour of a system, under the assumption of a given and invariant structure, from the analysis of structural change which is conceived as purely exogenous; in this approach dynamic instability plays the role of explaining the endogenous, i.e. disequilibrium, dynamics of the system which is typically triggered by a disequilibrating shock. On the contrary the approach here outlined is grounded on the basic concept of structural instability in order to coordinate the exogenous determinants of the structural change and the dynamic behaviour of the system with its endogenous factors; in this view the impact of the exogenous factors (perturbations) depends not only on their size and nature but also on the structural characteristics of the system as there are

\(^1\) According to the received view an economic system is unstable whenever, in consequence of a shock that displaces it from its equilibrium position, it tends to diverge progressively from equilibrium. In this view the instability of a system depends exclusively on its dynamic behaviour in reference to a given equilibrium configuration while the functional and parametric structure of the model remains unchanged. Since, contrary to the received view, this concept of instability is not exhaustive, it is advisable to specify it as dynamic instability. The analysis is here focused on a different concept of instability that will be called structural instability. Let’s define a system as structurally unstable whenever in consequence of a small shock, it undergoes a sizeable and abrupt change in its functional and parametric structure which alters the qualitative properties of its dynamic behaviour. (The distinction between dynamic and structural instability and its implications for economic analysis are spelled out in some detail in Vercelli, 1991, chapters three and four).
well-specified thresholds beyond which the qualitative features of the system’s
dynamics radically change; the endogenous factors of the system’s dynamics are not
limited in this case to disequilibrium dynamics but include also the structural
features of the system which may change beyond certain thresholds either in
consequence of the endogenous dynamics or in consequence of a perturbation or
both.

The approach to structural change suggested in this paper does not necessarily
imply any sort of disaggregation and is therefore particularly efficient as a reduced-
form description of structural change in macroeconomic processes. Of course, as
soon as the black-box of structural change is opened, disaggregation has to be
introduced. However the fundamental problem of a satisfactory integration be-
tween the macro-dynamic and the disaggregated approaches to structural change
analysis is not going to be discussed in what follows. The purpose of this paper is
only that of trying to contribute to the clarification of the suggested approach by
outlining an heuristic model of the influence of financial structural instability on
cylical fluctuations in a sophisticated monetary economy.\(^2\) The specific role of this
heuristic model is that of sketching the general design of a bridge between the
Keynes–Minsky pre-analytic vision of financial instability on one side and, on the
other side, the general directions for working out fully-fledged analytical models
capable of specifying in precise and falsifiable terms financial instability not in
terms of dynamic instability, as usual, but in terms of structural instability. This
heuristic model cannot be claimed to be realistic since the list of simplifying
assumptions is too long to allow a direct application to empirical evidence. The
purpose is just that of representing an artificial economy suitable to analyse a few
basic aspects of sophisticated monetary economies which remain concealed in the
existing models. This is a well-known methodological strategy already successfully
pursued in the past, in particular by Wicksell (1936) with his heuristic model of a
pure credit economy.

The structure of the paper is as follows. In the second section the concept of
financial fragility is discussed in the light of the distinction between dynamic and
structural instability. In the third section the concept of financial fragility is defined
in reference to a representative financial unit, showing that the feedback between
the current cash flows and financial fragility in principle determines cyclical
fluctuations in its dynamic behaviour. In the forth section it is shown how the
interaction between the current and expected cash flows of financial units deter-
mines cyclical fluctuations in the financial aggregates of the entire economy which

\(^2\) I have argued elsewhere (Vercelli, 1991) the crucial importance of specifying an heuristic model of
the kind of that presented in this paper as a bridge between the pre-analytic vision (in the sense of
Schumpeter (1954)) and the analytic models which specify in a precise and fully rigorous way
well-defined aspects of the heuristic model. The heuristic model is a sort of weak formalisation of the
pre-analytic vision which aims to keep an intuitive control of the meaning of the model and of its results
renouncing to a full quantitative specification of the model and of its implications but giving a general
code for working out fully-fledged analytic models which specify with precision a few aspects of the
heuristic model. There is a clear trade-off between the greater rigour and quantitative precision of an
analytic model and the wider scope and deeper intuitive and conceptual control of the heuristic model.
are likely to affect the timing of the real cyclical fluctuations. In the fifth section a few implications of the suggested approach for economic analysis and policy are briefly discussed. In the concluding section a preliminary assessment of the limits and promises of the approach here outlined is tentatively sketched.

