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Título: **Accommodationists versus structuralists: some empirical evidence from Spain (1987-98)**

Resumen:

The main purpose of the study is to test empirically the theoretical controversy between the so-called "accommodationist" and "structuralist" approaches in the context of the endogenous money hypothesis. The former is usually summarised as stating that the determination of the money supply is essentially both *credit-driven* and *demand-determined*. The information used for empirical testing corresponds to monetary time series data from the Spanish economy covering the period 1987-1998. It thus encompasses the period which stretches from the complete liberalisation of commercial banks deposit and lending rates in Spain up to the passing over of monetary policy management from the Bank of Spain to the European Central Bank. Direct Granger causality tests are then run between the monetary base, various money multipliers (using the M1, M2 and M3 definitions) and bank lending to the non-bank private sector for the period considered. Overall the results lend strong support for the structuralist approach since Granger causality is found to run *predominantly* from bank lending to the monetary base (and thus banks' reserves) and the various money multipliers.

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**ACCOMMODATIONISTS VERSUS STRUCTURALISTS: SOME EMPIRICAL EVIDENCE FROM SPAIN (1987-98)**

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**1.- Introduction**

The main purpose of this study was to test empirically the theoretical controversy between the "accommodationist" and "structuralist" approaches in the context of the endogenous money hypothesis. The former is usually summarised as stating that the determination of the money supply is both *credit-driven* and *demand-determined*. The theoretical controversy between the accommodationist and structuralist approaches has been portrayed as focusing on two main points (Palley, 1996a). First there is disagreement over the significance ascribed to the private initiatives of commercial banks in accommodating increases in loan demand. Accommodationists claim that accommodation depends almost exclusively on the willingness of the central bank to supply the reserves required by increased bank lending. Structuralists place special emphasis on the banks initiatives generally known as "liability management" aimed at reducing their loan : reserve ratio in order to accommodate increases in loan demand. Second there is the argument by accommodationists that central banks can *only* follow a policy regime based upon the control of interest rates whereas structuralists

claim that the monetary authorities can also implement a policy regime based upon the control of reserves (Palley, 1996a, p.585).

The information used for empirical testing of the two approaches corresponds to monetary and financial time series data from the Spanish economy covering the period 1987-1998. It encompasses the period which stretches from the complete liberalisation of commercial banks' deposit and lending rates in Spain after the change of political regime up to the passing over of monetary policy management from the Bank of Spain to the European Central Bank. Direct Granger causality tests (Granger, 1969) were then run between the monetary base, various money multipliers (using the M1, M2 and M3 money supply definitions) and bank lending to the non-bank private sector for the period considered. Overall the results lend strong support for the structuralist approach since Granger causality is found to run *predominantly* from bank lending to the monetary base (and thus banks' reserves) and the various money multipliers. Empirical analysis is extensively described in section 4.

## **2.- Theoretical Background**

The purpose of this section is twofold: (i) define precisely the fundamental point of disagreement or differences of emphasis between accommodationists and structuralists and (ii) specify an appropriate way of empirically discriminating between these two approaches. The former tasks will be carried out the following way. First we introduce what is usually considered as being the essence of the accommodationist approach to the determination of the level (and growth rate) of money supply and short-run interest rates. The exposition is based on Basil Moore's ideas (Moore, 1988, ch.6). Second we look at the essential objections to the accommodationist approach raised by Pollin (1991).

Since all the tests devised by Pollin in his 1991 paper (see references) in order to discriminate empirically between the two approaches were subsequently (and I would argue successfully) criticised by both Moore (1991) and Palley (1991) and given that some time later Pollin (1996) himself partially recognised his own mistake, we will focus on what, according to us, is left of Pollin's argument. It will then be argued that the main source of disagreement between accommodationists and structuralists rests upon differences of emphasis laid upon the initiatives of banks as far as the accommodation of loan demand is concerned. Finally it is argued that the test proposed by Palley (1996b) constitutes an adequate approach - albeit with some relatively minor modifications - of empirically discriminating between the accommodationist and structuralist approaches.

### **2.1.- Theoretical controversy**

According to Moore (1988) the current Federal Reserve operating procedure is one of "reserve restraint" or "dirty" interest rate targeting. The supply of nonborrowed reserves (NBOR) responds automatically within the reserve maintenance period to shifts in the demand for reserves, which in turn depends on the amount of new loans granted. The former occurs in such a way that these demand shifts needn't have any effect on the

federal funds rate unless the Fed so desires. The degree of reserve restraint target is changed on a discretionary basis when a list of key variables (in particular the expected rate of inflation) deviate from the preferred behaviour. The federal funds rate is not *directly* set by the Fed according to this view. However, Moore argues that (Moore, 1991, p.124):

*The Fed directly sets the discount rate, directly targets the volume of borrowed reserves, and directly determines the implicit cost of discount window funds by the degree to which it administers, monitors, and supervises discount-window borrowing, and so largely sets the slope of the upward-sloping supply of borrowed reserves functions...Once the discount rate, degree of restraint (nonborrowed reserves), and administrative discount-window procedures have been set, the federal funds rate is predetermined within a small range, ordinarily within fifty or sixty basis points...Only within this narrow range is it correct to regard interest rates as "market-determined." By changing any of the above three parameters, the Fed is able to administer the federal funds range so that it lies around whatever level the Fed desires.*

Banks borrowing from the discount window would face two costs: the explicit cost of borrowing (the discount rate) plus the implicit nonpecuniary costs. Those banks that borrow frequently or in relatively large amounts come under closer scrutiny. It may also be the case that banks perceived to overuse the window are refused credit for a certain period of time (Moore, 1998, p.117). In general, it is argued that the Fed relies on a set of lending procedures to limit the amount individual banks can borrow at the discount window, since it *intends banks to view the discount window only as a "last resort", that is, a residual source of funds when they face unexpected needs...This procedure imposes additional implicit surveillance costs on banks that borrow, the costs of providing information and negotiating with the Federal Reserve Bank plus the threat of possible future denial of access. These nuisance or "frown" costs are sufficient to keep most banks from making use of the window unless market rates rise substantially above the discount rate...A Federal Reserve decision not to provide nonborrowed reserves in the amounts the banks are required to hold will cause borrowing at the discount window to increase, as banks turn to the window to meet required reserves. Since access to the window is limited by frequency and amount, policies that force higher discount-window borrowing tend to raise short-term interest rates as banks use up their welcome at the window* (Moore, 1988, p.118-9).

Within this framework, if the Fed did not set nonprice quantity limits on borrowing, banks would never pay more than the discount rate to borrow reserves in the federal funds market. However, as explained above, Moore argues that the Fed somehow pursues nonprice rationing. By supplying some volume of NBOR relative to total required reserves (RR), the Fed directly controls the amount of discount-window borrowing. For a certain quantity of required reserves demanded by depository institutions, reducing average NBOR through open market sales raises average discount-window borrowing. As borrowings from the discount window increase, the marginal *effective* total cost of obtaining (discount rate plus frown costs) reserves rises above the discount rate, after borrowed reserves (BOR) have increased beyond some frictional and variable amount (Moore, 1988, p.122).

Through bank arbitrage, the federal funds rate rises *pari passu* above the official discount rate. Increases in NBOR relative to total required reserves operate in a reverse direction to reduce short-term rates. *The combination of the discount rate and the amount of borrowing tends in a loose way to determine the federal*

*funds rate. In this manner by altering the volume of borrowed reserves, the funds rate, and so the marginal cost of funds to banks, the Federal Reserve can move the banking system along the demand for credit schedule it faces, provided that the banks continually adjust their administered lending rates. By these exceedingly loose linkages the Fed is able to affect the nominal quantity of bank credit demanded and consequently the nominal quantity of bank deposits supplied (Moore, 1988, p.122).*

In addition to this, Moore argues that if the central bank *only* sets the supply price but *not* the supply quantity of reserves, the credit money supply function is then *horizontal* in the market period, at an interest rate exogenously administered within some range (Nota 1) by the central bank (Moore, 1991, p.405). We thus understand that if a variation in the volume of RR leads to a sustained variation in the level of short-term interest rates, it is because the central bank desires so. However, as Moore points out (Moore, 1991) the authorities do *not* hold the level of short-term interest rates constant over long periods of time. *Rather, they continually respond to changes in the economy as they attempt to move key macroeconomic variables toward their preferred target values (Moore, 1991, p.406).* The central bank is thus viewed as changing the level of short-term interest rates according to a policy reaction function.

