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Η δανειακή συμπεριφορά των τραπεζών κάτω από ρυθμιστικό πλαίσιο

Στέλιος Καραγιάννης, Γιάννης Παναγόπουλος και Αριστοτέλης Σπηλιώτης

ΠΕΡΙΛΗΨΗ

Το συγκεκριμένο άρθρο έχει ως σκοπό να διερευνήσει τις συνέπειες από την εφαρμογή της Βασιλείας ΙΙ σε ότι αφορά την ενδογένεση ή μη της προσφοράς χρήματος στο τραπεζικό σύστημα των επτά μεγαλύτερων οικονομιών (G7). Αναλυτικότερα, η εφαρμογή των κανονισμών και αρχών της Βασιλείας ΙΙ δημιουργεί έναν νέο τρόπο παρουσίασης του υπάρχοντος νομισματικού και πιστωτικού περιβάλλοντος. Ο τρόπος αυτός μπορεί να συνοψισθεί εδώ στην εκτίμηση των δύο παρακάτω παραγόντων :

Α) Ενός πολλαπλασιαστή ιδίων κεφαλαίων των τραπεζών αλλά και

Β) Ενός νέου πολυμεταβλητού πιστωτικού μοντέλου (ή μοντέλου δανειακού χαρτοφυλακίου) του τραπεζικού συστήματος.

Τα οικονομετρικά αποτελέσματα από την εκτίμηση των δύο αυτών παραγόντων (ή φάσεων Α και Β) θα κάνουν πιο ξεκάθαρο το υπάρχον νομισματικό πλαίσιο λειτουργίας, του τραπεζικού συστήματος των επτά μεγαλυτέρων οικονομιών, το εξεταζόμενο χρονικό διάστημα (1979-2005). Για παράδειγμα, ένα νομισματικό ή πιστωτικό περιβάλλον που «ακολουθεί» τις γενικές μακροοικονομικές αρχές του Νεο-Κεϋνσιανισμού (New Keynesianism) και ακόμα πιο συγκεκριμένα της Νεο-Συναινετικής (New Consensus) προσέγγισής του, αποτελεί πρόσφορο έδαφος για μια αποτελεσματική εφαρμογή των αρχών της Βασιλείας ΙΙ, κυρίως πάνω στο δανειακό χαρτοφυλάκιο [banking book] αλλά και το χαρτοφυλάκιο αγοραπωλησιών [trading book] των τραπεζών.

Από την άλλη πλευρά ένα νομισματικό πλαίσιο λειτουργίας που θα «ακολουθεί» την Μετα-Κεϋνσιανη (Post Keynesian) νομισματική σκέψη, το εξεταζόμενο χρονικό διάστημα, θα περιόριζε σημαντικά τις πιθανότητες αποτελεσματικής εφαρμογής της Βασιλείας ΙΙ.

Με βάση τα οικονομετρικά αποτελέσματα στο τραπεζικό σύστημα των επτά μεγαλύτερων οικονομιών παρατηρούνται δύο πράγματα : 1) Ο πολλαπλασιαστής ιδίων κεφαλαίων τους κατ' ουσία δείχνει να λειτουργεί αμφίδρομα (feedback) και 2) Στο νέο πολυμεταβλητό μοντέλο δανείων που εξετάζουμε η σημαντικότερη μεταβλητή είναι αυτή της ενεργού ζήτησης (Α.Ε.Π.) και δευτερευόντως η μεταβλητή των ιδίων κεφαλαίων των τραπεζών και το χαρτοφυλάκιο αγοραπωλησιών [trading book]. Κατ' επέκταση το νομισματικό πλαίσιο λειτουργίας του G7 προσεγγίζει περισσότερο σε αυτό που αναφέραμε ως Μετα-Κεϋνσιανη (Post Keynesian) νομισματική σκέψη και ειδικότερα στην Δομική έκφρασή της (Structuralism).

Με άλλα λόγια τα αποτελέσματα αναδεικνύουν πρώτον, ότι η προσφορά χρήματος στο τραπεζικό σύστημα των επτά μεγαλύτερων οικονομιών είναι μάλλον ενδογενής (money endogeneity) και δεύτερον, ότι υπάρχει περιορισμένο μόνο έδαφος για μια πλήρως αποτελεσματική εφαρμογή των κανόνων και αρχών της Βασιλείας ΙΙ.

CONTENTS

Abstract

The aim of this paper is to examine the money supply process under a capital regulated framework (like the Basel II one) in the banking systems of the G7 economies. This is done by means of a two-stage process: first, testing the existence of the equity ('new credit') multiplier; and secondly, implementing a multivariate loan model. Data are provided by the OECD's bank profitability database for the 1979-2005 time period. Panel data analysis is employed in the empirical part of this study, including panel co-integration estimators. Our evidence seems to favour a Structuralist explanation of the money supply process in the G7 economies. The statistical results imply that although capital regulations (imposed by Basel II) and the trading book investments have a moderate effect on the loan supply process, the aggregate demand proxy and the loan/customer relation still play the prime roles.

J.E.L. Classification: E51, C23, C22.

Keywords: Basel II, bank lending modelling, money supply, panel co-integration.

1. Introduction

The main aim of this paper is to examine the money supply process under the Basel II framework in the G7 economies. However, this approach brings forward something that is persistently neglected in the monetary and banking literature – the link between credit expansion and the equity of banks. Consequently, both the loan creation modelling process and the endogenous/exogenous testing procedures of the money supply will be examined by taking into account the Basel II (2006) directives (i.e. the capital requirements).

This paper is constructed as follows: In section 2, we have a brief discussion of the historical evolution of the debate regarding the money supply process. In section 3, we present briefly the emergence of the bank's equity importance – initially raised by the Basel Committee for Banking Supervision (BCBS) at the 1988 Basel Accord – for credit expansion as well as the new clarifying Basel II (2006, Pillar I) proposals and their weaknesses. In section 4, the emerging 'bank capital channel' and the monetary policy transmission mechanism are discussed in connection with the redefined money supply process. We focus on the importance of bank equity, as a 'new credit' multiplier model, which we further examine through a new multivariate loan model. The New Keynesian/New Consensus [NK/NC] approach – emerging from the Basel II proposals – could obviously be challenged by Post Keynesians [PK]. Such PK 'challenge' could further help us to discuss the internal PK debate, between Horizontalists and Structuralists, in a new point of view. In section 5, the panel co-integrating econometric techniques are implemented in both examination stages. Finally in section 6, we conclude with the expected effectiveness of the Basel II rules.

2. The history of the money supply process debate

The debate regarding the money supply process is prolonged and continuously evolved among mainstream [NK/NC] and PK authors. It goes back to the time of Kaldor (1970) and Friedman (1968) when they discussed the endogenous or exogenous role of money. Later on, this debate was formalised in a causality dilemma between reserves, banks' deposits and loans (e.g. see Moore, 1988 and 1989b). By this time, new views regarding the money supply process had appeared which do not simply represent these two main

schools of thought but also include some mixed approaches (see Nell, 2000-1)[1].

Nowadays, the diminishing role of agents' deposits, due to the gradual abandonment of the minimum reserve requirements (see Dow, 2006; Rochon and Rossi, 2007; and Lavoie, 2006) and the lack of a convincing loan-deposit link (see Panagopoulos and Spiliotis, 2008), redefined the money supply debate not only with respect to the mainstream but also among PK's (e.g. the Horizontalist/Structuralist debate – see Fondana, 2004; Arestis and Sawyer, 2006). More specifically, by looking carefully at a bank's balance sheet identity we can observe that on its liability side we have an important variable that is usually neglected in the literature of the money supply process: the bank equity or what Basel I & II called 'the risk-based capital requirements'. The emerging importance of this variable, regarding loans or banking book expansion and monetary policy stability, was first identified by the Basel Committee in 1988. Such an *ex-post* expressed reality is the cornerstone for extending the debate on the endogenous or exogenous nature of a redefined money supply process.

3. The emergence of equity through the Basel II directives

For most of the 1980s and 1990s, the satisfactory economic performance of the G-7 countries was also mirrored in banks' loan positions and consequently in their retained earnings (in other words, in a bank's profitability or Tier I[2]). Such results established an analogous expected link between banks' future loans and their retained earnings (or banks' profitability). However, since the late 1980s the Basel Committee had realised that the euphoria regarding the banking book performance could not be considered as irrelevant for the quality of the counterpart's collateral. Additionally, the liberalisation of the banking systems around the world embedded a lending boom-bust cycle (see Goodhart *et. al*., 2004) which had to be restricted for stability reasons. Consequently, the banks' 'loop' economic performance[3] and their relative (to other sectors of the

[1] For an extensive analysis of the evolution of the theoretical debate on the money supply process, see Panagopoulos and Spiliotis (2008).

[2] Tier I is the bank's Core capital, according to Basel II (2006) and basically consists of equity capital (at common stocks) plus disclosed reserves (mainly the post-tax retained earnings, e.g. profits). Tier II, on the other hand, is basically the bank's supplementary capital and consists of preferred stock and subordinated debt (see Chami and Cosimano, 2001).

[3] *Ex-ante* banking book's portfolio investments (loans) causes bank's profitability (equity) which, in turn, causes *ex-post* banking book's portfolio investments (new loans).

economy)[4] low Capital Adequacy Ratios (CAR = Equity/Assets), was an issue which concerned the Basel Committee due to banks' future insolvency risks.

So, in the late 1990s, the Basel Committee issued a number of directives for the G-10 banks (Basel I-1998), which had two supplementary aims: First, to clarify the different categories of collateral, attached to the different bank loans; and secondly, to explain the new actual exposure of the banking book. Such directives were aimed to stabilise the banks' relatively low CAR. In recent years, however, the Basel Committee was compelled to issue new improved directives (see Basel II, 2006, Pillar I) for a more analytical description of banks' exposures. More analytically, these directives contained: (a) new formulas (the *Standardized* and the *Internal Rate Based* (*I.R.B.*) methods) for a more accurate estimation of the actual credit risk exposure; (b) an increased classification of the loans categories with an analogous increase in the financial collateral; and finally, (c) a re-determination of the bank's CAR, also taking into account the bank's exposure to the operational risk (see Akkizidis and Bouchereau, 2006).