2. Concepts of instability and financial fragility

As is well known, any flow of goods between two traders is accompanied by an opposite flow of money. Mainstream economic theory has focused the analysis mainly on the flows of goods, while the flows of money have been considered as a veil or as the object of a second-stage analysis which may qualify the first-stage real analysis without substantially altering it. This is true in particular for the greater part of received theories of cyclical fluctuations which have been mainly developed in real terms; money has been seen as a passive variable or as a source of real disturbances unable to affect in a crucial way the manner in which the economy works. Therefore the received wisdom has often clouded the central role played by money and financial relations in determining the cyclical fluctuations of modern industrial economies which are characterised by increasingly sophisticated financial relationships. In this paper we intend to develop the germs of a different formal approach which focuses on the monetary flows and financial relationships between traders. The elementary heuristic model worked out in order to clarify this approach is not less unilateral than the usual ones, though in a complementary way; however we hope that it may contribute to a better understanding of a few neglected aspects of the role of money and financial relations in the cyclical fluctuations of a sophisticated monetary economy.

The approach outlined is grounded in a vision of the working of a sophisticated monetary economy which owes much to that put forward by Minsky (1975, 1982, 1986) and his main inspirers (in particular Keynes (1936) and Schumpeter (1934)). However the heuristic formalisation here suggested of this vision is quite different from that suggested by Minsky himself (Minsky, 1957, 1959 and the appendix of Minsky, 1986) and by the subsequent literature inspired by his contributions (e.g. Foley, 1987; Sethi, 1992), since the intrinsic financial instability of a sophisticated monetary economy is formalised in terms of structural instability rather than in terms of the usual assumption of dynamic instability.

Modern industrial economies are liable to recurrent financial crises. To wit, in the case of the USA the prodromes of a serious financial crisis manifested in 1966, 1970, 1974–75, 1979–80, 1982, 1984–85, etc. In these occasions the premonitory

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3 A recent example has been the so-called theory of ‘real business cycles’ initiated by Kydland and Prescott (1982) which has been very influential in the last 15 years.

4 The formalisations of the concept of financial instability suggested by Minsky are discussed in Vercelli (1999) where it is claimed that the concept of structural instability clearly emerges from them, though in a not fully explicit way.
signs of a generalised financial crisis, though somehow controlled and aborted, have been effective enough to depress the real activity of the economy by reducing the liquidity and wealth of economic agents and by deteriorating their expectations. Therefore the most severe financial crises have triggered a domestic slump which have often produced sizeable international spillovers as in the case of the financial crises in Mexico in 1982 and in 1995, and in the Far-East in 1998. Also the booms have been triggered and/or sustained by favourable financial conditions which have often given birth to speculative bubbles in the financial markets. The financial conditions of economic units have triggered downward and upward cumulative processes due to their strict interdependence: the cash outflows of a unit are cash inflows of other units, and — ceteris paribus — the increases (decreases) of cash inflows of a unit produce an analogous increase (or decrease) in its cash outflows.

These cumulative processes play an important role in explaining the observed auto-correlation between the deviations from the trend which defines in empirical terms the economic cycle. Moreover, the financial side of these cumulative processes helps explaining their observed asymmetry, i.e. the fact that the downward cumulative process which characterises the crisis is, generally speaking, sharper and shorter than the upward cumulative process which characterises the boom. The insolvency, and eventually bankruptcy, of the most financially fragile economic units triggers a downward chain reaction, often called ‘debt-deflation process’, which does not have a counterpart in the boom as the increase in the flow of new entrant firms induced by euphoric expectations is bound to have a slow and progressive effect.

The behaviour of financial units over the cycle crucially depends on their financial fragility (or instability) which determines the size and direction of their response to a changing environment and to unexpected shocks; the financial fragility of economic units depends in its turn on the evolution of the cycle which crucially depends on the average degree of financial fragility of the entire economy. Despite a wide agreement on its crucial role, the concept of financial instability has been rarely analysed in some depth and even more rarely formalised. In the absence of a deep clarification of its meaning, financial instability has been generally interpreted and formalised in terms of the usual concept of dynamic instability. However the concept of financial instability, and even more clearly the synonym ‘financial fragility’, evokes the idea of a possible sizeable and abrupt change in the functional and parametric structure of the unit which forces it to change the qualitative characteristics of its dynamic behaviour. The more financially fragile is a certain economic unit the smaller is the shock which may induce insolvency and eventually bankruptcy, which force it to change radically its financial behaviour. In order to model this idea we have to resort to a different concept of instability which we have called ‘structural instability’. Let’s define a system as structurally unstable whenever in consequence of a small shock $\epsilon$, it undergoes a sizeable and abrupt change in its functional and parametric structure which alters the qualitative
properties of its dynamic behaviour. Financial instability is often called ‘financial fragility’ in order to stress the pathological implications of this property. The degree of financial instability (or fragility) may be measured by the minimum size of the shock \( \varepsilon \) which triggers a structural change with the characteristics defined above.