Having showed what, according to us, are the basic features of the accommodationist approach as far as central bank behaviour is concerned, we then move on to present the fundamental objections raised by so-called structuralists (Pollin, 1991). According to Pollin, the structural endogeneity theory is distinguished from the accommodative approach because it does *not* recognise any commitment on the part of the central bank toward pursuing full accommodation of total RR. As a result of it, *when central banks choose to restrict NBOR, then additional reserves, though not necessarily a fully adequate supply, are generated within the financial structure itself -through innovative liability management practices such as borrowing in the federal funds market, Eurodollar market, and certificates of deposit markets (Pollin, 1991, p.368).*

The argument is two-fold (Pollin, 1991, p.373-4): (i) discount-window borrowing is *not* a close substitute for NBOR and (ii) the central bank exercises its authority to *quantity-constrain* the reserves it supplies - it will not necessarily pursue a fully accommodative stance through open market operations. As for the first point, it is argued that the administrative restrictions on discount window borrowing are real and effective. As a result of it, it is argued, even though discount rates are typically below money market rates, banks and other intermediaries are generally reluctant to seek discount window funds except in emergencies. However, as we showed above, this point is clearly shared by Moore (1988) when he recognises both that banks borrowing from the discount window face two costs, the explicit cost of borrowing or discount rate plus the implicit nonpecuniary costs, and that *access to the window is limited by frequency and amount.*

As for the second point, it is argued that central banks operate under a set of constraints which limit their ability to pursue accommodative open market operations. In particular, *while the central bank may recognise the contractionary dangers of quantity restrictiveness, it could believe that inflationary dangers associated with monetary ease are equally, if not more, problematic. Similarly, the central bank must be concerned that too rapid a growth of NBOR could exert downward pressure on the exchange rate value of the national currency... For many reasons, in short, advocates of structural endogeneity assume that some degree of open market restrictiveness is the norm and that such restrictiveness does act as a significant restraint on the quantity of reserves supplied by the central bank (Pollin, 1991, p.374).*

Presumably, Moore's response to this second point could be framed as follows. If the central bank does not supply all the reserves required by banks and short-term market interest rates rise, it is not because the central bank pursues a *less than fully accommodating* strategy as a general rule, but because the central bank policy reaction function dictates, at a specific time and under specific circumstances, that a rise in short-term interest rates should take place if *ultimate* policy goals are to be attained. This point has been recently made clear by Moore (1998, p.176):

*The terminology "partial" or "complete" central bank accommodation, although widely used, should really be abandoned. It is misleading (and confusing) relic of the mainstream vision that the central bank exogenously controls the money supply. In the real world, the central bank always fully accommodates bank demand for reserves, in its role as residual supplier of system liquidity. In a closed economy, it also must always set the level of short-term interest rates.*

Therefore, whether or not an increase/fall in the demand for reserves ends up leading to a rise/fall in short-term interest rates -leaving liability management aside for the time being- will depend on the specific circumstances faced by the central bank and the economy. Particularly, it will depend upon the deviation of the actual values of the ultimate goals of monetary policy from their target values, that is, it will depend on the variation in interest rates implied by the policy reaction function. *Interest rates are thus an autonomous policy instrument. Their level depends on how central banks choose to respond* (Moore, 1991, p.406). The essence of the "reserve price setting" position is, according to Moore (1991, p.408), *that solvent individual banks can always obtain additional reserves at the market rate*. However, Pollin replied (1991, p.370-1):

*It is difficult to see why liability management should emerge as a sustained and systematic practice for financial intermediaries once one assumes that BOR are perfect substitutes for NBOR, and that therefore no effective quantity constraint exists. Liability management requires that intermediaries with insufficient reserves to meet loan demand pay market interest rates for funds acquired through federal funds borrowing, repurchase agreements, issuing certificates of deposits or rather similar practices. Intermediaries will acquiesce in paying market rates on such instruments only if they could not expect to obtain the funds they need more cheaply and/or readily through accommodative open market operations and discount window borrowing, frown costs included...In the aggregate, an institutional framework where no quantity constraint exists would not encourage the systematic practice of liability management.*

Further, according to Pollin, one implication of this systematic practice of liability management is that, when one takes account of changes in legal reserve requirements, the accommodationist position of a horizontal supply curve *implies that loans and reserves will grow at a proportional rate*. If that is not the case, he goes on to argue, it is because some significant barriers to full accommodation are present (Pollin, 1991, p.371). An obvious objection to this argument can be found in Palley (1991, p.401):

*Pollin argues that the accommodationist perspective predicts a stationary loan : reserve ratio. The apparent logic is that since banks can get all the reserves they want at a fixed interest rate, loans and reserves expand proportionately. In my opinion, this is incorrect. Banks are profit maximizers, and reserve requirements represent an implicit cost since they reduce the amount of each dollar of deposits banks can lend out. Consequently banks have an incentive to innovate to avoid these requirements. Such innovations involve introducing new liabilities with lower or no reserve requirements. As a result the loan : reserve ratio is characterised by an upward secular trend under both the structuralist and the accommodationist perspectives.*

In a similar way, Moore argues that the stability of the loan : reserve ratio is, in no sense, a test for the two approaches. Banks, he argues, make loans first, and look for the reserves later. In the process, they *continually* seek to reduce their effective reserve requirements, since reserves are nonearning assets (Nota 2) (Moore, 1991, p.407). What emerges from this response is that a test on the stationarity in mean levels of the loan : reserves ratio of banks can *not* constitute a legitimate way of discriminating between the accommodationist and structuralist approaches. Nevertheless Pollin (1991; 1996) set up two additional empirical tests to discriminate between the two approaches: (i) close *substitutability* between NBOR and BOR and (ii) *causality* running from the central bank to financial market interest rates. In the first case, Pollin argues that an implication of the accommodationist approach is that BOR and NBOR are close substitutes, whereas in the structuralist approach they are not. He adds that BOR could be considered close substitutes for NBOR if in formal statistical tests, changes in the growth of NBOR have a significant *inverse* relationship with changes in BOR (Pollin, 1991, p.372; Pollin, 1996, p.506-7).

However, as Palley (1991, p.401) pointed out, an accommodationist might respond that when the Fed wishes to reduce NBOR, it may well be that it wants to raise interest rates. If that is the case, it is very likely that it will simultaneously take other actions such as raising the discount rate, which discourages discount-window borrowing. Putting it a different way, if the Fed wants to raise interest rates, it is likely that it will reduce NBOR along with other actions such as discouraging discount-window borrowing. As a result of it, if the empirical evidence shows that BOR and NBOR have not a significant inverse relationship, then the former is not necessarily supportive of the structuralist approach whatsoever.

Moore's objection to Pollin's second test is as follows (1991, p.409). He argues that when total reserves are constant, then we would expect that an increase/decrease in NBOR would be accompanied by a decrease/increase in BOR. As a result of it, *whenever the change in total reserves is zero (or very small), changes in NBOR will be negatively correlated with changes in BOR* (Moore, 1991, p.409). However, when total reserves are rising - as it is normally the case in a growing economy - then an increase in NBOR which is lower than the increase in required reserves (RR) will necessarily take place alongside an increase in BOR, since the central bank will have to supply the additional reserves through discount-window borrowing by banks. It might be the case that, as a result of an increase in RR, the central bank raises NBOR *but* reduces BOR by simultaneously purchasing banks' securities (through open market operations) and rising the discount rate. Thus depending on central bank policy, positive, negative or zero correlation between NBOR and BOR will be consistent with BOR and NBOR being *perfect* substitutes (Moore, 1991, p.409).

The third test set up by Pollin aims at testing accommodationists' claim that causality always runs from those interest rates controlled by central banks to overall rate behaviour against structuralists' claim that there is a *two-way* causality between central bank-controlled rates and the other interest rates. According to Pollin, if central bank-controlled interest rate changes do *lag* the market to a statistically significant extent, this would suggest that there is a substantive basis for the market's sequentially prior action. Moore's objection to this test (Moore, 1991, p.411) is that evidence of two-way causality between central bank-controlled rates and other market rates does *not* allow us to discriminate between the accommodative and structuralist approaches. This is so because current market rates embody expectations about future short-term rates (closely controlled by the central bank). As a result of it, according to Moore, evidence of two-way causality would even be supportive of the accommodative approach when properly interpreted.

A tempting response to Moore is that the expectations hypothesis of the term structure of interest rates is not universally accepted, so that his objections critically depend on the expectations hypothesis being the correct theory of long-term interest rate determination. Yet as far as it is usually argued the "markets" consider expected future short-term interest rates as an important factor determining the term structure of interest rates, and to the extent that what matters in such cases is what the "markets" believe that matters, then the prophecy is likely to come true. In consequence, we thus share with Moore the view that the sort of causality test set up by Pollin should not be used to discriminate between the two approaches.

## 2.2.- Causality

The question that emerges from the discussion above is whether there is a sensible way of discriminating between the accommodationist and structuralist approaches. It is argued below that the test set up by Palley (1996b, p.118-20) is not subject to the sort of objections and misinterpretation problems encountered by the tests set up by Pollin (1991). On the basis of what we understand to be the main point of disagreement we explain why the test proposed by Palley represents a reasonable way of empirically discriminating between the two approaches.

It was said above that, according to our own interpretation of the accommodationist approach, increases in RR (for instance brought about by increases in loan demand) would lead to interest rate rises only to the extent that the central bank policy reaction function dictates it. We understand this is the way Moore's statement that *solvent individual banks can always obtain additional reserves at the market rate* must be understood (Moore, 1991, p.408). However, we also think there is a point in the structuralist approach that has been overlooked by accommodationists (Nota 3). In particular, it will normally be the case that, during an upswing in the economy, borrowing by the non-bank private sector, deposits and reserves expand. As the economy booms inflationary pressures may emerge at some point which, in turn, will prompt the central bank -in implementation of its policy reaction function- to rise short-term interest rates. Reserve restraint will ensue. Although it is likely that individual banks will be able to obtain all the additional reserves they need at the new (higher) interest rate set up by the central bank -and in this sense the reserve supply curve could be seen as being horizontal at the (new) higher short-term rate- the rise in the federal funds rate will somehow encourage banks to search for alternative sources of funds with lower reserves requirements. The former may not be an attractive source of

funds for banks when they are not running short of reserves and the federal funds rate is relatively low - presumably because banks have not yet used up their initial welcome at the discount window- but they might become increasingly attractive for banks as the federal funds rate reaches relatively high levels.