Nevertheless, the Basel Accord has some substantial weaknesses. The most often underlined is that it is inherently pro-cyclical (see Kayshap and Stein, 2004). In addition, the (credit) risk measurement is not only considered as complex but the pro-cyclicality is accentuated when the internal rate-based approach is implemented (see Goodhart *et a.l*, 2004)[5]. Other specialists underline that capital regulation is not enough for securing the banking system and other supplementary measures – such as market discipline supervision – are required (see VanHoose, 2007). Finally, Cecchetti and Li (2008) argue about the conflicting objectives between central bankers and financial supervisors regarding the Basel II implementation.

4. Basel II, monetary policy transmission and money supply process

For the majority of the aforementioned economists, any capital regulation framework (like the Basel II (2006) directives) assumes that credit in the economy is supply-driven and shocked and therefore has a rather Orthodox 'insight'. Consequently, the CAR 'floor' on the bank's equity elements (e.g. Tiers I & II) can be interpreted as an attempt

[4] Gup (2004, Table I), for example, provide some *CAR* results for different sectors of the USA economy.
[5] There are different ways of facing such weaknesses: either through a capital buffer stock management (see Ayuso, Pérez and Saurina (2004) and Heid (2007)) or with a family of risk curves ($PD's$) and not a fixed one (see Kayshap and Stein, 2004).

by the G10 central banks to control the commercial banks' banking book portfolio or loans. In *Figure 1* we present diagrammatically the way Basel II is affecting the debate on monetary policy transmission and the money supply process.

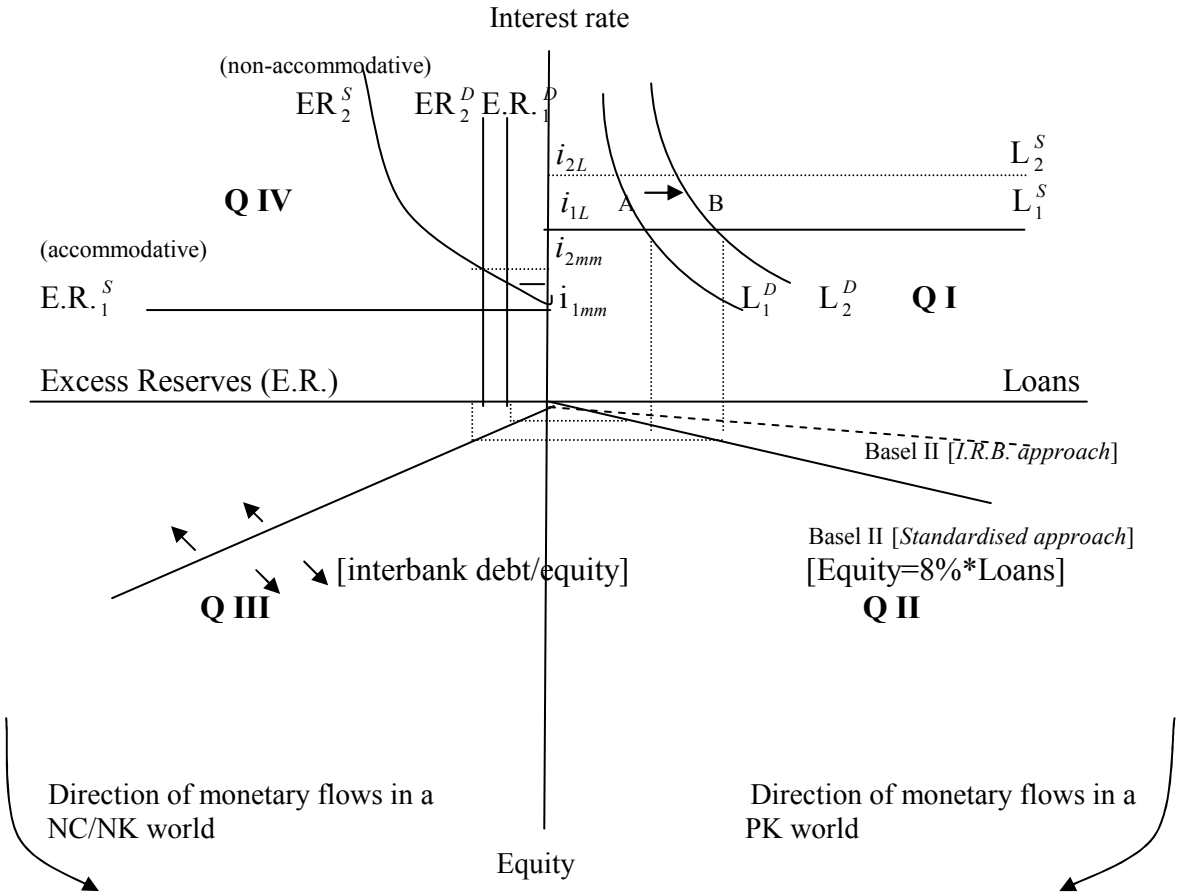

Figure 1 : The determination of the money supply process from the interbank M-M to the loans market under the Basel II influence.

More specifically, following a four-quarters diagrammatic presentation, in our monetary policy transmission process we simultaneously link (under the new conditions imposed by Basel II) the interbank Money-Market (M-M) with the loans market. We should also notice however that the flow direction of the diagrammatic analysis is vital for the macroeconomic interpretation of the money supply process.

In the first quarter of the diagram (Q I) we present the way the loan supply and demand are determined. So a typical negative sloped loan demand curve co-exists with a Moorian (1989b) «*price setting and quantity taking*» supply. In other words, in a

particular interest rate level (i_{1L}) banks offer a theoretically unlimited amount of accredited – according to the Basel II directives – loans (L^s).

In the second quarter of the diagram (Q II), we present the loan-equity relationship, as defined by the Basel II directives [e.g. Equity $=8\% *$ Loans]. The slope of the line which represents this relationship, will depend on the method of estimation (*Standardised* or *I.R.B.*) of the bank's actual exposure. In other words, the slope of the line will be steeper if the bank's actual loan exposure estimation is based on the *Standardised* (external) method than if it is based on the *I.R.B.* (internal and advanced) method. The small diagrammatic difference in the slope can be considered as a "reward", in terms of required equity on behalf of the Basel II, for every bank which chooses to apply the *I.R.B*. approach for the estimation of its actual loan exposures.

In the third quarter of the diagram (Q III) we present the relationship between a bank's interbank Debt and its Equity. More analytically, Interbank Debt appears as an account on the liability side of every bank. Its supply originates in the large bank's profitability, after the subtraction of their corresponding required reserves and their new loans, which then is sold to borrowing banks through the interbank's M-M. Actually, it is often used by smaller (borrowing) banks to cover either an already agreed loan which is going to be cashed out to a client or for existing residual reserve purposes. Usually the big banks are the "sellers" and the smaller banks the "buyers" of the Interbank Debt system.

The slope of this line [the Interbank Debt/Equity nexus] has the following characteristic: a non-accommodative Central Bank (CB) behaviour [an upward pressure on the M-M rates] is immediately spillovered in the bank's Interbank Debt account.[6] This happens because of the floating nature of this account and implies the immediate change of the Interbank Debt/Equity ratio (see from the arrows in the QIII part of the diagram). Consequently, as the Interbank Debt/Equity ratio increases (due to the non-accommodative CB's policy) then *ceteris paribus* the bank's Equity availability for new loan supply is obviously constrained. The entire mechanism can be engaged in the opposite direction, when the CB decides to «reduce the burden» regarding the Interbank Debt account of the banks.

[6] Through the pass-through process such non-accommodative CB behaviour can also be spillovered in the depositors' claim for a higher interest rate. This way the equity account is further burdened.

Finally the fourth quarter (Q IV) of the diagram presents the relationship between the interbank money rates and the interbank settlement balances (or Excess Reserves – E.R.). These "balances" are required for the banks' clearances related to already agreed lending obligations and are usually bought from the interbank M-M. The demand for interbank settlement balances is expected to be almost vertical (the $E.R.^{D}$ line). The reason for this "verticality" is simple: they have a last resort mission (usually for the small banks) for already undertaken obligations. Therefore, banks are ready to pay the prevailing Overnight and/or other M-M interest rates for this extra liquidity as long as it is still profitable for them, i.e. $i_{1L} - i_{1mm} > 0$ in the diagram.

Concerning now the supply of those interbank settlement balances (the $E.R^{S}$ line) we could present them in two ways: either with a horizontal shape, reflecting an accommodative CB behaviour, or with a non-accommodative upward bending one.

Now if, in Figure 1, the monetary system runs from QI towards QIV or the opposite, it is vital in order to interpret it as PK or NK/NC accordingly (with the analogous consequences for the money supply process). For instance, if we accept the primary role of aggregate demand proxies (e.g. the Loans) in the system then we begin the discussion with an increase of Loans, from L_1^D to L_2^D, in QI of Figure 1. Such a loan demand increase is expected to be financed by a higher level of the bank's equity which possibly at that moment is not available to the bank. So, the only option is to seek the supplementary (excess) capital from the interbank M-M. If the CB accommodates such request then it will try – with its policy variables (e.g. the discount rate) – to keep the M-M interest rates line at its existing supply level (see the horizontal line, $E.R._1^S$). Such interpretation of the monetary system behaviour –from the loan market (QI) to the interbank one (QIV) – is considered as a purely Horizontalist one and the money supply process is purely endogenous.

However even in this pure Horizontalist interpretation – where the monetary system runs unquestionably from QI towards QIV – we can find some room for raising some Structuralists' objections. These can be developed in quarters Q II and Q IV. Staring from the last one (Q IV) at the end of the flow –which still initiate from Q I – the CB decides to restrain the full accommodation of the aggregate demand proxies (Pollin's (1991) argument). This is achieved with an upward sloping non-accommodative $E.R^{S}$

curve, engineered by a reactive CB's discount rate policy. As a consequence, the Interbank Debt/Equity ratio will worsen and will move towards the horizontal axis [see Q III]. This new flatter Interbank Debt/Equity ratio position worsens the bank's equity availability. The new restrained bank's equity will finally finance only a part of the loan demand (L_2^D). In other words, due to the CB behaviour, the bank will accommodate a loan demand between L_1^D and L_2^D in Q I [Structuralism].