The pathology of financial instability is usually represented in terms of progressive divergence from an equilibrium having optimal, or at least desirable, properties. However this view does not seem able to capture the essential features of financial fragility and of its influence on the economy, since it ignores the structural changes induced by financial fragility to the financial structure and behaviour of the economic units and of the economy as a whole. These structural changes seem to me the crux of the matter but remain out of focus if we adopt the usual approach based exclusively upon dynamic instability. Therefore we are going to suggest the basic outlines of a different approach based upon structural instability which posits structural changes at the centre of the analysis. This shift of perspective is bound to have not negligible implications for economic cycles analysis and policy which will be spelled out in Section 5.

3. The financial units

In the sophisticated monetary economy under consideration all the decision makers are seen as financial units. This is particularly suitable for banks and other financial institutions and fairly suitable for firms; the assumption is more difficult to swallow for the sector of households, though their financial behaviour is becoming increasingly important in the most advanced economies such as the USA. In any case, as usual, the utility of this abstraction may be better assessed by evaluating the results which may be drawn from it. For the time being we stress that in the approach here suggested the traditional sovereignty of the consumer steps back from the front stage while the crucial role is played by financial indexes and constraints. The focus is on the interaction between the decisions of financial units and the financial constraints of their behaviour without entering into the details of their decision process. If the general picture which is going to emerge makes sense, appropriate decision-theoretic foundations are to be worked out in the future.

Each financial unit \( i \) is characterised in each period \( t \) by a sum of cash outflows \( e_{it} \) which correspond to its purchases of goods and services, and cash inflows \( y_{it} \) which correspond to the sum of sales of goods and services which were in its possession at the beginning of the period. For our purposes a crucial role is played

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5 We have distinguished elsewhere Vercelli (1999) between three different concepts of structural instability: structural instability in the strict sense as defined by mathematics where the shock \( \varepsilon \) is infinitesimal (Andronov et al., 1937), \( \varepsilon \)-instability when the shock is small but finite, and parametric instability when the structural change in the parametric structure of the system does not involve a qualitative change in its dynamic behaviour. The concept of structural instability here utilised is that of \( \varepsilon \)-instability.

by the current financial ratio, i.e. the ratio between total outflows and total inflows realised by the financial unit in a certain period:

\[ k_{it} = \frac{e_{it}}{y_{it}} \]

The ratio \( k_{it} \) may easily assume a value \( > 1 \) and sustain it for many periods provided that it is properly financed by the unit \( i \); of course this implies a corresponding reduction in the stock of cash balances or an increase in the stock of debt or a mix of the two, and this affects the financial constraints faced by the unit in the future. We stress at this point a severe limitation of the model which is going to consider explicitly only the cash flows realised in a certain period or expected in future periods, while the impact of these flows on the stocks owned by financial units is not going to be explicitly modelled. In this pure-flow economy the crucial variable that defines the financial viability of an economic unit may therefore be expressed in a very simple way as the intertemporal financial ratio between the sum of discounted expected outflows \( e^*_{it} \) and the sum of discounted expected inflows \( y^*_{it} \), both discounted in the usual way on the basis of the current rate of interest within a given time horizon \( m \):

\[ k^*_{it} = \frac{\sum e^*_{it+n}(1+r)^n}{\sum y^*_{it+n}(1+r)^n}, \quad 0 \leq n \leq m. \]

We may define the following condition of financial sustainability:

\[ k^*_{it} \leq 1. \quad (1) \]

This condition may be violated in the short run by a certain economic unit only by reducing its cash and capital reserves so that for any unforeseen shock the maximum horizon of sustainability is limited by the size of its reserves; however when the condition is violated the horizon of sustainability gets easily much shorter as the creditors of the unit typically react by withdrawing their support to the unit. Therefore, whenever the condition (Eq. (1)) happens to be violated by an economic unit, it reacts as soon as possible by reducing \( k_{it} \) under 1 in order to reduce the value of \( k^*_{it} \) and to avoid insolvency and bankruptcy. The relationship between \( k_{it} \) and \( k^*_{it} \) goes also in the other direction: whenever \( k^*_{it} \) has a value safely under the unity there is room for values of \( k_{it} \) greater than one in order to exploit the existing economic opportunities under the pressure of competition. The crucial feedback between the current and the intertemporal financial ratios is of course affected by the state of long-run expectations and by exogenous shocks which may affect the rate of interest and expectations themselves.