If we think of these alternative sources of funds as consisting of either transformation of demand into time deposits or the issuing of certificates of deposit, clearly the interest rate to be paid on them will be relatively higher than the interest rate to be paid on demand deposits. If we think of the alternative sources of funds as being the eurocurrency markets, then the higher cost may well take the form of higher transaction costs associated to currency exchange which, for a given borrowing rate, will turn them into a relatively expensive source of funds. In both cases, their use is only desirable when the federal funds or interbank market rate has reached a relatively high level. As arbitrage between these markets and the federal funds market takes place, banks will be able to carry out a transformation of the liability side of their balance sheets allowing them to reduce their loan : reserves ratio (Nota 4) . Along with the transformation of banks' balance sheets, liability management may also include the discovering of new financial products aimed at further reducing banks' loan : reserves ratio.

On the opposite, during a downswing we will observe a tendency for interest rates to fall as inflationary pressures in the economy weaken and, consequently, the central bank relaxes its monetary policy. Both loan demand and deposit growth rates will slow down. Banks will feel less pressure to search for sources of funds with lower reserve requirements as both their loan : reserve ratio and the federal funds rate fall. The former does *not* mean that banks will stop searching for new financial products which allow them to further reduce the loan : reserves ratio. It simply means that the pressure to find these new products will now be lower and that, conceivably, other things being the same, *the rate of financial innovation will tend to slow down and, in a more general sense, the intensity of liability management (innovative or not) will decrease.*

However, once innovative liability management during the economic upswing has proved successful (Nota 5) , the new financial products will be available thereafter *whatever the pressure banks have to find alternative sources of funds with lower reserve requirements.* Thus we would expect the loan : reserve ratio, and consequently the various money multipliers, to have a secular upward trend. Therefore, although both Moore and Palley similarly argue that banks, as profit-maximizers, will *continually* be seeking to reduce their loan : reserve ratio, it is reasonable to expect that both the intensity of liability management, and consequently, the rate of growth of money velocity (Nota 6) (as well as the rate of growth of the money multipliers) usually rise when monetary policy is tightened and fall when monetary policy is relaxed. Putting it in a slightly different way, we would expect liability management activities to intensify during the upswing as the central bank raises interest rates, and we would expect them to slow down during the downswing as inflation goes down and the central bank lowers interest rates.

As a result of it, once the various time series considered have either been made stationary or a cointegrating relationship (Nota 7) has been found to exist between the pair of series considered, if the accommodationist approach portrays a picture of loan demand accommodation by banks *closer* to reality than the picture portrayed by the structuralist approach we should get the following results (Nota 8) . First we *should* be able to reject the null hypothesis that bank lending Granger causes the money multipliers (Nota 9) . In addition, we should *not* be able to reject both the null hypotheses that bank lending Granger causes the monetary base (Palley, 1996b, p.118) and that reserves (or the monetary base) Granger cause bank lending. In turn, if the structuralist approach is to be validated, we should *not* be able to reject the null hypothesis that bank lending Granger causes both the monetary base and the various money multipliers.

### **3.- Monetary Policy in Spain in the last two decades**

It is the purpose of this section to review the most important developments that have taken place in Spanish monetary policy in recent times. In particular, this section has two main objectives. First it aims at providing some useful insights into the institutional framework which has characterized monetary policy in Spain during the last two decades. Second it purports to identify possible structural breaks in the time series used in the study. In the light of the information provided, it will be argued that the specific institutional arrangements of monetary policy in Spain throughout this period did not significantly differ from US monetary policy (as described in section 2) thereby making it relevant to study the relative importance of liability management for loan demand accommodation as similar studies for the US economy previously did. In addition, as we will show in next section, a structural break in the form of a permanent level shift occurred in March 1990 in the aftermath of a substantial reduction in required reserves by the Bank of Spain. The former may have a significant impact on the results of the unit root tests that will be implemented further forward. Section (3.1) contains a general overview of monetary policy in Spain from the second half of the eighties whereas section (3.2) focuses on some basic institutional features of monetary policy operational procedures.

#### **3.1.- An overview of monetary policy in Spain**

As we pointed out above, the choice of 1987 as the starting year for our study is due to two reasons. First, there is the fact that banks' lending and deposit rates were not completely liberalized in Spain until that year (Servicio de Estudios del Banco de España, 1997, p.93). Second, short-term interest rates became the basic monetary policy instrument (Nota 10) the same year (Rodríguez, Parejo, Cuervo and Calvo, 1996, p.122). In the 1980s Spanish monetary policy was strongly influenced by Spain's entry into the European Community, an event which actually took place in 1986. A consequence of that important political development was the resulting need to reduce the volatility of both interest rates and the exchange rate. For instance in the period 1984-1989 (June) monetary policy was still characterized by the setting of a growth rate for a broad monetary aggregate as an intermediate target. However, despite the setting of target growth rates for monetary aggregates throughout the 1980s a gradual shift in the monetary policy regime was already under way. The Bank of Spain was attaching increasing importance to a nominal exchange rate indicator of the peseta *vis a vis* the main European currencies (representing the main trade partners except Portugal and Greece) as an argument of its policy reaction function across this period. From 1988 onwards, the bilateral exchange rate against the Deutsche mark was substituted for the aforementioned exchange rate indicator.

In an attempt to reinforce the battered credibility of Spanish monetary authorities, the peseta joined the European Monetary System (EMS) in June 1989 with a 6% fluctuation margin in each direction. As a result of the new institutional arrangement, the broad monetary aggregate previously used as an intermediate target eventually turned into just another economic indicator thus turning short-term nominal interest rates into the main instrument used to keep the exchange rate within its fluctuation threshold. In addition, a widening of the fluctuation margins within the EMS aimed at ending speculative attacks upon the weaker currencies took place in summer 1993 allowing them to fluctuate as much as  $\pm 15\%$  thereafter.

Therefore Spanish monetary policy from 1987 to 1995 basically consisted in the maintenance of a target long-term nominal value for the exchange rate *vis a vis* the main European currencies (in practice the Deutsche mark). The determination of the level of short-term interest rates aimed at making monetary and credit aggregates grow at a pace compatible with the sustainability of the long-run target exchange rate. Insofar as the achievement of this long-run target exchange rate entailed the convergence of the rate of inflation towards the average level (lower) prevailing in the core European economies, Spanish real interest rates had to remain relatively high. In such a context of high capital mobility high real interest rates led to powerful capital inflows which put upward pressure on the peseta exchange rate against most other European currencies. Finally the Bank of Spain abandoned the regime based upon the setting of an exchange rate target against the Deutsche mark in 1995 and an inflation-targeting strategy with no intermediate target was adopted. The new monetary policy regime worked successfully until December 1998 when the launching of the Eurocurrency led to the transfer of monetary policy away from the Bank of Spain to the European Central Bank.

### **3.2.- Monetary policy instruments**

Prior to 1987 the determination of the degree of restraint of monetary policy was based upon the setting of a target growth rate for the level of banks' reserves. Thereafter Spanish monetary policy was based upon the control of short-term nominal interest rates. In turn *open-market operations* became the basic instrument used for the determination of the degree of restraint of monetary policy. The former usually took place through repurchase agreements of Certificates of Deposit issued by the central bank (Nota 11) (CDs) and Treasury Bills (TB) on a decennial (ten days) and daily basis using the *striking-price* auction system (Nota 12). As a result of it, the interest rate set by the Bank of Spain in the decennial auctions of CDs and TB became the reference interest rate for the interbank market and monetary policy. Therefore the Bank of Spain basically set the short-term rate of interest or degree of restraint of monetary policy through the determination of the marginal interest rate of auctions in decennial open-market operations.

In addition to open-market operations carried out on a daily or a decennial basis, there was still an additional monetary policy instrument in the form of a *last-resort credit device*. The former was an instrument akin to the discount-window system described in section 2 when we reviewed the US Fed operational procedures. However a slight difference exists. The discount rate set by the Fed is always lower than the Federal Funds rate, whereas the interest rate set by the Bank of Spain was always above the money market rate. The former is due to the fact that, as borrowing by individual banks from the Fed's discount-window exceeds a certain threshold, *non-pecuniary* marginal costs of borrowing gradually increase thereby encouraging banks to limit discount-window borrowing to exceptional cases. In contrast, the Bank of Spain did not rely on the imposition of *non-pecuniary* costs upon the last-resort credit device interest rate, but simply set this interest rate slightly above the money market rate thus encouraging banks to make use of this credit source only under exceptional circumstances. As a result of it the last-resort credit device became a marginal monetary policy instrument all throughout the period considered.

Having said this, we believe the institutional arrangements of monetary policy in Spain did not differ

significantly from US monetary policy throughout the period considered. In particular we think that within this institutional framework it is still possible to argue that the reserves' supply curve banks faced was horizontal at the interest rate set by the monetary authorities. Therefore we understand that all the conclusions of section 2, especially those ones referred to the test proposed by Palley carry over to the current section.

#### **4.- Evaluating competing models: some empirical evidence from Spain**

The current section contains the statistical analysis of monetary data from the Spanish economy. The purpose of the analysis is to discriminate empirically between the two competing approaches to the process of loan demand accommodation by banks. The sample period is 1987:01 - 1998:10. The data is in average monthly form, and drawn from the *Boletín Económico del Banco de España*. The original time series were initially filtered by taking logarithms. All subsequent estimates were by ordinary least squares. The procedure followed had two stages. First, since stationarity is a requirement for the implementation of Granger causality tests (Granger, 1969, p.431) we checked all series for stationarity. This was done by means of graphical inspection in the first place and unit root tests in the second place. In turn, graphical inspection included the observation of the actual behaviour of the series and their corresponding correlograms.