An alternative *Structuralist* objection can be presented with the transmission of the interest rate policies in our diagram. More specifically, a non-accommodative CB interest rate behaviour can have a «ladder's effect» in our diagram (similar to the Deriet and Seccareccia (1996) one). In that case banks will have two alternative options related to their loans market pricing (expressed with horizontal lines in Q I of the diagram):

1. Either to mark-up the entire non-accommodative CB pricing behaviour to the loan prices (e.g. a $i_{1mm} - i_{1L} = i_{2mm} - i_{2L}$ effect). In such a case the entire «ladder's effect» will be transmitted in the loan's supply (e.g. L_2^S) and consequently a smaller loan demand will be satisfied (but the unit loan's profitability will be intact).
2. Or we will have a partial mark-up of the non-accommodative CB pricing behaviour. In such an alternative case the bank's strategy will be to hold its existing share in the loan market in exchange for a smaller unit loan's profitability. In other words, the «ladder's effect» will not shift the loan supply line (L_1^S remains).

The new line of Structuralism defence can also take a quantitative form into the quarter II (Q II) of our diagram. More specifically, through a *feedback* relationship between bank's equity and loans (e.g. $Equity \Leftrightarrow Loans$). This is acceptable as long as the Basel II equity directives operate as a kind of new "monetary base" variable.

If we now assume that the entire monetary system in Figure 1 runs the opposite direction, from Q IV towards Q I, then we actually enter in the NC/NK interpretation of the monetary policy transmission process. Starting from Q IV of the diagram, we accept the CB primary role in the system and its "money channel" in particular. Moreover, its prime objective is a continuous price stability (see Taylor (2000)). In practical terms, through a non-accommodating anti-inflationary $E.R.^S$ curve, the CB tries to restrain the fulfilment of banks' request for liquidity ($E.R.^D$) from the interbank M-M, because it suspects that it will end up to some households' request for consumers' inflationary

loans (in QI). Simultaneously, in Q III of the diagram, the existing interbank debt/equity ratio will worsen and the corresponding line of this ratio will shift towards the horizontal axis. As a continuation of the above analysis, in Q II of the diagram, equity availability for loans deteriorates. Then, the predetermined (by Basel II) constant quantitative relationship between the bank's equity and loans is next engaged and the equity's reduced availability will directly spillover to the loan supply[7].

Finally, in the last quarter of the flow (Q I) – that of the loan market – we face a restricted new loan supply (either in an inward movement from L_1^S to L_2^S or from the point B to point A in the L_1^S curve). So the core issue is the controllability of the loan supply, which in its turn will next satisfy an *ex post* determined loan demand curve (in contrast to an *ex-ante* PK loan demand curve). In brief, through the above analysis we reach the final stage of the NK/NC philosophy which is the control of the aggregate demand factors and the exogeneity of money supply process.

Consequently, the existence of the 2006 Basel Accord is certainly influenced, if not created, by the supporters of the 'bank capital channel' regarding the monetary transmission process. These theorists are in accordance with (or part of) the mainstream NK/NC economic philosophy which argues that 'liabilities create assets' in the banking system. In that case, we can re-define both the classical money multiplier and the loan model regarding to the money supply process.

4.1. The new money multiplier

In the aforementioned monetary framework, banks' equity can be considered as the new 'monetary base' of the monetary and banking system. Therefore, following Lavoie's (2003, p. 514) terminology, CAR can be assessed as a new multiplier and the following alternative hypotheses can be examined:

Hypothesis 1: *The bank's equity determines (causes) the banking book portfolio* (e.g. Equity ⇒ Loans). If this is the causal relationship between banking book (loans) and its

[7] Jackson *et al.* (1999), Chami and Cosimano (2001), Van den Heuvel (2002, 2007), Kopecky and VanHoose (2004a), Wang (2005), Zicchino (2006) and Kishan and Opiela (2006) Gambacorta and Mistrulli (2004) are among the economists who brought forward the importance of the equity into a supply-side NC/NK monetary policy theoretical framework. This framework became known as 'bank capital channel' or 'bank capital adequacy' with respect to bank lending behaviour.

equity, then the new multiplier is operative (see Lavoie 2003).

Hypothesis 2: *The banking book portfolio determines the bank equity* (e.g. Loans $\Rightarrow$ Equity). In this case, the new multiplier is operative but reversed. Alternatively, the aggregate demand factors (loans) determine the bank's equity. As a theoretical concept, this is similar to a Horizontalist monetary view that "*banks sell loans and look for reserves* (now equity) *later*" (see Holmes, 1969).

Hypothesis 3: *The bank's equity is in feedback with the banking book portfolio* (e.g. Equity $\Leftrightarrow$ Loans). If this is the case, then the bank's equity constrains loans expansion and, at the same time, loans create the bank's equity. As a theoretical concept, this can be considered as a Structuralist monetary view (see Palley, 1994).

Hypothesis 4: *The bank's equity does not determine the banking book portfolio* (e.g. Equity $\neq$ Loans). In this case the new multiplier is obviously non-operative. Presumably the CAR level is possibly well above the predetermined 'floor' (or is not binding) and therefore it is perhaps more difficult to be caught in causality tests.

The operative or non-operative role of the new multiplier is only the first stage of our discussion. This stage merely defines the causality part of the money supply process; the second stage requires the construction of a new multivariate loan model. The significance of its explanatory variables will give us a clearer view regarding the money supply process.

4.2. The new loan model

In this sub-section, we discuss the build-up process of a multivariate loan model by equating loan demand and supply functions. Banks' lending behaviour is mainly determined by changes in the demand for loans from households and firms. Bank loans undertaken by the private sector's economic agents are mainly the result of their need for financing based on their income expectations and the production processes (see Davidson 1978).

Money and credit are not simply offered by an injection by some kind of

authorities in order to serve the needs of the economy 'in exchanging goods already produced'. Credit and finance comes into existence because time is a device which prevents everything from happening at once. Production processes take time and hence the decision to organise production in a certain manner must occur earlier than the outcome. The integration of money in the economic system must not be done when output is already specified, as in the exchange economy of general equilibrium models, but rather money must be introduced as part of the production process. This process is inherently dynamic, as entrepreneurs in each period must produce a new flow of commodities. Those who organise production require access to existing resources, mainly human labour. This access is satisfied by credit-money. Any flow of production requires a flow of new credit-money or the renewal of past flows of credit.

The underlying theory here is that money is the result of credit flows. ''When entrepreneurs expand their production, they must increase their wage bills as well as their other outlays. Production takes time; until output is sold and consequently cash flows unfolded, entrepreneurs will require more loans to bridge this gap. Commercial banks will satisfy this demand for loans which brings about an increase in deposits with the banks'' (Arestis, 1988 p. 51). Entrepreneurs must predict the pattern of the forthcoming effective demand and infer from this the cash outlays they will require in order to pay for the factors of production to be employed and the outlays required (so that they can finance their investments). Once this is done their loan requirements from the banks can be ascertained and their demand for money formulated.

Also, in modern highly liberalised and globally integrated economies the fraction of consumer credit becomes more and more important in the formulation of the total demand for lending. The consumers' demand for some extra financing in the current period is also (but in this case indirectly) related to the production or income generating process. It is basically based on expectations about their future incomes. In the developed financial systems (especially in the G7 economies) economic agents tend to actively participate in the formulation of the expectations related to the future effective demand as consumers and/or as investors. In these active roles economic agents behave either as borrowers either as lenders or both.

The GDP variable has been chosen as the appropriate proxy for aggregate

demand in the G7 economies. However, borrowers sometimes use their credit lines[8] in order to explore financial opportunities that temporarily appear in the market. That implies that in building an empirical model to explain the demand for loans by households and firms, we should include variables which try to capture any possible demand for loans for speculative purposes. For example, if bank lending rates are temporarily lower than the return on government papers, then investors may have an incentive (at least in the short run) to borrow from a bank in order to invest in bonds. Also, if borrowers for some reason believe that there is a good chance of gaining some extra profit by borrowing from banks, in order to invest in the stock market, then the demand for loans will be governed not only by firms' working capital needs (see Moore 1988, 1989b) or households' income expectations, but also (at least to some extent) by their speculative incentives.

In the Sprenke and Miller (1980) model, the demand for loans increases when the return to liquid assets increases, regardless of whether the relative return is greater than zero. In other studies (e.g., Bell (1978); Spencer and Mowl (1978); Moore and Threadgold (1985)), it has been assumed that 'round tripping' would only occur when the relative return to holding liquid assets is positive. In the Moore and Threadgold (1985) study, for instance, the round tripping variable was defined as the excess of the three month certificate deposit (SD) rate over the lending rate to prime ICC firms. In this model, variables such as the spread of the Government Bonds' Yield or the Treasury Bills' Yield minus the Lending Rate and/or the expected stock market return have been chosen in order to serve as the catchers of the demand for loans with speculative incentives.

From the banks' point of view, we could assume that during a period of increased economic activity and upward pressures on interest rates, bank asset preferences tend to change in such way that their demand for loans shifts upwards at the expense of their demand for securities. So, we may observe loan rates rising less than yields of securities simultaneously with increases in bank lending relative to bank security holdings. The markets for loans and securities are viewed differently by banks. More analytically: a) A bank could be seen as a perfect competitor in the securities market and as an imperfect

[8] Nowadays (at least, prior to the recent financial crisis) access to bank credit by households and firms was quite easy: sometimes the opening or extension of existing credit lines took place without the use of traditional banking restrictions and controls such as collateral, expected income etc.

one in the loans market; b) The demand for loans confronted by a bank is dependent not only on the current loan rates but also on the quantity of loans provided by the bank in earlier periods.