The financial fragility of a unit depends on its direct sensitivity to financial markets, namely to unexpected increases in the interest rate, and on its direct

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\(^7\) The mechanism of formation of expectations is not going to be specified in the heuristic model outlined in this paper. This is one of the shortcomings that should be remedied in order to develop a satisfactory analytic model based on it. Sethi (1992) argues convincingly that the financial instability hypothesis advanced by Minsky is not compatible with the rational expectations hypothesis but is consistent with a more sophisticated hypothesis of rationality in the behaviour of decision makers.
sensitivity to real markets, namely to unexpected falls in the rate of profit. In addition it depends on the expectations over future cash flows. As for the direct sensitivity to financial markets we follow Minsky in classifying the units into three categories characterised by increasing sensitivity: hedge, speculative, and Ponzi financing units. Hedge units are immune to unexpected increases in the interest rate as these are unable by themselves to make $k^* \alpha$ greater than one. Speculative units are vulnerable to unexpected developments in the financial markets since an unexpected increase of the interest rate may change the value of one or more terms of $k^* \alpha$. Ponzi units are even more vulnerable to financial markets since an increase of the rate of interest may prevent in some period, typically the early ones, the repayment not only of the principal but even of the interest. The direct financial dimension of financial fragility may be measured by the minimum size of the financial shock which makes $k^* \alpha$ just greater than one. The ‘real’ dimension of financial fragility which measures the direct sensitivity to unexpected falls in the profit rate may be measured by the minimum size of the shock which ceteris paribus just downgrades the unit from hedge to speculative, or from speculative to Ponzi, or from Ponzi to virtual insolvency; this affects indirectly also the sensitivity of the unit to direct financial shocks and its overall financial fragility. Therefore in order to assess the financial fragility of a unit we need a third measure: the minimum size of a, possibly combined, shock which would make $k^* \alpha$ just greater than one.\(^8\) This combined index of financial fragility within our conceptual framework is the most important index of financial fragility because even a hedge unit may be very fragile in this, more comprehensive, definition of financial fragility. Let’s suppose that an hedge unit is characterised by terms which are all equal to one; it is evident in this case that, if changes in the rate of interest cannot jeopardise, by themselves alone, the solvency of the unit, an infinitesimal shock originating in the real market would be sufficient to provoke this result; on the contrary a speculative unit could be made insolvent only by a very large, and unlikely, increase in the rate of interest. As this example shows, the Minskyian classification gives useful information on the relative sensitivity of financial units to different kinds of shocks but may be misleading as an ordering meant to measure synthetically the financial fragility of units. Therefore in the sequel we are going to measure the financial fragility of a unit in terms of the combined index suggested before.

Each unit defines a threshold of financial fragility $1 - \mu_i$ beyond which it does not want to go (see Fig. 1), taking into account the risk of its activities and its degree of risk aversion. Therefore, as soon as an unexpected shock pushes the unit beyond the threshold, it reacts by reducing $k^* \alpha$ in order to increase its current liquidity or to reduce its extant debt in order to reduce $k^* \alpha$. On the other hand, whenever it is within the safe zone ($k^* \alpha < 1 - \mu_i$) generally speaking the pressure of competition pushes it to increase the size of investment which implies an increase in $k^* \alpha$. An increase in $k^* \alpha$ in principle deteriorates $k^* \alpha$ by increasing the debt or by decreasing its cash balances. The feed-back between $k^*_\alpha$ and $k^*_\alpha$ may be represented by a very

\(^8\) The size of different shocks may be combined by measuring each of them in terms of its effects on $k^*_\alpha$. 