The unit root tests implemented were in the standard and Perron's version (depending on whether or not a structural break was observed) of the augmented Dickey-Fuller test. In the first case we used Mackinnon's critical values (Davidson and Mackinnon, 1993, p.703) whereas in the second case critical values tabulated by Perron (Franses, 1998, p.151) were used. After having checked all series for stationarity Granger causality tests were run using five different lag lengths for the autoregressive distributed lag (ADL) relations (Nota 13). The variables definitions used throughout the analysis are the following (Nota14):

LBM = log of monetary base

Lm1 = log of M1 money multiplier

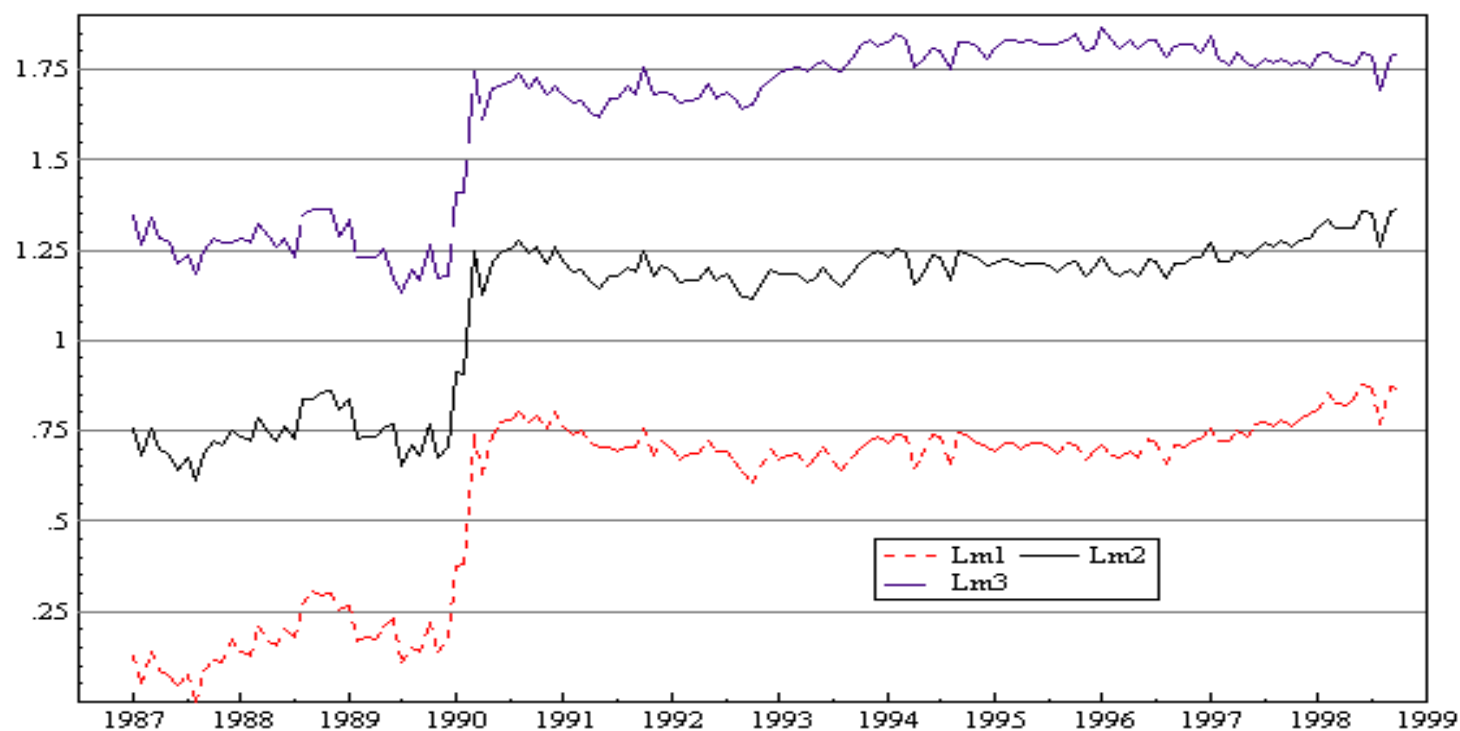
Lm2 = log of M2 money multiplier

Lm3 = log of M3 money multiplier

LLoans = log of loans

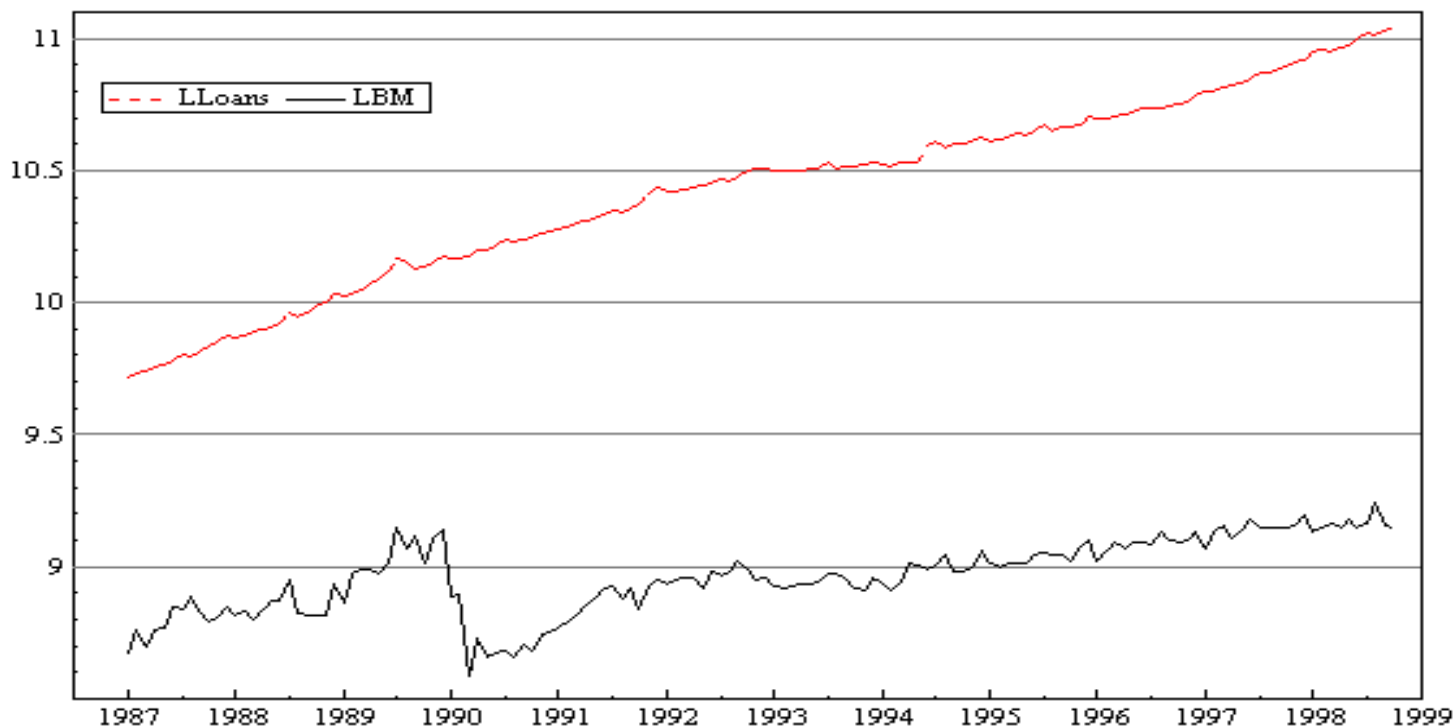
##### **4.1.- Stationarity analysis**

Stationarity analysis starts off with the visual inspection of the logarithms of the series in levels. Figures 1 and 2 below show that all variables display an upward trend. The former is very clear for LLoans and LBM but there is also evidence that there has been positive growth of Lm1, Lm2 and Lm3 over time. In addition the figures show that all the variables except LLoans experienced a structural break in the form of a permanent upward (downward for LBM) level shift in 1990:03. As we indicated in the previous chapter, a substantial reduction in required reserves was implemented by the Bank of Spain in March 1990. The result of such reduction was a sudden fall in the monetary base as banks were obliged to purchase Certificates of Deposits issued by the Bank of Spain. Insofar as money supply did not experience an equivalent fall the money multipliers shifted upwards.



Source: Boletín económico del Banco de España

**FIGURE 1**



Source: Boletín económico del Banco de España

**FIGURE 2**

Visual inspection of the correlograms of Figures 5 and 6 in the appendix (section 2.1) corroborates our initial judgement. The correlograms show that Lm1, Lm2 and Lm3 display the usual pattern for a non-stationary series with the autocorrelation coefficients dying out. The correlograms for LBM and LLoans are not so clear-cut, but somehow point in the same direction. Unit root tests suited for *trending* (Nota 15) time series were run and the results were compiled in Table 1 below. Augmented Dickey-Fuller (ADF) tests were run for all series. Critical values tabulated by Mackinnon (Davidson and Mackinnon, 1993, p.703) were used in the ADF test for LLoans. The presence of a documented permanent level shift in all remaining series invalidated these critical values for a standard ADF test. (Nota 16) Consequently asymptotic critical values tabulated by Perron (Franses, 1998, p.151) for ADF tests in the presence of a level shift at a known date were used in the ADF tests run for Lm1, Lm2, Lm3 and LBM.

	t-value (lag length)	Critical values
Lm1	<b>-3.963 (3)**</b>	<b>-3.30/-3.88</b>
Lm2	<b>-4.330 (5)**</b>	<b>-3.30/-3.88</b>
Lm3	<b>-3.458 (5)*</b>	<b>-3.30/-3.88</b>
LBM	<b>-6.844 (5)**</b>	<b>-3.30/-3.88</b>
LLoans	<b>-2.0539(0)NR</b>	<b>-3.445/-4.032</b>

\* indicates that the null hypothesis  $H_0: \gamma = 0$  can be rejected at the 5% significance level but can *not* be rejected at the 1% level.