Following the Basel II (2006) classification, we introduce a distinction from the banks' point of view between loan (banking book portfolio) and security investments (trading book portfolio) and the loan/customer relationship. There is an inverse relation between loans volume and the loans rate in the current period but, in addition, the current quantity of loans extended influences the strength of future loans demand. None of the above characteristics applies to the bank's operations in securities. The profitability of future transactions in securities is not affected by the failure of the bank to buy another bond today. However, a bank's decision not to accommodate a prospective borrower may have a cost – in addition to the forgone revenues from the loan – impelling the disappointed borrower to take his/hers business elsewhere in the future.

However, the loan/customer relationship works both ways. Firms maintain a continuing relationship with the bank, often borrowing even more than their optimal short run requirements, in this way taking precautionary measures against any future credit stringency. Banks are also interested in keeping a continuing relationship with firms and therefore prefer, at times, to extend loans beyond that amount consistent with the maximisation of current profit. As a consequence,

> "…in choosing its loan/security portfolio, the bank takes into account not only current loan demand but also the influence of current loans extended on future loan demand…" Wood (1974, p. 405).

Banks' lending activity is not only demand determined for financing households and firms additional needs: the loan/customer relationship also plays an important role. Additionally, we should bear in mind that investment portfolio elements may be involved in the loan determination process. Finally, the power of the 'new credit multiplier' (banks' equity) has to be tested for its restrictive significance in a multivariate explanatory loan model.

Starting from the total demand for loans confronted by households and firms, we have:

$$L_t^d = g(L_{t-i}^d, AD, RT, Q) \quad (1a)$$

where:

L_t^d, the banking loan demand

L_{t-i}^d, the past borrowing, as a proxy of the lender-borrower effect

AD, the aggregate demand of the economy proxied by the gross domestic product (GDP),

RT, the 'round tripping', a demand sided investment portfolio variable proxied by: a) the spread of the Government Bonds' Yield or the Treasury Bills' Yield minus the Lending Rate and b) the expected stock market return

Q, a variable representing 'quality factors' (such as collateral, maturity and the repayment period).

Turning to the loan supply function,[9] this can be schematically presented as :

$$L_t^S = f(L^s{}_{t-i}, aE, TB, SE, Q) \quad (1b)$$

where:

L_t^S, the banking loan supply

aE, the equity variable multiplied with Basel I & II predetermined coefficient regarding its relationship with loans (e.g. α=12,5))

L_{t-i}^s, the past lending as a proxy of the lender-borrower effect

TB, the trading book of the banks (a quantitative 'substitution effect' variable) [10]

SE, the price 'substitution effect', a supply sided (banks' investment portfolio) variable proxied by: a) the spread of the Government Bonds' Yield or the Treasury Bills' Yield minus the Lending Rate and b) the expected stock market return

Q, a variable representing 'quality factors' (such as collaterals, maturity and the repayment period).

[9] An alternative loan supply function in the Basel II framework is provided by Liebig et al (2007).

[10] Such a variable could be separately or jointly proxied by the banks' trading book volume investments on: Treasury Bills and/or Government Bonds and/or listed and non listed Stocks and/or Derivatives (e.g. Options, Futures etc).

An *equilibrium* loans level (L_t^e) can be produced by equating the loan demand and supply functions[11, 12]. In algebraic terms, that leads to:[13]

$$L_t^e = k(L_{t-i}^e, AD, aE, TB, RT \text{ or } SE) \qquad (1c)$$

The question which raises next is whether the demand or the supply factor will prevail in the loan process determination. More analytically, if the AD (aggregate demand) variable is the only significant one in the model, this will imply that a Horizontalist PK view is prevailing. On the other hand, if the aE (Equity) variable is the only significant one, this will imply that the loans market follows an NK/Basel II framework. In addition, if this is accompanied by a significant negative TB (Trading Book) variable, this will be a strong indication for an NC interpretation of the financial system.

However, there are alternative theoretical results. More specifically, if AD and TB are the significant variables, this phenomenon will be interpreted as a Structuralist/PK determination of the system. In other words, the aggregate demand proxy will play the prime role but the Central Bank has some control over the money supply. In addition, we have the price 'substitution effects' in the model. So if the SE variable(s) is (are) significant and negative, this will imply that it (they) can play a restrictive role in the money supply process. Its (their) importance has a rather Structuralist interpretation. The same interpretation can also be given for the round tripping variable (RT) because the (RT) variable serves as a 'substitution effect' as well (from the borrowers' point of view).

[11] For an alternative bank credit model with panel data and the application of the equity restriction see Honda (2002), Gambacorta & Mistrulli (2004) and Altunbas, Gambacorta & Marqués (2007).

[12] A regression of bank lending on a set of independent variables could in principle be interpreted either as a supply or as a demand function. This, in turn, implies that an identification problem would appear. Somebody could attempt to 'identify' the demand curve (that distinguishes it from a supply curve) by isolating those variables that affect one side of the market only (i.e. identification by parameters restrictions). Alternatively, one may 'identify' the demand function by assuming that because of automatic overdraft facilities, bank lending to households and firms is demand determined at the interest rate set by the banks, i.e. a perfectly elastic (horizontal) supply of loans. However in the real world, 'quality factors' (such as collateral, maturity and the repayment period, the Q variable) are assumed to be adjusted to clear the market.

[13] Solving out (1a) and (1b) for Q results in a 'pseudo-reduced' form equation (1c) depending upon all the variables of the demand and supply functions (see Cuthbertson and Foster, 1982; Norton, 1969; Artis, 1978; Panagopoulos and Spiliotis, 1998).

Finally particular attention should be given to the lagged values of the dependent variable (L^e_{t-i}). The significance of such variables can reinforce the Horizontalist/PK explanation of the loan determination process. The more statistically strong and positively-signed the lagged dependent variables are, the more oligopolistic the loan market becomes. In other words, the stronger the seller-borrower link is the more the banking book portfolio is expected to grow. But the more it grows, the more it operates counter to the Basel II equity directives objectives, on the issue of the equity-loan link.

The significance of the model's variables gives us valuable information as far as the effectiveness of the capital regulatory framework (e.g. Basel II) is concerned. This could be summarised as:

1. If the Horizontalist variables (e.g. AD and secondary L^e_{t-i}) prevail, the prospective effectiveness of Basel II directives upon banks' credit risk and expansion is almost nil.
2. If the Structuralist variables (e.g. AD and TB plus any combination of the SE or RT variables) explain the dependent variable in the model, then there is some room for Basel II effectiveness in restraining the banks' credit expansion.
3. Finally, if the New Keynesian and/or New Consensus terms (e.g. aE and secondary any combination of the TB and SE terms) have certain explanatory power then the Basel II directives, upon credit expansion, are expected to be effective.

5. Econometric Methodology and Empirical Results

5.1 Data

In order to investigate the relationship between credit expansion (loans) and the equity of banks we use data from the Bank Profitability database available from OECD. This database provides aggregate financial statements of banks at country level. Our unbalanced panel dataset refers to yearly observations from 1978 to 2005 and includes all the G7 countries.[14] Data are expressed in current prices and denominated in dollars[15]. In detail, *Loans, Trading Book* and *Interbank Deposits* are obtained from the Asset side of the balance sheet of the aggregate financial statements while *Equity* and *Central Bank*

[14] Our data refer to commercial banks only, with the exception of Italy which includes all the banks.
[15] We choose current and not real prices in our model because we use aggregate data from banks' balance sheets and we want to see how they interact in nominal terms. Moreover, most of the literature uses nominal terms.

Borrowing are obtained from the liabilities side.

In addition, we introduce two pricing 'Substitution Effects' as described in the theoretical part (see Section 4.2, Footnote 7), defined as: (i) Substitution Effect A = *Government Bonds Yield* minus *Lending Rate*, and (ii) Substitution Effect B = *Treasury Bills Yield* minus *Lending Rate*. These data are obtained by International Financial Statistics provided by the International Monetary Fund (IMF). Also, we include the annual stock market indices of the G7 countries, in order to capture any possible 'round tripping' effect. Finally, the GDP series are obtained from AMECO macroeconomic database available from the European Commission.

As we resort to panel data techniques, it's essential to know whether the data have indeed a panel structure. For that reason it is interesting to look at the summary statistics which decompose the overall variation into the 'between' and the 'within' variation. Table 1 (and Figures 1-7) available in the Appendix provides the relevant descriptive statistics. The listed variables report variation between countries as well as variation for each country over the different years. This clearly supports the use of panel techniques. In addition, the Breusch-Pagan test for poolability (1980) results strongly rejects the null of no panel dimension for all countries pooled.[16]

5.2 Panel unit root tests

Following the relevant literature, we apply two types of panel unit root tests. A first specification assumes that all units are stationary with the same autoregressive coefficient across units, implying that the relevant variable in all countries converges towards the average at the same speed. The statistics used are those developed by Levin, Lin and Chu (2002) (LLC hereafter) and by Breitung (2000). In both tests the null of unit root against this homogeneous alternative of stationarity is examined.[17] Second-generation unit root tests allow for heterogeneous short-run dynamics. So, we apply the test developed by Im, Pesaran and Shin (2003) (IPS hereafter) which allows for some (but not all) of the individual series to have a unit root under the alternative hypothesis, implying that the degree of persistence of the variable of interest is not forced to be the

[16] Breusch Pagan test for poolability (Ho: No panel-dimension in data) Chi-square= 777.01 and Prob= 0.0000.

[17] These tests allow for heterogeneous serially correlated errors, country-specific fixed effects and country-specific deterministic trends, and are based on an Augmented Dickey-Fuller (ADF) regression.

same. Maddala and Wu (1999) (MW hereafter) suggest a test of unit root against the heterogeneous alternative that combines the p-values from unit root statistics in each cross-sectional unit.

Table 2 (see Appendix) presents the results from the unit-root tests. In general, all the variables – obtained from the balance sheet of the banks such as *Loans, Equity, Interbank Deposit* & *Central Bank Borrowing* – suggest that the series are I(1) (according to both individual test as well as group IPS test). The null hypothesis of unit root in levels cannot be rejected, while the null hypothesis of a unit root in first difference can be rejected. With respect to the monetary variables of *Government Bonds Yield, Lending Rate* and *Treasury Bills Yield* panel unit root tests results are consistent indicating that our series are I(0). Finally, *GDP* series can be regarded as integrated of order one (I(1)), while the *Stock Market Indices* is I(2).