simple discrete-time heuristic model which aims to help an intuitive perception of the main causal relations:

\[ \Delta k_{it}/k_{it} = \alpha (k_{it}^* - 1 + \mu_i) + \varepsilon, \quad \alpha < 1; \]
\[ \Delta k_{it}^*/k_{it}^* = \beta (k_{it} - 1) + \eta_i, \quad \beta > 1, \]

where \( \Delta \) designates the time difference of the variable, while \( \varepsilon \) and \( \eta \) designate exogenous shocks. As is well known a system of difference equations of this kind exhibits a wide variety of possible dynamic behaviour including chaos (for a clear synthesis, see e.g. Lauwerier, 1986). This is fully consistent with the pre-analytic vision inspiring this heuristic model and with the available evidence which suggest that the economic units are characterised by quite irregular fluctuations. A simple inspection of the phase diagrams of this specific model (of the well-known Lotka–Volterra type) immediately shows that, on the basis of the feedback described before and represented in the most simple way by the model, a financial unit tends to fluctuate in a clockwise direction around \( o_i \) (see Fig. 1). We do not need for our purposes to specify for what values of the parameters \( o_i \) is a centre or a stable or unstable focus. An analytic model based on this heuristic model should be specified in such a way that a small shock should be sufficient to change the behaviour of the unit from stable to unstable and vice-versa, contributing to the structural instability of the system, without necessarily excluding time-spells of chaotic behaviour. The persistence of these irregular fluctuations is understandable within this conceptual framework since an unstable spiral would soon deteriorate the financial health of the unit inducing stabilising decisions, while a stable spiral is likely to be de-stabilised sooner or later by unexpected shocks. Summing up it is reasonable to assume that the behaviour of the financial units is characterised by fluctuations that are tendentially cyclical but not very regular as they are affected by the shocks \( \varepsilon \) and \( \eta \) and by control decision of the financial units themselves and of the policy.

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9 The choice of a formalisation in terms of discrete time is particularly suitable for an heuristic model since it helps one to keep an intuitive perception of the main causal relations involved in the argument.
authorities that, for the sake of simplicity, have not been explicitly modelled here. These fluctuations are often, but not necessarily, correlated with the macroeconomic cycle as the boom produces unexpected increases in inflows and the crisis unexpected reduction in inflows and for the pro-cyclical behaviour of expectations (see Section 5). The less cautious (or less lucky) units are easily pushed by unexpected shocks which trespass the threshold $\mu$ into the zone characterised by financial unsustainability (i.e. where $k_{it}^* > 1$). If these units do not succeed to come back very quickly in the region of financial sustainability they are bound to become virtually insolvent. Unless they are somehow bailed out, their insolvency triggers a debt-deflation process which characterises the most severe financial crisis: the insolvency of the first unit sharply reduces the actual and expected inflows of other financial units so increasing their $k_{it}$ and $k_{it}^*$ and pushes them into the unsustainable zone, and so on. In each period it is unavoidable that, in consequence of unexpected shocks, a certain number of units (mainly industrial and commercial firms) become insolvent and a few of them go bankrupt, but the margins of safety of most units are sufficient to bear the shocks. In the case of financial crises the number of insolvent units and their size is such that the safety margins progressively breaks down unless the debt-deflation process is promptly aborted by energetic policy measures (see Section 5).

4. Macroeconomic fluctuations

The fluctuations of financial units described in the preceding section may help to explain the cyclical fluctuations which characterise a sophisticated monetary economy. The fluctuations of single units are quite irregular in amplitude and period as they are affected by a host of specific factors which may change sharply from case to case. The interaction between the units and the process of aggregation of their behaviour lead to macroeconomic cyclical fluctuations that are likely to exhibit a more regular pattern. This depends on a pronounced degree of correlation over the cycle between the financial fluctuations of many units which depends on the network of financial links which connects them; the outflows of a unit are inflows of other units (from which it buys goods and services or it has to repay a debt), the outflows of which are inflows of other units, and so on. Since a fall (increase) in inflows of a certain unit ceteris paribus induces a fall (increase) in outflows in order to keep $k_{it}$ and $k_{it}^*$ close to their desired values a fall (increase) in inflows is tendentially transmitted to other units. Therefore by aggregating the inflows and outflows of the single units we obtain the following model which represents the aggregate fluctuations of the entire economy to the extent that they are determined by financial constraints:

$$\Delta k_{it}/k_{it} = \alpha (k_{it}^* - 1 + \mu) + \varepsilon, \quad \alpha < 1;$$  \(4\)

$$\Delta k_{it}^*/k_{it}^* = \beta (k_{it} - 1) + \eta, \quad \beta > 1.$$  \(5\)
This model is consistent with cyclical fluctuations of the endogenous variables which are qualitatively altogether similar to the micro fluctuations described by the model characterised by Eqs. (2) and (3), apart from a likely greater regularity produced by aggregating correlated individual behaviours. However also in this case there is no reason to believe that the economy remains close to a limit-cycle (see Fig. 2 where, for the sake of simplicity, a possible time path of the system is drawn as continuous). However it is reasonable to assume that the representative point never enters in the unsustainable zone since this event would be prevented by any means, even by extreme policy measures such as the adoption of negative real interest rates or hyperinflation. However, under given circumstances the representative point may turn back very near the dividing line which implies that a sizeable share of financial units would fall in the unsustainable zone so triggering a dangerous process of debt deflation. In the absence of vigorous policy measures meant to abort the process (see Section 5) the economy may fall in a persistent state of acute depression as in the great depression of the 1930s.