\*\* indicates that the the null hypothesis  $H_0: \gamma = 0$  is rejected at the 1% significance level.

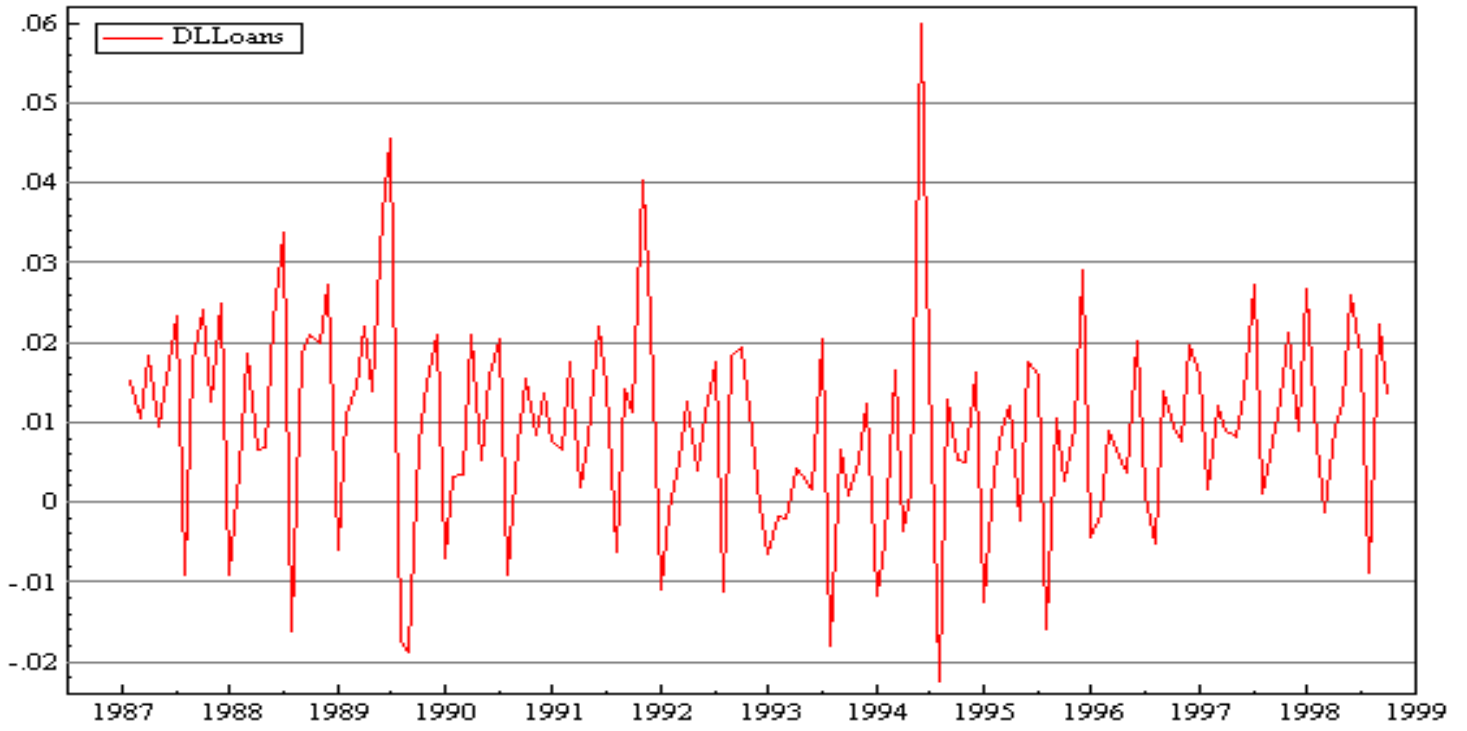
NR indicates that the null hypothesis  $H_0: \gamma = 0$  can not be rejected at the 5% significance level.

The unit root test for LLoans also included a seasonal following the observation of the correlogram for DLoans. The first number in the column containing the critical values corresponds to the 5% significance level whereas the second number corresponds to the 1% significance level. Finally, the numbers in parenthesis indicate the lag length used in the ADF test.

### TABLE 1

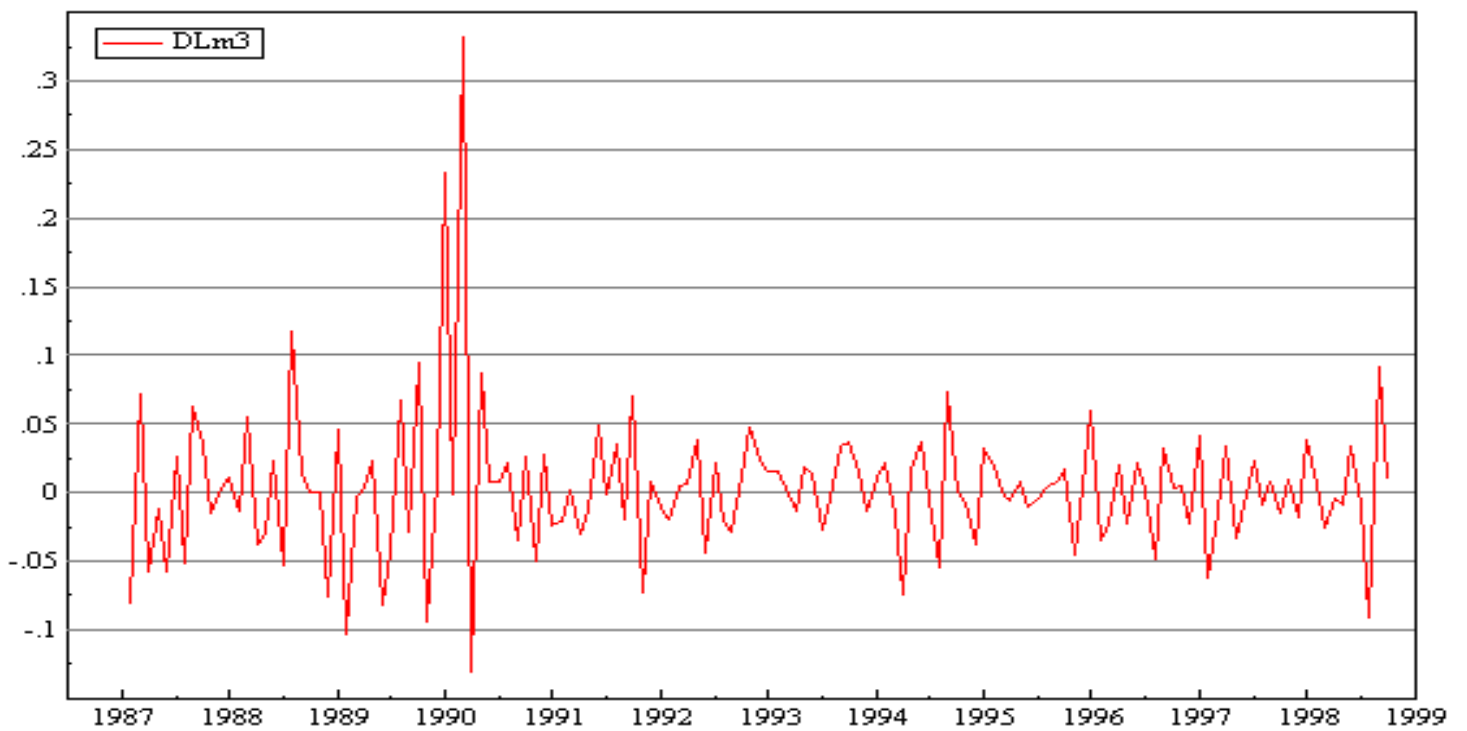
The second column in Table 1 shows the t-values and the lag length used in the ADF test . (Nota 17) The third column shows the corresponding critical values. The test format used varied depending on whether a standard ADF or Perron's version of the ADF test was run (see section 1.1 in the appendix). If the unit root hypothesis can not be rejected that means that the trending series' data generating process (DGP) is a random-walk with drift. As Table 1 shows, the unit root hypothesis can be actually rejected for Lm1, Lm2 and LBM at the 1% significance level, but it can only be rejected for Lm3 at the 5% significance level, and it can not be rejected at all for LLoans. Therefore these results indicate that all series except LLoans and Lm3 are best described by a trend stationary process. However, the fact that the unit root hypothesis can not be rejected for LLoans and Lm3 entails the need to check for the number of unit roots in these two series.