5.3. Panel cointegration tests

This paper uses residual-based tests of the null hypothesis of no cointegration developed by Pedroni (1995, 1997, 1999). Pedroni's residual based tests allow for a considerable degree of heterogeneity between groups with regard to the intercept, the error structure, and the cointegrating relationship. Pedroni presents seven tests that can be grouped into two types of statistic. These tests differ according to the way in which information is combined. The first type of statistic is based on pooling along the within-dimension of the panel; the second is based on pooling along the between-dimension (see Pedroni 1999, p. 657).[18,19]

Table 3 (available in the Appendix) reports the results of all the cointegration tests. First, Table 3A presents test results for our initial specification of interest, that is between *Loans* and *Equity*. According to the results, the null hypothesis of no cointegration is rejected in all cases. Second, the null hypothesis of no cointegration is

[18] The within dimension statistics are based on estimators that pool the autoregressive coefficient across different members for the unit root tests on the estimated residuals. The between dimension statistics are based on estimators that average the individually estimated coefficients for each member of the panel (see Pedroni, 1999).

[19] The second type of statistic allows for an additional source of heterogeneity across individual panel members since it allows for heterogeneous autoregressive coefficients of the estimated residuals under the alternative of no cointegration (Pedroni 1999). According to Baltagi & Kao (2000), this second type of statistic also allows an easier interpretation of the statistic if the null is rejected.

rejected for the *Loans*, *Equity* and *GDP* specification (Table 3B). Third, when the variable *Trading Book* is included, together with *Loans*, *Equity* and *GDP*, Pedroni tests accept the null hypothesis of no cointegration, especially in the group of ADF statistics which allows for a more general structure of the residual correlation under the null hypothesis (Pedroni, 1997). Finally, in our concluding specifications the variables *Substitution Effect B* and *Stock Indices* are included in a stepwise manner (Tables 3D & Table 3E respectively) and the null hypothesis of no cointegration is rejected.

5.4. Heterogeneous Panel ECM estimation

Having established the order of integration of our variables, as well as the existing co-integrating vectors, we continue using two advanced methods for the statistical analysis of dynamic panel data – the mean group (MG) and the pooled mean group (PMG) estimation. Earlier models, such as the dynamic fixed effect, control for country fixed effects but impose the same coefficients for all countries. The MG estimation derives the long-run parameters for its panel from an average of the long-run parameters derived from the ARDL model of each country separately (see Pesaran and Smith, 1995; Asteriou, 2009). For example, if the ARDL is the following:

$$\alpha_i(L)\, L_{it}^{e} = b_i(L)x_{it} + d_i\, z_{it} + e_{it} \qquad (2)$$

for country i, where i=1,…,N. Then the long-run parameter for country i is :

$$\theta = \frac{b_i(1)}{\alpha_i(1)} \qquad (3)$$

and the MG estimator for the whole panel will be given by :

$$\theta = \frac{1}{N}\sum_{i=1}^{N}\hat{\theta}_i \qquad (4)$$

An intermediate choice between imposing slope homogeneity and no restrictions is the pooled mean group estimator (PMG) proposed in Pesaran, Shin and Smith (1999), which combines the characteristics of the fixed effect estimators with those of the MG estimator group. The PMG estimator treats differently the short- and long-run dynamics. The short-run dynamics are allowed to differ across countries but the long-run effects are

constrained to be the same. The PMG estimator is appropriate when data have complex country-specific short-term dynamics which cannot be captured imposing the same lag structure on all countries. This estimator combines the properties of efficiency of the pooled dynamic estimators while avoiding the inconsistency problem deriving from slope heterogeneity.[20]

In the framework of our study (continuing from our equation 1d), the unrestricted specification for the ARDL system of equations, for t = 1,2,…,T time periods and i = 1,…,N countries, for the dependent variable L^e_{it} is:

$$L^e_{it} = \sum_{j=1}^{m} \lambda_{ij} \; L^e_{i,t-j} + L^e_{it} \; \sum_{j=0}^{n} \delta'_{ij} \; x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (5)$$

where x_{ij} is the (k x 1) vector of explanatory variables for group i and μ_i represents the fixed effects. Re-writing model (5) as a VECM system we derive :

$$\Delta L^e_{it} = \theta_i \, (L^e_{it-1} - \beta_i' \, x_{i,t}) + \sum_{j=1}^{m-1} \gamma_{ij} \; \Delta L^e_{i,t-j} + \sum_{j=0}^{n-1} \gamma'_{ij} \; x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (6)$$

where β_i's are the long-run parameters and θ_i's are the error correction parameters. The pooled group restriction is that the elements of β are common across countries, thus:

$$\Delta L^e_{it} = \theta_i \, (L^e_{it-1} - \beta' \, x_{i,t}) + \sum_{j=1}^{m-1} \gamma_{ij} \; \Delta L^e_{i,t-j} + \sum_{j=0}^{n-1} \gamma'_{ij} \; x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (7)$$

According to our specification, all the dynamics and the ECM terms are free to vary. Additionally, the appropriate lag length for the individual country equations was made using the Akaike Selection Criterion.

5.5. The MG and PMG Estimation Results

Starting from the bivariate model results, the PMG and MG methods are presented in Tables 4A and 4B. Regarding the estimation between *Loans* and *Equity*, which constitutes the new money (or equity) multiplier model, a feedback relationship appears according to both estimators (*Equity* $\Leftrightarrow$ *Loans*). This implies that a Structuralist PK

[20] The restriction of homogenous long-run coefficients are tested with a Hausman (1978) test.

relationship exists in the banking system of the G7 economies. So, the third hypothesis regarding the new money multiplier issue is satisfied: the bank's equity constrains loans expansion and at the same time loans create the bank's equity.

Second, in the multivariate models results (Tables 5A to 5D) a number of models are estimated in order to include a number of alternative variables in addition to the fundamental ones. First, following our theoretical model (see Equation 1c) the relation between *Loans*, *Equity* and the Aggregate Demand Proxy (*GDP*) is estimated. Table 4A shows that there is a long-run relationship among the participating variables of our model, since the error correction coefficient is negative in both estimators (PMG and MG). Our results indicate that lagged *Loans* and *GDP* have a positive and significant effect on the dependent variable. Such econometric results favour a Horizontalist PK interpretation of the money process in G7 banking systems.

Third, our loan model is further enriched in order to include the *Trading Book* variable, which is considered as a quantitative 'substitution effect' (see Equation 1a). According to our PMG estimator (Table 5B), we can conclude that lagged *Loans* and *GDP* as well as *Equity* have a positive and significant effect on the dependent variable. In addition, the lagged *Trading Book* variable is estimated to have a negative and statistically significant effect on the *Loan* generation process. Thus, Structuralism now emerges in our estimated model, since *Equity* and *Trading Book* are statistically significant.

Lastly, the pricing 'substitution effect' variables as well as the *Stock Indices* variable (the 'round tripping' effect from Equation 1b) are introduced separately in our new loan model[21] (see Tables 5C & 5D respectively). Our estimations do not present any statistical evidence regarding their effect on *Loans*[22] (with the exception of its lagged value).

6. Concluding remarks

In this paper, we examine the banks' lending behaviour in a capital-regulated framework. Two theoretical suggestions are actually tested. First is the emergence of an

[21] Please refer to the data subsection for the definition of these variables.
[22] Not all estimates are presented here, for reasons of space. Tables and results are available from the authors upon request.

equity multiplier in the G7 banking systems. In a monetary world, Horizontalism will imply that this new multiplier is reversed (i.e. loans cause equity) while Structuralism will imply a feedback relationship between equity and loans. Second, the appearance of a new multivariate loan determination model which contains banks' equity as a key explanatory variable as well as demand for ,and supply of, banks' lending behaviour factors. Both of the aforementioned steps can help us identify the nature of the money supply process in different monetary environments.

According to our empirical results, the Structuralist view of the money supply process appears to be verified in the G7 banking systems. The above results indicate that although the Basel II directives (represented by the equity) have some explanatory power in the loan generation process, the aggregate demand proxy (GDP) and the lender-borrower relationship are still the dominant factors. In addition, the trading book variable is estimated to have a negative effect on the loan generation process.

APPENDIX

Table 1. Summary Statistics, G7 Average, 1979 – 2005

	units	obs.	mean	st. dev.	min	max
Loans	Mil. Euros	163	488759.9	893737.7	3903.8	4327940
Equity	Mil. Euros	163	46992.2	134641.9	184.2	722665.5
Trading Book	Mil. Euros	163	185808.6	370864.8	1021.1	1868160
GDP	Mil. Euros	189	1127.1	2175.186	174.1	11240.8
CB Borrowing	Mil. Euros	111	1486.8	19584.3	1.23	96219
Interbank Loans	Mil. Euros	163	112441.7	191152.6	809.1	990173.9
Treasury Bills Yield	Rate	189	5.42	4.21	0.1	19.7
Government Bond Yields	Rate	189	7.42	3.69	1.01	20.22
Lending Rate	Rate	185	8.81	4.09	1.68	22.27
Stock Market Indices	Index	115	3821.1	7999.5	107.9	38916