We intend now to analyse in qualitative terms the implications of this cyclical mechanism based on current and intertemporal cash-flow rates, for the overall financial aggregates of the economy. The aggregate outflows $E_t$, which sums up the private aggregate expenditure $E'_t$ with the public expenditure $\Delta M_t$, translate into aggregate inflows $Y_t$ because the cash outflow of the buyer is identically equal to the cash inflow of the seller (whether the object of the transaction between them is a consumption good or an investment (real or financial) good. On the contrary the cash inflows of a unit do not need to feed outflows of an equal magnitude within the period. We may assume, for the sake of simplicity, that there is a lag of one period between realised inflows and the realised outflows which take account of them. Their ratio $k_t = E'_t / Y_{t-1}$ describes the marginal propensity to cash expenditure of the private units of a certain economy in the period $t$. Moreover, in our

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10 We are not going to discuss in this paper the problems related to the procedure of aggregation leading from the outflows and inflows of individual units to the aggregate values of outflows and inflows.
A model economy two public units have been introduced: the ‘Government’ and the ‘Central Bank’. The outflows of the Government are given by the purchases from the private units of good and services which characterise the public expenditure $G$, and the purchase by the Central Bank of bonds $\Delta B$ owned by private units, while the inflows are given by $T$, taxes and fees paid by the private units to the Government as a counterpart of the public goods and services provided, and by public bonds sold by private units to the Central Bank. Therefore the exogenous component of aggregate outflows is given by the deficit spending of the Government $D_G T$ which is financed by issuing public bonds\(^\dagger\) and by the net effect of open market operations by the Central Bank $\Delta B$. Under the present assumptions the sum of the cash value of deficit spending and of the net effect of open market operations measures the exogenous change in the stock of money circulating in the private sector of the economy $\Delta M$:

$$\Delta M = D + \Delta B.$$  

We may now represent the dynamic behaviour of cash flow aggregates through the following elementary model (see Fig. 3 for a representation in terms of block diagrams):

$$Y_t = E_t \quad \text{(6)}$$

$$E_t = k_t Y_{t-1} + \Delta M. \quad \text{(7)}$$

The dynamic behaviour of this model depends on the cyclical fluctuations of $k_t$ as described by Eqs. (4) and (5) and represented in Fig. 2, and by the sign of $\Delta M$. We have to distinguish an inflationary regime when $\Delta M > 0$ (represented in Fig. 4) and a deflationary regime when $\Delta M < 0$ (represented in Fig. 5). In both diagrams we have depicted likely paths (from the qualitative point of view) followed by this model economy. In both cases we have cyclical fluctuations which are characterised, generally speaking, by upward dynamic instability in the boom phase and down-

\(^\dagger\) What is said in the text is literally true only if we assume that the public debt is integrally monetised, i.e. if the public debt issued by the Government to finance its deficit spending is ‘bought’ by the Central Bank. The current model does not have enough structure to allow a more detailed analysis of the effects on aggregate cash flows of different ways of financing the public debt. However in what follows what is important is only the sign of $\Delta M$. 
ward dynamic stability in the depression phase. However, in the inflationary regime there may be an expansion characterised by upward dynamic stability which endogenously transforms itself in an expansion characterised by upward dynamic instability in consequence of the progressive increase in $k_t$ triggered by the expansion itself on the basis of the mechanism described by Eqs. (4) and (5). Moreover, and this is the most important difference, in the case of a deflationary regime the
economic system may be trapped into a path of downward dynamic instability such that it would continue to deflate notwithstanding a value of $k_t$ greater than one. A ‘deflationary trap’ of this kind may have characterised the Great Depression of the 1930s and perhaps some of the most severe subsequent financial crises (see Section 5), however — also because of this experiences — modern industrial economies have managed to avoid to fall in a deflationary regime and therefore to be framed into a deflationary trap. Let’s therefore concentrate the attention on the inflationary regime which may be considered as the usual or normal case starting the analysis of the typical cycle from the recovery characterised by downward stability which implies a further reduction of $k_t^*$, but a decelerating rate and a progressive increase of $k_t$ which pushes up the equilibrium triggering the boom. The transition from the recovery phase to the boom is characterised by a radical structural change which modifies the dynamic characteristics of the system: the equilibrium suddenly shifts in the third quadrant becoming unfeasible and becomes at the same time dynamically unstable. In the boom both $k_t$ and $k_t^*$ increase until $k_t^*$ enters into the dangerous zone. This triggers a financial crisis characterised by a sharp fall in $k_t$, in order to reduce the financial fragility of the economy; while — notwithstanding the efforts of the individual units — in this phase $k_t^*$ still increases in consequence of the interaction between downsizing units and the influence of the debt-deflation mechanism triggered by the increase of insolvent units. As soon as $k_t$ succeeds in becoming smaller than unity the recovery may begin. The transition from the crisis to the depression is again characterised by a radical structural change which is inverse to that leading to the shift from the recovery to the boom: the equilibrium switches again in the first quadrant and becomes dynamically stable. As soon as $k_t^*$ manages to get out of the dangerous zone, the recovery starts as $k_t$ may increase under the pressure of competition and the financial solidity may continue to increase.