Next, inspection of the first-difference of LLoans and Lm3 (DLoans and DLm3) revealed that the presence of a unit root was unlikely since neither their mean nor their variance exhibited a trend. Figures 3 and 4 below lend support for this claim. They show the behaviour of these two series in first-differences (approximately the rate of growth). Inspection of their corresponding correlograms in Figure 7 in the appendix (section 2.2) provides additional support in the case of DLm3 since it is white-noise. DLoans also appears to be stationary. In addition the high autocorrelation coefficient for the twelfth lagged value suggested the presence of a seasonal component. The former was taken into account when running the corresponding unit root test.



Source: Boletín económico del Banco de España

**FIGURE 3**



Source: Boletín económico del Banco de España

**FIGURE 4**

Unit root tests were then run for DLLoans and DLm3 in order to determine whether the series in levels contained more than one unit root. The procedure we used was the same than for the series in levels except that this time the ADF test format applied did not assume the presence of a time trend (Nota 18) (see section 1.2 in the appendix). As Table 2 shows, the unit root null hypothesis can be rejected at the 1% significance level. The former imply that Lm3 and LLoans did not contain more than one unit root and were thus *integrated of order 1*.

	<b>t-statistic with constant included (lags)</b>	<b>Critical values with constant included</b>
DLm3	<b>-4.0084 (4) **</b>	<b>-2.884/-3.483</b>
DLLoans	<b>-9.777 (0)**</b>	<b>-2.884/-3.483</b>

\*\* indicates that the the null hypothesis  $H_0: \gamma = 0$  is rejected at both the 1% significance level.

The unit root test for DLLoans includes a seasonal following the observation of the correlogram for DLLoans. The first numerical value in the column containing the critical values corresponds to the 5% significance level whereas the second value corresponds to the 1% significance level. Finally, the numbers in parenthesis indicate the lag length used in the ADF test. The critical values are those tabulated by Mackinnon since the series did not exhibit any structural break.

**TABLE 2**

The results above allowed us to go ahead with the causality analysis. Since stationarity is a requirement for the implementation of the Granger causality tests and all series exhibited a trend we previously transformed all of them in order to induce stationarity. In the case of Lm1, Lm2 and LBM we detrended them, that is, we run a regression on time (since they all were found to be trend-stationary processes) whereas in the case of Lm3

and LLoans they were differenced once (because they were found to be random-walks with drift or difference-stationary process and integrated of order 1). Thereafter the detrended counterparts for Lm1, Lm2 and LBM have been referred to as DTLm1, DTLm2 and DTLBM respectively (Nota 19). The stationary counterparts for both Lm3 and LLoans continued to be referred to as DLm3 and DLoans.

#### 4.2.- Granger-causality tests

In section 2 it was argued that a slightly modified version of the test proposed by Palley (1996b, p.118) was an appropriate way to discriminate between the accommodationist and structuralist approaches. It was also argued that were the accommodationist approach to be supported as a better description of loan demand accommodation by banks than the description provided by the structuralist approach, once the series had been made stationary, we should get the following result: (i) we *should* be able to reject the null hypothesis that bank lending Granger causes the various money multipliers and that the monetary base Granger causes lending and (ii) we should *not* be able to reject the null hypothesis that bank lending Granger causes reserves (or the monetary base). In contrast, validation of the structuralist approach would actually require that the null hypothesis that bank lending Granger causes *both* the monetary base and the money multipliers was not rejected. The postulated hypotheses are shown in Table 3 below.

<p style="text-align: center;"><b>Accommodationist</b></p>	<p style="text-align: center;"><b>DLoans =&gt; DLBM but DLBM <math>\nRightarrow</math> DLoans</b></p> <p style="text-align: center;"><b>DLoans <math>\nRightarrow</math> DLm1 and DLm1 <math>\nRightarrow</math> DLoans</b></p> <p style="text-align: center;"><b>DLoans <math>\nRightarrow</math> DLm2 and DLm2 <math>\nRightarrow</math> DLoans</b></p> <p style="text-align: center;"><b>DLoans <math>\nRightarrow</math> DLm3 and DLm3 <math>\nRightarrow</math> DLoans</b></p>
<p style="text-align: center;"><b>Structuralist</b></p>	<p style="text-align: center;"><b>DLoans =&gt; DLBM</b></p> <p style="text-align: center;"><b>DLoans =&gt; DLm1</b></p> <p style="text-align: center;"><b>DLoans =&gt; DLm2</b></p> <p style="text-align: center;"><b>DLoans =&gt; DLm3</b></p>

**TABLE 3**

Once the postulated hypotheses had been clearly stated, it remained to set up an operational definition of causality in Granger's sense. The following definition represents a slight reformulation of the original one for two-variable models which appears in Granger (1969, p.431), modified to account for the case of *non-zero* mean variables (Nota 20). Thus let  $X_t$  and  $Y_t$  be two *stationary* time series with non-zero means. The simple causal model is

$$Y_t = a_0 + \sum_{i=1}^n a_{1,t-i} Y_{t-i} + \sum_{i=1}^n a_{2,t-i} X_{t-i} + \varepsilon_t \quad (1)$$

$$X_t = b_0 + \sum_{i=1}^n b_{1,t-i} Y_{t-i} + \sum_{i=1}^n b_{2,t-i} X_{t-i} + \eta_t \quad (2)$$

where  $\varepsilon_t$  and  $\eta_t$  are taken to be two uncorrelated *white-noise* series.

The definition of causality proposed by Granger implies that  $X_t$  is causing  $Y_t$  provided some  $a_2$  is not zero. Similarly,  $Y_t$  is causing  $X_t$  if some  $b_1$  is not zero. If both of these events occur, according to Granger's definition (Granger, 1969, p.428), there is said to be a *feedback* or bivariate relation between  $X_t$  and  $Y_t$ . The results from the Granger causality tests between bank lending to the non-bank private sector, the money multipliers for the M1, M2 and M3 aggregates and the monetary base are shown in Table 4 below. The first column contains the explanatory and dependent variables in each test and its result. A  $\Rightarrow$  means that the left-hand side variable Granger-causes the right-hand side variable, whereas a  $\nRightarrow$  means just the opposite. The remaining columns contain the results of the F-tests (Nota 21) for five different values of the lag length in equations (1) and (2). The first numerical value in each column represents the F-statistic whereas the numbers in parenthesis correspond to the probability value or probability that the null hypothesis be true.

	18 Lags	12 Lags	9 Lags	6 Lags	3 Lags
DLLoans $\Rightarrow$ DTLBM	1.4997 (0.1099)	2.0742 (0.0248)**	2.6457 (0.0081)***	2.42 (0.0303)**	1.2933 (0.2795)
DTLBM $\Rightarrow$ DLLoans	1.4491 (0.1301)	1.9626 (0.0351)**	2.2469 (0.0238)**	1.1908 (0.3157)	0.51729 (0.6711)

DLLoans =>DTLm1	<b>1.6169</b> (0.0735)*	<b>1.8429</b> (0.0505)*	<b>2.09343</b> (0.0357)**	<b>2.4343</b> (0.0294)**	<b>2.9229</b> (0.0364)**
DTLm1=>DLLoans	<b>1.459</b> (0.1259)	<b>1.7711</b> (0.0626)*	<b>1.4769</b> (0.1649)	<b>3.022</b> (0.0087)***	<b>1.0498</b> (0.3729)
DLLoans=>DTLm2	<b>1.3915</b> (0.1568)	<b>1.5188</b> (0.1290)	<b>1.9828</b> (0.0476)**	<b>2.6429</b> (0.0191)**	<b>3.7539</b> (0.0126)**
DTLm2 =>DLLoans	<b>1.2684</b> (0.2292)	<b>1.6772</b> (0.0824)*	<b>1.4983</b> (0.1570)	<b>2.8198</b> (0.0132)**	<b>0.88343</b> (0.4516)
DLLoans =>DLm3	<b>1.6423</b> (0.0672)*	<b>1.7005</b> (0.0770)*	<b>1.5329</b> (0.1448)	<b>2.1494</b> (0.0525)*	<b>2.7976</b> (0.0427)**
DLm3 ≠> DLLoans	<b>0.63617</b> (0.8613)	<b>0.89753</b> (0.5520)	<b>1.0444</b> (0.4096)	<b>0.80011</b> (0.5717)	<b>0.14891</b> (0.9302)

\*\*\* indicates that the null hypothesis can not be rejected at the 1% level

\*\* indicates that the null hypothesis can be rejected at the 1% significance level but can *not* be rejected at the 5% significance level.

\* indicates that the null hypothesis can be rejected at the 5% significance level but can not be rejected at the 10% significance level.

**TABLE 4**

The first comment we can make in relation to the results in Table 4 is that, overall causality *predominantly* runs from bank lending to all the remaining variables. In principle, this result provides strong support for the endogenous money hypothesis independently of the specific approach supported. When it comes to discriminating between the accommodationist and structuralist approaches the evidence is supportive of the structuralist approach. As Table 4 shows, bank lending to the non-bank private sector (DLLoans) Granger causes *both* the monetary base (and therefore reserves) and all the money multipliers. The former necessarily entails the rejection of the accommodationist approach since, once innovative liability management or financial

innovation has been removed by making all series stationary, there is no reason to expect bank lending to Granger cause the various money multipliers unless banks resort to liability management practices to accommodate increased loan demand by the non-bank private sector. In addition, there is evidence to support Granger causality running from DLBM (9 and 12 lagged values), DTLm1 (6 and 12 lagged values) and DTLm2 (6 and 12 lagged values) to DLLoans, although the evidence here is *not* so clear-cut as in the opposite direction. Bivariate causality also implies, in our scheme, refutation of the accommodationist approach.