Figures 1-7. Main Variables, G7 Countries, 1979 – 2005

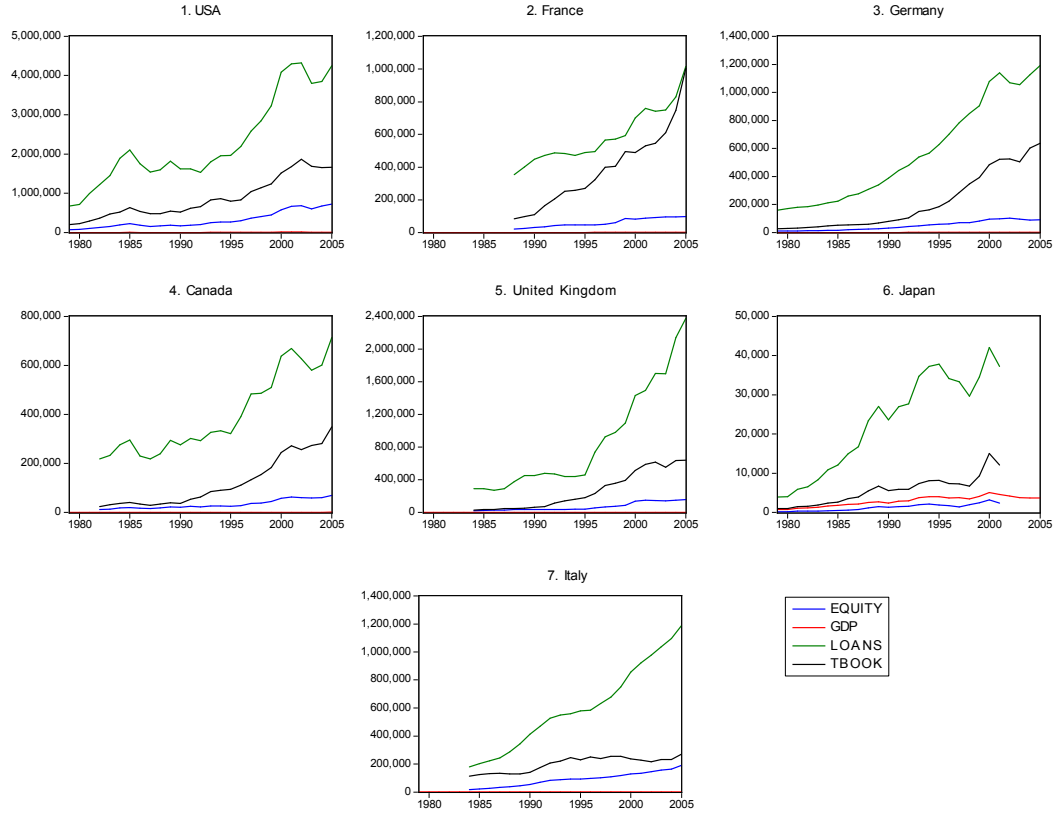

Table 2: Panel Unit Root Tests

		LOANS		EQUITY		TRADING BOOK	
Ho: *Unit root (common unit root)*		*without trend*	*with trend*	*without trend*	*with trend*	*without trend*	*with trend*
LLC t	*Level*	0.07 (150)	0.50 (142)	**0.00** (152)	1.00 (144)	0.08 (148)	0.53(145)
	First Difference	**0.00 (143)**	**0.00 (140)**	1.00 (141)	1.00 (142)	**0.00** (145)	**0.00** (139)
Breitung t-stat	*Level*		**0.00 (135)**		0.26 (137)		0.38 (138)
	First Difference		**0.00 (133)**		**0.01** (135)		**0.00** (132)
Ho: *Unit root (individual unit root)*							
IPS t-stat	*Level*	0.97 (150)	0.35 (142)	**0.00** (152)	0.66(144)	0.64 (148)	0.38 (145)
	First Difference	**0.00 (143)**	**0.00 (140)**	**0.00** (141)	**0.00** (142)	**0.00** (145)	**0.00** (139)
ADF-MW χ^2	*Level*	0.88 (150)	0.18 (142)	**0.00** (152)	0.40(144)	0.55 (148)	0.45 (145)
	First Difference	**0.00 (143)**	**0.00 (140)**	**0.00** (141)	**0.00** (142)	**0.00** (145)	**0.00** (139)
PP-MW χ^2	*Level*	0.56 (156)	0.98 (156)	**0.00** (156)	**0.00** (156)	0.92 (156)	0.96 (156)
	First Difference	**0.00 (149)**	**0.00 (149)**	**0.00** (149)	**0.00** (149)	**0.00** (149)	**0.00** (149)

		INTERBANK		GDP		CB BORROWING	
Ho: *Unit root (common unit root)*		*without trend*	*with trend*	*without trend*	*with trend*	*without trend*	*with trend*
LLC t	*Level*	0.28 (148)	0.01 (146)	**0.00** (176)	0.05 (168)	**0.02** (106)	**0.00**(102)
	First Difference	**0.00** (142)	**0.00** (138)	**0.00** (159)	**0.00** (159)	**0.00** (95)	**0.00** (92)
Breitung t-stat	*Level*		0.58 (139)		0.17 (161)		0.20 (97)
	First Difference		**0.00** (131)		0.08 (152)		**0.00** (87)
Ho: *Unit root (individual unit root)*							
IPS t-stat	*Level*	0.65 (148)	0.05 (146)	**0.00** (176)	0.17 (168)	**0.04** (106)	**0.00** (102)
	First Difference	**0.00** (142)	**0.00** (138)	**0.00** (159)	**0.00** (159)	**0.00** (95)	**0.00** (92)
ADF-MW χ^2	*Level*	0.06 (148)	0.05 (146)	**0.00** (176)	0.09 (168)	**0.03** (106)	**0.01** (102)
	First Difference	**0.00** (142)	**0.00** (138)	**0.00** (159)	**0.00** (159)	**0.00** (95)	**0.00** (92)
PP-MW χ^2	*Level*	0.88 (156)	0.58 (156)	**0.00** (182)	0.04 (182)	**0.04** (106)	**0.01** (106)
	First Difference	**0.00** (149)	**0.00** (149)	**0.00** (175)	**0.00** (175)	**0.00** (101)	**0.00** (101)

		TREASURY BILLS YIELD		GOV. BONDS YIELD		LENDING RATE	
Ho: *Unit root (common unit root)*		*without trend*	*with trend*	*without trend*	*with trend*	*without trend*	*with trend*
LLC t	*Level*	0.99 (164)	0.98 (157)	0.98 (178)	**0.04** (178)	0.81 (168)	0.79 (163)
	First Difference	**0.00** (161)	**0.00** (153)	**0.00** (162)	**0.00** (162)	**0.00** (160)	**0.00** (160)
Breitung t-stat	*Level*		0.80 (150)		**0.02** (171)		**0.01** (156)
	First Difference		0.38 (146)		**0.00** (155)		**0.01** (155)
Ho: *Unit root (individual unit root)*							
IPS t-stat	*Level*	0.99 (164)	0.02 (157)	1.00 (178)	**0.00** (178)	0.83 (168)	**0.00** (163)
	First Difference	**0.00** (161)	**0.00** (153)	**0.00** (162)	**0.00** (162)	**0.00** (160)	**0.00** (160)
ADF-MW χ^2	*Level*	0.99 (164)	0.00 (157)	1.00 (178)	**0.00** (178)	0.65 (168)	**0.02** (163)
	First Difference	**0.00** (161)	**0.00** (153)	**0.00** (162)	**0.00** (162)	**0.00** (160)	**0.00** (160)
PP-MW χ^2	*Level*	0.99 (177)	0.15 (177)	1.00 (182)	**0.00** (182)	0.93 (178)	**0.02** (178)
	First Difference	**0.00** (169)	**0.00** (169)	**0.00** (175)	**0.00** (175)	**0.00** (171)	**0.00** (171)

		SUBSTITUTION EFFECT A		SUBSTITUTION EFFECT B		STOCK MARKET INDICES*	
Ho: *Unit root (common unit root)*		*without trend*	*with trend*	*without trend*	*with trend*	*without trend*	*with trend*
LLC t	*Level*	**0.03** (173)	**0.02** (166)	**0.00** (174)	**0.00** (166)	0.16 (100)	0.03 (93)
	First Difference	0.00 (164)	**0.00** (161)	**0.00** (165)	**0.00** (165)	**0.03** (83)	0.35 (83)
Breitung t-stat	*Level*		**0.00** (159)		**0.00** (166)		0.81 (86)
	First Difference		**0.00** (154)		**0.00** (158)		**0.00** (78)
Ho: *Unit root (individual unit root)*							
IPS t-stat	*Level*	**0.00** (173)	**0.00** (166)	**0.00** (174)	**0.00** (166)	0.57 (100)	0.24 (93)
	First Difference	0.00 (164)	**0.00** (161)	**0.00** (164)	**0.00** (165)	**0.00** (83)	**0.03** (83)
ADF-MW χ^2	*Level*	**0.00** (173)	**0.00** (166)	**0.00** (174)	**0.00** (166)	0.75 (100)	**0.04** (93)
	First Difference	0.00 (164)	**0.00** (161)	**0.00** (165)	**0.00** (165)	**0.00** (83)	**0.03** (83)
PP-MW $\chi2$	*Level*	**0.00** (178)	**0.02** (178)	**0.00** (178)	0.07 (178)	0.87 (100)	0.72 (108)
	First Difference	0.00 (171)	**0.00** (171)	**0.00** (171)	**0.00** (171)	**0.00** (88)	**0.00** (88)

Notes: All data are expressed as natural logarithms of differences with respect to the cross-country averages. Country-specific intercepts are included in the testing equation. The p value of the test when the null hypothesis of unit root is not rejected is in bold. The null of unit root is accepted at significance level α when the p-values are bigger than α/100. The number of observations is reported in parentheses. Automatic selection of lags based on the Akaike Information Criterion (AIC). ADF and PP are two tests that use Fisher's (1931) result to derive test that combine the p-values from individual unit roots tests. The tests are distributed as a $\chi2$ with 2*N degrees of freedom where N is the number of cross-sections. * Tests for unit root are performed on the second differences.