What we have seen so far is an elementary heuristic model describing the cyclical fluctuations of the private sector of an economy seen exclusively from the point of view of its financial constraints, namely exclusively in reference to the actual and expected cash flows of financial units. The results obtained cannot be immediately and light-heartedly translated in terms of the usual aggregates which characterise the received macrodynamic approach to economic cycles. However, no doubt, cash flows are nothing but the financial side of real transactions; therefore the results obtained through the above model of financial cycle have a bearing on the usual real aggregates. In order to understand the real implications of the financial cycle we need assumptions on the real behaviour of the financial units and on the cyclical behaviour of specific real aggregates, namely consumption and investment in its main components. In this paper we limit ourselves to a few preliminary hints on the line of research which may be pursued in the methodological perspective outlined in this paper. If we adopt the usual assumption that consumption is relatively stable throughout the cycle, the fluctuations of $k_t$ depend mainly on investment which is strictly correlated to $k_t^*$. The financial fragility of an economy increases in the boom exactly because investment increases sharply as it is pushed by euphoric expectations and by a cash flow multiplier $k_t$ greater than one; the ensuing increase
in both $k_t$ and $k_t^*$ somehow captures in this framework the implications of the accelerator mechanism. However the model here presented does not have enough structure to discriminate between real and financial investment. Therefore in the absence of an apt portfolio theory we cannot establish to what extent the fluctuations of investment have real effects. The next step of the preliminary analysis here suggested is the coordination of the model here presented with a portfolio theory sensitive to financial constraints and therefore consistent with the theory here outlined. In any case the financial approach here sketched may play a role in understanding the timing and the asymmetries of the cyclical fluctuations of a sophisticated monetary economy, in particular as far as financial crises are concerned.

5. Remarks on a few implications of the suggested approach for analysis and policy

The main purpose of the paper is the conceptual clarification of an approach to cyclical fluctuations which is quite different from the traditional ones.

The heuristic model suggested in this paper is in a sense the polar opposite, both in method and in substance, of that underlying the real business cycle approach which has dominated economic research in the last 15 years (see footnote 3). The real factors of cyclical fluctuations are here considered exclusively as a source of financial disturbances (unexpected falls in profits and therefore in the cash inflows of a certain unit), while the financial factors, ignored or underplayed in real business cycle models, are central. The approach presented is also sharply different from that underlying the monetary business cycle approach (initiated by Lucas, 1975, 1981) which has been very influential in the late 1970s and early 1980s as the crucial role of money is not restricted to the transmission of shocks produced by a discretionary monetary policy and would persist even under fixed monetary rules, while what is really important is the interplay of the financial constraints of decision units over the cycle. As for the method, it is in sharp contrast with that of both streams of equilibrium business cycles since the path of the economy typically develops outside equilibrium that may be reached only for a fleeting instant, while dynamic and, above all, structural instability play a crucial role.