A second comment refers to the different effect of bank lending upon the various money multipliers. Bivariate causality appears to exist for the M1 and M2 money multipliers, whereas it appears to be non-existent for the M3 money multiplier. This result does not have any straightforward explanation. A possible form of liability management practice by banks in the context of increased loan demand is to induce its customers to shift away from demand deposits and into time deposits through interest rate changes (Palley, 1996b, p.116). This strategy occurs because the latter nearly always have lower reserve requirements than the former. If this was the case, we would expect the M3 rather than the M2 and M1 money multipliers to exhibit bivariate causality with bank lending, since the latter would be subject to a *substitution* effect (shifting away from demand deposits and into time deposits) that might weaken the otherwise dominating *income* effect (demand deposits expansion brought about by increased bank lending). However, the result we have got is precisely the opposite.

One possible explanation for this is strictly econometric and points to the fact that Lm3 was differenced rather than detrended because we could not reject the unit root null hypothesis at the 5% significance level. We therefore assumed that the DGP was a random-walk with drift rather than a trend-stationary process (TSP). In order to get out of this puzzle we repeated the Granger causality test assuming that Lm3 was actually a TSP (we detrended Lm3) and the result we got was the following:

	18 Lags	12 Lags	9 Lags	6 Lags	3 Lags
DLLoans => DTLm3	1.9658	2.0598	2.5279	2.3992	3.1212
DTLm3 $\nrightarrow$ DLLoans	(0.0204)**	(0.0260)**	(0.0112)**	(0.0316)**	(0.0279)**
	0.63316	1.3496	0.76796	0.78188	0.25704
	(0.8613)	(0.2026)	(0.6461)	(0.5857)	(0.8562)

\*\* indicates that the null hypothesis can be rejected at the 1% significance level but can *not* be rejected at the 5% significance level.

\* indicates that the null hypothesis can be rejected at the 5% significance level but can not be rejected at the 10% significance level.

## TABLE 5

As Table 5 indicates the results were approximately the same as before. Bank lending was found to Granger cause the M3 money multiplier, but the latter was not found to Granger cause the former. Therefore it seems that the explanation to this puzzling result is not of the econometric type. A second possible explanation is that the sort of banks' balance sheet liability side transformation that seems to come about in the aftermath of loan expansion does not predominantly entails shifting away from demand deposits and into time deposits *but* shifting away from demand deposits and into other alternative financial assets issued by banks which have not been included under the M3 definition we used. However testing of this hypothesis would require analysing Granger causality between bank lending and some monetary aggregates broader than M3, a task which exceeds the purpose of this study.

The third and final comment refers to the relative importance of the substitution and income effects of bank lending expansion upon money supply. As Palley (1996b, p.116) points out, whether the narrow money supply (M1 and M2 in our case) rises in response to increased lending is ambiguous owing to offsetting income and interest rate effects. The induced rise in loans and nominal income increases the demand for checkable deposits, but the subsequent rise in interest rates reduces demand. Insofar as the same pattern applies to currency demand, the narrow money supply only rises if the income effect prevails. What emerges from the results above is that the income effect actually *dominates* since both the M1 and M2 money multipliers are positively correlated with bank lending. The income effect also dominates in the M3 money multiplier case.

## 5.- Conclusions

The purpose of this study was to discriminate empirically between what is known in the economic literature as the accommodationist and structuralist approaches to loan demand accommodation by commercial banks in the context of the endogenous money hypothesis. Previous studies for the US economy had lent support for the structuralist approach (Palley, 1996b; Pollin, 1991), although we have argued about the inadequacy of the approach adopted by Pollin. Therefore we replicated the sort of Granger causality tests proposed by Palley - with a few modifications of our own- using monetary data from the Spanish economy stretching for nearly twelve years. The results are supportive of the structuralist approach. In particular we could not reject the null hypothesis that Granger causality runs predominantly from bank lending to both the monetary base (and therefore banks' reserves) and the various money multipliers. The former is supportive of the endogenous money hypothesis in a general sense whereas the latter points against the accommodationist approach. Therefore, the results of this study confirm, at least provisionally, the results previously obtained for the US economy by Palley.

**APPENDIX****Section 1.1**

The test format used to discriminate empirically between a trend-stationary process and a difference-stationary process ( $H_0: \gamma = \alpha - 1 = 0$ ) was:

$$\Delta y_t = (\delta_0((1 - \alpha) + \alpha \delta_1) + \delta_1(1 - \alpha)t + \gamma y_{t-1} + \sum_{i=1}^{i=s} y_{t-i} + \varepsilon_t \quad (3)$$

for a standard ADF test and

$$\Delta y_t = (\delta_0(1 - \alpha) + \alpha \delta_1) + \delta_1(1 - \alpha)t + \omega I_t(t \geq r) + \lambda_1 I_t(t = r) + \lambda_2 I_t(t = r + 1) + \gamma y_{t-1} + \sum_{i=1}^{i=s} y_{t-i} + \varepsilon_t \quad (4)$$

for the Perron version of an ADF test.

**Section 1.2**

The ADF test format ( $H_0: \gamma = \alpha - 1 = 0$ ) we used to discriminate between a simple random-walk and a AR (1) process with constant where the first-order autocorrelation coefficient is less than unity was (Johnston and DiNardo, 1997, p.225):

$$\Delta y_t = \delta_0((1 - \alpha) + \gamma y_{t-1} + \sum_{i=1}^{i=s} y_{t-i} + \varepsilon_t \quad (5)$$

**Section 2.1**

This section contains the correlograms corresponding to the Lm1, Lm2, Lm3, LBM and LLoans series.