Table 3: Panel Cointegration Test (Pedroni, 1999)

Table 3A: LOANS & EQUITY

	without trend	*with trend*
Panel Statistics		
Panel v-Stat	8.53 (0.00)	4.67 (0.00)
Panel rho-Stat	-7.78 (0.00)	-5.21 (0.00)
Panel PP-Stat	-15.81 (0.00)	-17.82 (0.00)
Panel ADF-Stat	2.34 (0.02)	1.41 (0.14)
Group Statistics		
Group rho-Stat	-0.26 (0.38)	0.86 (0.27)
Group PP-Stat	-3.60 (0.00)	-3.34 (0.01)
Group ADF-Stat	-1.35	-2.13

Table 3B: LOANS, EQUITY & GDP

	without trend	*with trend*
Panel Statistics		
Panel v-Stat	1.69 (0.09)	0.28 (0.38)
Panel rho-Stat	0.93 (0.25)	2.01 (0.08)
Panel PP-Stat	0.04 (0.39)	0.31 (0.38)
Panel ADF-Stat	-0.06 (0.39)	-0.57 0.33
Group Statistics		
Group rho-Stat	2.19 (0.03)	2.71 (0.00)
Group PP-Stat	0.82 (0.28)	0.74 (0.30)
Group ADF-Stat	0.48	0.25

Table 3C: LOANS, EQUITY, GDP & TRADING BOOK

	without trend	*with trend*
Panel Statistics		
Panel v-Stat	0.16 (0.39)	0.32 (0.37)
Panel rho-Stat	1.35 (0.16)	2.60 (0.01)
Panel PP-Stat	0.29 (0.38)	1.62 (0.10)
Panel ADF-Stat	-0.97 (0.24)	1.05 (0.22)
Group Statistics		
Group rho-Stat	2.49 (0.01)	3.58 (0.01)
Group PP-Stat	0.83 (0.28)	2.17 (0.03)
Group ADF-Stat	-0.80	0.58

Table 3D: LOANS, EQUITY, GDP & SUBSTITUTION EFFECT B

	without trend	*with trend*
Panel Statistics		
Panel v-Stat	0.26 (0.38)	-0.91 (0.26)
Panel rho-Stat	0.51 (0.34)	1.64 (0.10)
Panel PP-Stat	-2.60 (0.01)	-2.91 (0.01)
Panel ADF-Stat	-1.92 (0.06)	-2.89 (0.01)
Group Statistics		
Group rho-Stat	1.73 (0.08)	2.76 (0.01)
Group PP-Stat	-2.62 (0.01)	-5.52 (0.00)
Group ADF-Stat	-2.55	2.61

Table 3E: LOANS, EQUITY, GDP & STOCK INDICES

	without trend	*with trend*
Panel Statistics		
Panel v-Stat	0.57 (0.33)	2.85 (0.01)
Panel rho-Stat	2.48 (0.01)	2.06 (0.04)
Panel PP-Stat	0.94 (0.25)	-14.58 (0.00)
Panel ADF-Stat	1.20 (0.19)	-3.33 (0.00)
Group Statistics		
Group rho-Stat	3.76 (0.01)	3.89 (0.01)
Group PP-Stat	2.42 (0.02)	-3.29 (0.01)
Group ADF-Stat	1.64	-2.10

Notes: Ho: no cointegration. The critical level of the test at 5% is -1.96. The calculated statistics must be in absolute value larger than this value to reject the null hypothesis of absence of cointegration for all units in the panel.

Table 4: Bi-Variate Results, G7 (1979-2005)

Table 4A: LOANS & EQUITY

	PMG estimates			MG estimates		
	Coeff.	S.E.	z-stat	Coeff.	S.E.	z-stat
Ln *Equity*	0.75***	0.02	-2.47	4.68	3.87	1.21
Error Correction Coefficients						
φ	-0.23**	0.10	-2.12	-0.33***	0.09	-3.56
Short-run Coefficients						
Δ *Loans (-1)*	0.21**	0.10	2.12	0.24**	0.11	2.15
Δ *Equity*	0.10	0.16	0.62	-0.00	0.15	-0.02
Δ *Equity (-1)*	-0.00	0.05	-0.11	-0.06	0.08	-0.70
Constant	1.17	0.45	2.60	1.42	0.39	3.62
Joint Hausman Test: 0.89 (0.51)						

Table 4B: EQUITY & LOANS

	PMG estimates			MG estimates		
	Coeff.	S.E.	z-stat	Coeff.	S.E.	z-stat
Ln *Loans*	1.04***	0.03	28.40	1.10***	0.11	9.21
Error Correction Coefficients						
φ	-0.28***	0.05	-4.88	-0.40***	0.05	-7.15
Short-run Coefficients						
Δ *Equity (-1)*	0.17**	0.07	2.30	0.17**	0.08	2.08
Δ *Loans*	0.07	0.19	0.37	-0.04	0.18	-0.24
Δ *Loans (-1)*	-0.00	0.11	-0.04	-0.03	0.09	-0.35
Constant	-0.96	0.14	-6.72	-1.97	0.41	-4.74
Joint Hausman Test: 0.72 (0.34)						

Table 5: Multi-Variate Results, G7 (1979-2005)

Table 5A: LOANS, EQUITY & GDP

	PMG estimates			MG estimates		
	Coeff.	S.E.	z-stat	Coeff.	S.E.	z-stat
Ln *Equity*	-0.24***	0.10	-2.31	0.67	0.29	0.23
Ln *GDP*	1.30***	0.17	7.53	1.44**	0.61	2.35
Error Correction Coefficients						
φ	-0.24**	0.10	-2.31	-0.38***	0.09	-4.10
Short-run Coefficients						
Δ *Loans (-1)*	0.33***	0.08	4.13	0.31***	0.06	5.21
Δ *Equity*	0.09	0.06	1.45	0.06	0.04	1.25
Δ *Equity (-1)*	-0.03	0.06	-0.54	-0.02	0.10	-0.23
Δ *GDP*	0.41**	0.22	1.90	0.32	0.21	1.51
Δ *GDP (-1)*	-0.01	0.22	-0.08	0.00**	0.23	0.02
Constant	0.36	0.16	2.30	0.63	0.61	1.04
Joint Hausman Test: 1.15 (0.30)						

Table 5B: LOANS, EQUITY, GDP & TRADING BOOK

	PMG estimates			MG estimates		
	Coeff.	S.E.	z-stat	Coeff.	S.E.	z-stat
Ln *Equity*	-0.18**	0.07	-2.43	0.56	0.44	1.27
Ln *GDP*	0.71***	0.08	8.62	1.85	1.41	13.1
Ln *TBook*	0.34***	0.03	8.73	0.73	1.18	-0.62
Error Correction Coefficients						
φ	-0.25**	0.11	-2.16	-0.75***	0.23	-3.17
Short-run Coefficients						
Δ *Loans (-1)*	0.33***	0.07	4.59	0.37***	0.11	3.31
Δ *Equity*	0.18**	0.09	1.96	0.09**	0.04	2.18
Δ *Equity (-1)*	0.10	0.08	1.28	-0.00	0.00	-0.48
Δ *GDP*	0.71**	0.32	2.21	0.71***	0.08	8.08
Δ *GDP (-1)*	-0.11	0.16	-0.69	-0.11	0.10	-1.11
Δ *TBook*	0.02	0.08	0.25	0.08*	0.04	1.76
Δ *TBook (-1)*	-0.11**	0.04	-2.31	-0.08	0.05	-1.56
Constant	1.43	0.72	1.97	0.47	0.19	2.45

Table 5C: LOANS, EQUITY, GDP & SUB. EFFECT B

	PMG estimates			MG estimates		
	Coeff.	S.E.	z-stat	Coeff.	S.E.	z-stat
Ln *Equity*	0.21***	0.06	2.19	0.33**	0.17	1.95
Ln *GDP*	1.37***	0.18	11.63	0.81**	0.30	2.64
Ln *Sub. B*	0.00	0.00	1.48	-0.04	0.03	-1.14
Error Correction Coefficients						
φ	-0.24**	0.11	-2.19	-0.54***	0.08	-6.24
Short-run Coefficients						
Δ *Loans (-1)*	0.25**	0.12	2.08	0.27**	0.10	2.57
Δ *Equity*	0.10	0.06	1.64	0.22	0.04	0.45
Δ *Equity (-1)*	-0.01	0.09	-0.18	-0.02	0.08	-0.27
Δ *GDP*	0.34	0.26	1.32	0.11	0.25	0.45
Δ *GDP (-1)*	-0.11	0.24	-0.45	-0.13	0.24	-0.57
Δ *Sub. B*	-0.01	0.00	-1.60	0.00	0.01	0.19
Δ *Sub. B (-1)*	-0.00	0.00	-0.35	0.00	0.00	0.67
Constant	0.34	0.18	1.87	1.76	0.41	4.26

Table 5D: LOANS, EQUITY, GDP & STOCK INDICES

	PMG estimates			MG estimates		
	Coeff.	S.E.	z-stat	Coeff.	S.E.	z-stat
Ln *Loans*	0.03	0.09	0.01	1.10	0.11	9.21
Ln *GDP*	0.75***	0.16	4.36	0.81**	0.30	2.64
Ln *Indices*	0.40***	0.15	2.57	-0.04	0.03	-1.14
Error Correction Coefficients						
φ	-0.86**	0.33	-2.59	-0.40	0.05	-7.15
Short-run Coefficients						
Δ *Loans (-1)*	0.31**	0.33	2.59	0.31***	0.06	5.21
Δ *Equity*	-0.06	0.77	0.84	-0.29	0.20	1.42
Δ *Equity (-1)*	-0.03	0.90	-0.39	-0.21	0.15	-1.43
Δ *GDP*	0.03	0.22	0.42	0.32	0.21	1.51
Δ *GDP (-1)*	-0.11	0.22	-0.08	0.00**	0.23	0.02
Δ *Indices*	-0.01	0.22	1.12	0.32	0.21	1.51
Δ *Indices (-1)*	-0.00	0.22	-0.08	0.00**	0.23	0.02
Constant	0.42	0.19	2.16	2.37	1.27	1.86

Notes: Lags are selected by the Akaike Information Criterion. The error correction coefficient measures the speed of adjustment and is computed as the average of each country speed of adjustment. The Hausman test is a test of poolability of the long-run coefficient (i.e. of the restriction that all countries have the same long-run elasticity). p-values are reported in the parenthesis. The null of homogenous long-run coefficient is accepted at 5% when the p-values are bigger than 0.05. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.

REFERENCES

Altunbas, Y., Gambacorta, L., & Marqués, D. (2007), 'Securitisation and the bank lending channel', Working Paper No 653, Banca D'Italia.

Arestis, P. (1988), "Post Keynesian Theory of money, Credit and Finance", in Post Keynesian Monetary Economics, Vol. 12, pp. 605-16.