The approach here outlined is more similar to the macrodynamic approach (started by Samuelson, 1939) which has dominated in the literature after the General Theory and before the take-over by the equilibrium business cycle approach since the dynamic path of the whole economy is based on behavioural rules which do not imply the continuous maximisation of the objective function of the individuals and therefore equilibrium is not granted throughout the cycle. In particular in this view the economic cycle is produced by the interactions of two basic behavioural rules, the multiplier and the accelerator, the financial version of which play a crucial role also in the approach here suggested. As we have seen, the second part of the model (Eqs. (6) and (7)) may be interpreted as the financial counterpart of the multiplier, while the pro-cyclical behaviour of $k_t^*$ captures the pronounced pro-cyclical behaviour of the investment with some analogy with the
accelerator. However, the orthodox macrodynamic approach sees the cycles as fluctuations around a dynamically stable equilibrium and completely neglects structural instability while in the present approach a feasible equilibrium does not always exist and instability, both dynamic and structural, plays a crucial role. The closest analogy may be found with the heterodox macrodynamic approach which is based on the dynamic instability of equilibrium contained by floors and ceilings (initiated by Goodwin, 1951; Hicks, 1950). However in the present approach the upper and lower turning points of the cycle are mainly endogenous while nothing prevents the addition of ceilings and floors when the values of $k_t$ and $k^*_t$ overcome given thresholds. In addition a feasible equilibrium does not always exist and when it exists it is not always dynamically stable; what determines the dynamic properties of the system and its sharp structural changes is its structural instability which depends on its financial fragility.

The approach to cyclical fluctuations here suggested has interesting implications also for policy. First it is consistent with the opinion expressed by Keynes that the best regime for the ordered explication of economic activity in sophisticated monetary economies is a slightly inflationary one (see, e.g. Keynes, 1936, p. 271). This does not imply an endorsement for inflationary policies whose social costs cannot be studied within this.fixed price model but which are well known; in any case the argument in favour of an inflationary regime based on the present model supports only a stable and very moderate rate of inflation not superior to, say, 1–2%. As for contracyclical policies, while the equilibrium business cycle approach considers them useless if not counterproductive and the orthodox macrodynamic approach considers them in principle capable of stabilising the economy, the present approach does not deny some role for contracyclical policies in moderating the cycles but denies that they are able to tackle the crucial cause of cyclical fluctuations: structural instability. This may be mitigated and controlled only by structural measures able to act on the cyclical behaviour of $k_t$ and $k^*_t$ such as more efficient rules of prudential regulation of the most important financial units. A thorough discussion of the most efficient structural measures to be taken to stabilise an economy characterised by structural instability requires a more detailed model which enters into the institutional, organisational and technological details of a certain economy clearly localised in time and space and goes therefore beyond the scope of this paper. The family of models that explains cyclical fluctuations as a consequence of the imperfections of financial markets (see e.g. Greenwald and Stiglitz, 1993)\textsuperscript{12} is of particular interest for the heuristic model here outlined. The synthesis between these two approaches seems to me particularly promising.

\textsuperscript{12} In this paper, in particular, the 'uncertainty shocks' determine shifts of the basic functions of the model that may be interpreted in terms of what I have called elsewhere Vercelli (1999) weak structural instability, or parametric instability.
6. Concluding remarks

The heuristic model presented and discussed in this paper has aimed to suggest the preliminary step of a formal approach to the study of cyclical fluctuations in a sophisticated monetary economy quite different from the existing formal approaches. The limitations of the analysis developed in this paper are quite severe: we recall in particular the assumption of exogenous prices, the missing distinction between real and financial investment and between different categories of units (households, firms, banks, etc.), the separation between cyclical fluctuations and development. If the approach here outlined can withstand fundamental criticisms, these and other limitations must be removed in order to work out fully-fledged analytical models which would allow a safe descriptive or prescriptive application to the real world. However an accurate scrutiny of the potential virtues of the approach here suggested may be justified since it promises to capture an aspect of modern economic activity which is becoming increasingly important in sophisticated monetary economies but is neglected or underplayed in existing approaches to economic cycles: the crucial impact of financial structural instability on the cyclical fluctuations of the entire economy. Increasing productive and technological flexibility is obtained through financial institutions and devices that increase at the same time the financial fragility of the economy; therefore the source of cyclical fluctuations discussed in this paper is becoming increasingly important in the real world.

This paper has tried to show in particular why and how the endogenous cyclical fluctuations of financial fragility may produce recurrent financial crises and affect the timing of the real cyclical fluctuations of the whole economy. The exact structure and measure of the real effects of financial crises and fluctuations depend on a host of factors which have been completely ignored in this paper: the policy rules adopted in a certain economy, its technological and institutional structure, its consumption and investment behaviour, etc. However, what has been stressed by the suggested heuristic model is that the financial fluctuations change in a crucial way the environment to which the economy has to adapt. In order to understand why and how this happens we need a method radically different from the prevailing one in cycle theory, i.e. a method able to analyse the crucial role of disequilibrium behaviour, instability and structural change in a sophisticated monetary economy. In this paper we have tried to move a preliminary step in this direction.

References

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