Arestis, P. and Sawyer, M. eds. (2006), *A Handbook of Alternative Monetary Economics*, Edward Elgar Publishing Limited.

Artis, M. J. (1978), 'Monetary policy, part II' in Blackby, F. (ed.), British Economic Policy 1960 – 1974, Cambridge University Press.

Asteriou, D. (2009), 'Foreign aid and economic growth: New evidence from a panel data approach for five South African countries', *Journal of Policy Modeling,* 31, pp. 155-161.

Akkizidis, I. and Bouchereau, V. (2006), *Guide to Optimal Operational Risk and Basel II.,* Auerbach Publications.

Ayuso, J., Pérez, D., and Saurina, J. (2004), 'Are capital buffers pro-cyclical? Evidence from Spanish panel data', *Journal of Financial Intermediation,* 13, pp. 249-264.

Basel Committee on Banking Supervision (April 1998), 'International Convergence of Capital Measurement and Capital Standards', Bank for International Settlements.

Basel Committee on Banking Supervision (June 2006), 'International Converging of Capital Measurement and Capital Standards: A Revised Framework (the Comprehensive Version)', Bank for International Settlements.

Baltagi, H.B. and Kao, C. (2000), 'Non-stationary panels, co-integration in panels and dynamic panels: a survey', in B.H. Baltagi (ed), *Non-stationary panels, co-integration in panels and dynamic panels*, Amsterdam: JAI Press, pp. 7-52.

Bell, S. (1978), 'Bank Lending to Industrial and Commercial Companies.', HM Treasury (mimeo.).

Bruesch, T.S. and Pagan, A.R. (1980), 'The Lagrange Multiplier Test and its Application to Model Specifications in Econometrics', *Review of Economic Studies*, XLVII, pp. 239-253.

Breitung, J. (2000), 'The local power of some unit root tests for panel data', in B.H. Baltagi (ed), *Non-stationary panels, co-integration in panels and dynamic panels*, Amsterdam: JAI Press, pp. 161-178.

Chami, R. and Cosimano, T. (2001), 'Monetary policy with a touch of Basel', I.M.F. *Working Papers* (No 01/151).

Cecchetti, S., and Li, L. (2008), 'Do capital adequacy requirements matter for monetary

policy?', *Economic Inquiry*, 46, pp. 643-659.

Cuthbertson, K. and Foster, N. (1982), 'Bank Lending to Industrial and Commercial Companies in Three Models of the U.K. economy', *National Institute of Economic and Social Research*, no. 120 , November, pp. 63-77.

Davidson, P. (ed) (1978), *Money in the real world*, Macmillan Press Publishing Ltd.

Dow, S. (2006), 'Endogenous money: structuralist', in Arestis, P. and Sawyer, M., *Handbook of Alternative Monetary Economics*, Edward Elgar Publishing.

Fondana, G. (2004), 'Rethinking endogenous money: A constructive interpretation of the debate between Horizontalists and Verticalists', *Metroeconomica*, 55, pp. 367-385.

Friedman, M. (1968), 'The role of monetary policy', *American Economic Review*, 58, no I.

Gambacorta, L., and Mistrulli, P.E. (2004), 'Does bank capital affect lending behaviour?', *Journal of Financial Intermediation,* 13, pp. 436-457.

Goodhart, C., Hofmann, B., and Segoviano, M. (2004), 'Bank regulation and macroeconomic fluctuations', *Oxford Review of Economic Policy*, 20, pp. 591-615.

Gup, B. (2004), 'The New Basel Capital Accord: Is 8% Adequate?', in B. Gup (ed.), *The New Basel Capital Accord*, Thomson Edition.

Hausman, J.A. (1978), 'Specification tests in econometrics', *Econometrica*, Vol. 46 (6), pp. 1251-1271.

Heid, F. (2007), 'The cyclical effects of the Basel II capital requirements', *Journal of Banking and Finance,* 31, pp. 3885-3900.

Holmes, A. (1969), 'Operational Constraints on the Stabilization of Money Supply Growth', In *Controlling Monetary Aggregates*. Boston: Federal Reserve Bank of Boston, June, pp. 65-77.

Honda, Y. (2002), 'The effects of the Basel accord on bank credit: The case of Japan', *Applied Economics*, 34, pp. 1233-39.

Jackson, P., Furfine, C., Groeneveld, H., Hancock, D., Jones, D., Perraudin, W., *et al* (1999), 'Capital Requirements and Bank Behaviour: The Impact of the Basel Accord', Basel Committee on Banking Supervision, *Working Paper* No. 1, April.

Im, K. S., Pesaran, M. H., and Shin, Y. (2003), 'Testing for unit roots in heterogeneous panels.', *Journal of Econometrics,* 115, pp. 53-74.

Kaldor, N. (1970), 'The New Monetarism', *Lloyds Bank Review*, July, pp. 1-7.

Kayshap, A., and Stein, J. (2004), 'Cyclical implications of the Basel II capital standards', *Federal Reserve Bank of Chicago Economic Perspectives*, pp. 18-31.

Kishan, R., and Opiela, T. (2006), 'Bank capital and the loan symmetry in the transmission of monetary policy', *Journal of Banking and Finance,* 30, pp. 259-285.

Kopecky, K., and VanHoose, D. (2004a), 'Bank capital requirements and the monetary transmission mechanism', *Journal of Macroeconomics,* 26, pp. 443-464.

Lavoie, M. (2003), 'The Primer on Endogenous Credit-Money', in Rochon, P-L. and Rossi, S. (eds), *Modern Theories of Money*, Cheltenham: Edward Elgar.

Lavoie, M. (2006), 'Endogenous money: Accommodationist', in Arestis, P. and Sawyer, M., *Handbook of Alternative Monetary Economics*, Edward Elgar Publishing.

Levin, A., Lin, C.F., and Chu, C. (2002), 'Unit root test in panel data: asymptotic and finite sample properties', *Journal of Econometrics,* 108, pp.1-25.

Liebig, T., Porath, D., Weder, B., and Wedow, M. (2007), 'Basel II and bank lending to emerging markets: Evidence from the German banking sector', *Journal of Banking and Finance,* 31, pp. 401-418.

Maddala, G., and Wu, S. (1999), 'A comparative study of unit root tests and a new simple test', *Oxford Bulletin of Economics and Statistics*, 61, pp. 631-652.

Moore, B. (1988), *Horizontalists and Verticalists. (The Macroeconomics of Credit Money)*, Cambridge University Press.

Moore, B. (1989b), 'The endogeneity of credit money', *Review of Political Economy*, pp. 64-93.

Moore, B. and Threadgold, A. (1985), 'Corporate Bank Borrowing in the U.K., 1965-1981.' *Economica*, 52, pp. 65-78.

Nell, K. (2000-1), 'The endogenous/exogenous nature of south Africa's money supply under direct and indirect monetary control measures', *Journal of Post Keynesian Economics*, 23, pp. 313-29.

Norton, N.E. (1969), 'Debt Management and Monetary Policy in the U.K.', The *Economic Journal*, 79, September, pp. 475-495.

Palley, T. (1994), 'Competing views of the money supply process: Theory and evidence.', *Metroeconomica*, pp. 67-88.

Panagopoulos, Y. and Spiliotis, A. (1998), 'The Determinants of the Bank's Lending Activity: Some Evidence for Greece', *Journal of Post Keynesian Economics*, 20 (4), pp. 649-672.

Panagopoulos, Y. and Spiliotis, A. (2008), 'Alternative money theories: A G7 testing', *Journal of Post Keynesian Economics*, 30 (4), pp. 607-629.

Pedroni, P. (1995), 'Panel Co-integration: asymptotic and finite sample properties of pooled time series, with an application to the PPP hypothesis', *Indiana University*

Working Papers in Economics, pp. 95-103.

Pedroni, P. (1997), 'On the role of cross-sectional dependency in panel unit root and panel co-integration exchange rate studies', *Indiana University* (mimeo.).

Pedroni, P. (1999), 'Critical values of co-integration tests in heterogeneous panels with multiple regressions', *Oxford Bulletin of Economics and Statistics*, 61, Special Issue, pp. 653-670.

Pesaran, M.H., Shin, Y., and Smith, R. J. (1999), 'Pooled mean group estimator of dynamic heterogeneous panels.', *Journal of the American Statistical Association,* 94, pp. 621-634.

Pesaran, M.H., and Smith, R. J. (1995), 'Estimating long-run relationship from dynamic heterogeneous panel.', *Journal of Econometrics,* 68, pp. 79-113.

Rochon, P-L. and Rossi, S. (2007), 'Administered Interest Rates and Interbank Settlements: Monetary Policy in a World with Zero Reserve Requirements', 3rd International Conference on Principles of Post-Keynesian Economic Policy, organised by Cemf, Université de Bourgogne, France.

Spencer, P. D. and Mowl, C. (1978), 'The Model of the Domestic Monetary System, in a Financial Sector for the Treasury Model'. Government Economic Service Working Paper, No 17 (Treasury Working Paper, No 8).

Sprenkle, C. M. and Miller, M. H. (1980), 'The Precautionary Demand for Narrow and Broad Money', *Economica*, 47, November, pp. 407-21.

Van den Heuvel, S. (2002), 'Does Bank Capital Matter for Monetary Transmission?', Federal Reserve Bank of New York, *Economic Policy Review*, May.

Van den Heuvel, S. (2007), 'The Bank Capital Channel of Monetary Policy', The Wharton School, University of Pennsylvania, mimeo.

VanHoose, D. (2007), 'Theories of Bank Behavior Under Capital Regulation', *Journal of Banking and Finance*, 31, pp. 3680-3697.

Wood, J. H. (1974), 'A Model of Commercial Bank Loan and Investment Behaviour' , in Johnson, H. G. and Nobay, A.R. (eds), Issues in Monetary Economics, Oxford University Press.

Wang, L. (2005), 'Bank capital requirements and the effectiveness of monetary policy', Mimeo., Peking University.

Zicchino, L. (2006), 'A Model of Bank Capital, Lending and the Macroeconomy: Basel I versus Basel II', *The Manchester School*, pp. 50-77.