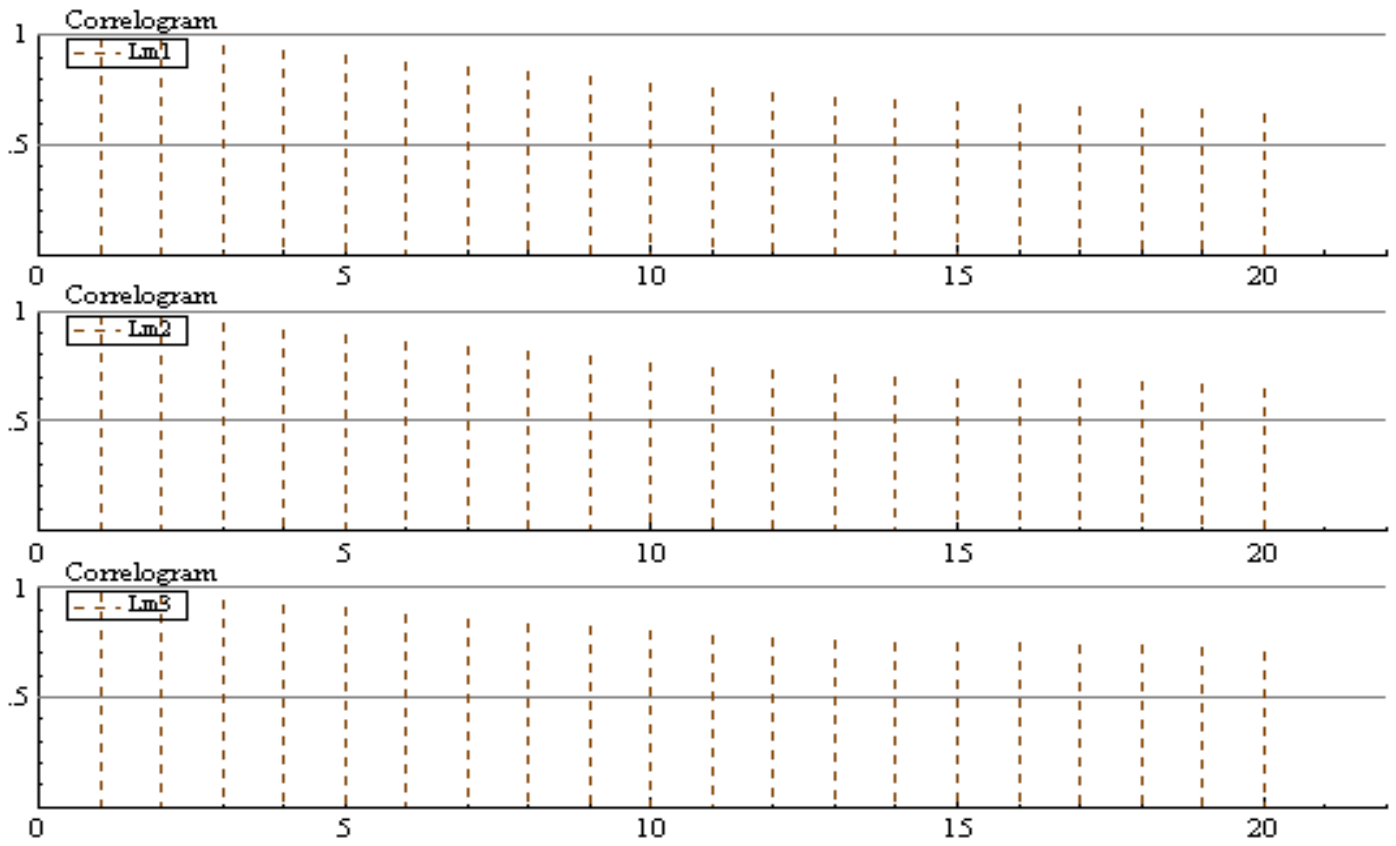


Figure 5

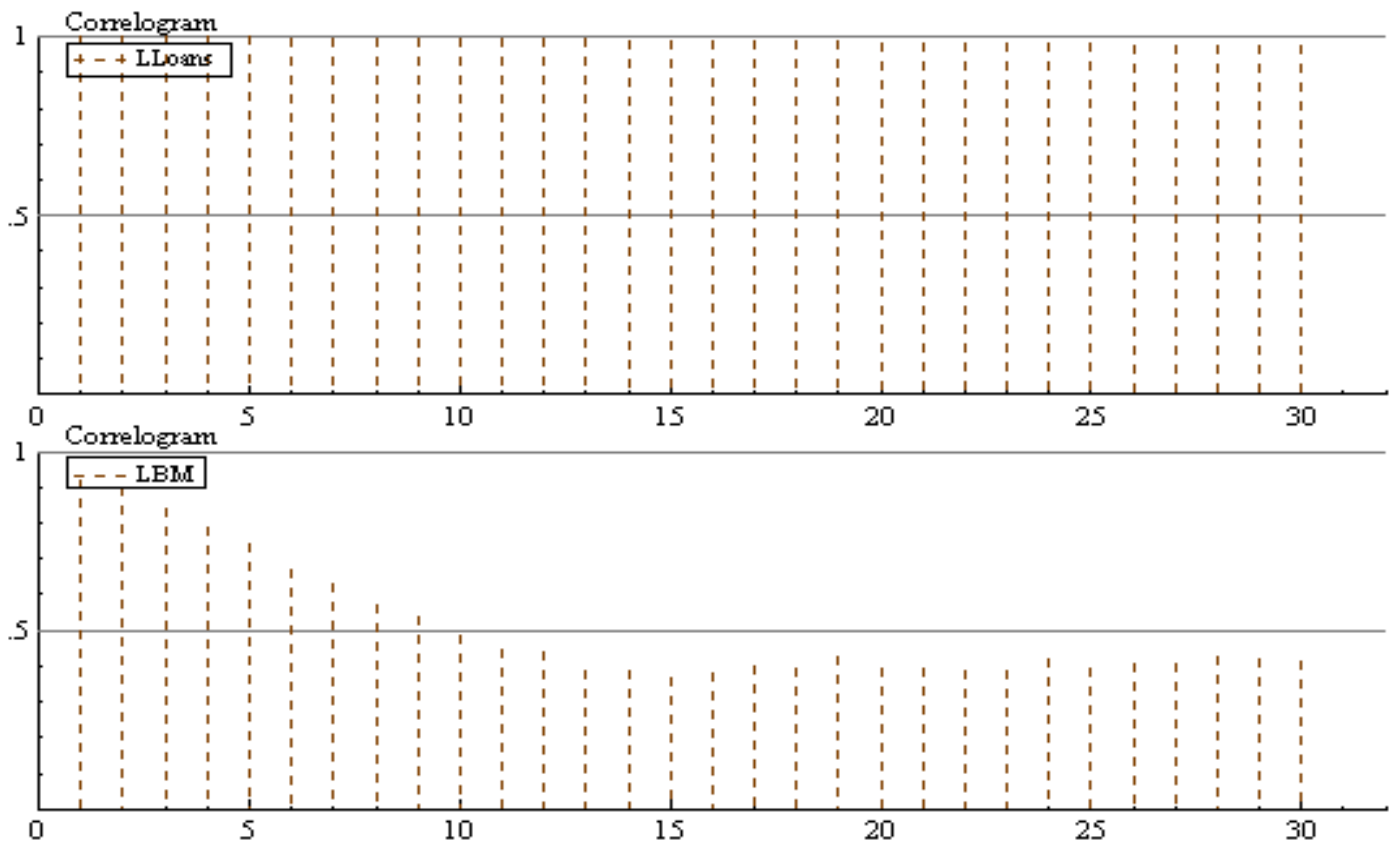


Figure 6

**Section 2.2**

This section contains the correlograms corresponding to the DLm3 and DLLoans series.

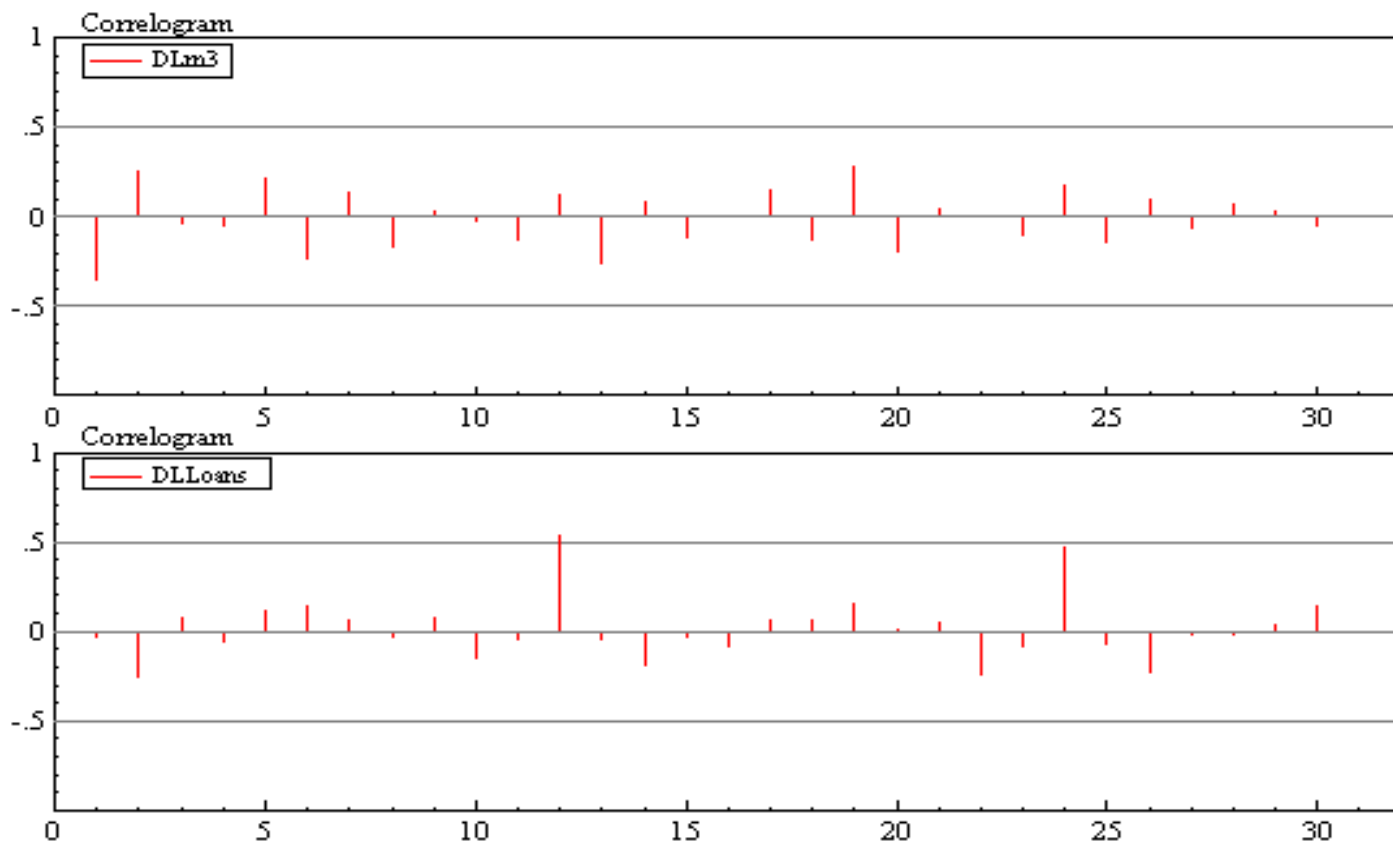


Figure 7

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## Notas a pie de página

1. Moore argues that the range will depend on the willingness and ability of the monetary authorities to intervene forcefully in financial and foreign exchange markets and that the range may differ widely over time and among different countries. A detailed discussion of this particular issue can be found in Moore (1988, p.266-76).

2. According to Moore, the level of reserve requirements affects the volume of bank intermediation in the manner of an indirect tax. He also argues that, by changing the proportion of assets that banks must hold in the form of non-interest-bearing government debt, changes in reserve requirements alter the required mark-up on bank earning asset portfolios over the cost of funds necessary to earn any particular rate of return on equity (Moore, 1988, p.96).

3. In a recent paper, Palley coined the term "superstructuralism" to refer to a position according to which, private sector interest rates would change as loan demand changes even in the case where *the central bank holds the line on the federal funds rate* (Palley, 1998, p.171). This change in interest rates would be the result of banks' balance sheet transformation -leading to changes in risk positions - brought about by increases in lending to the non-bank private sector. However, Palley himself admits that his own model is not "superstructuralist" because banks have buffer stock holdings of bonds and they just swap those holdings with the Fed in order to obtain the additional reserves needed to back and fund new loans (Palley, 1998, p.172). He further points out that, were those buffer stocks to be exhausted, his own model would become superstructuralist. Since we believe this second scenario to be rather uncommon, we restrict our consideration of the structuralist argument to the point we develop below.

4. The liability management process focuses, according to Palley (1996b, p.116) on inducing the non-bank private sector to shift away from demand deposits (which have high reserve requirements) and into time deposits and other long-term deposits (with low reserve requirements). In addition, he draws attention to the buffer stock role played by secondary reserves (mainly fixed-income financial assets such as government securities), which buffer variations in the liquidity position of the banking system.

5. According to Pollin (1996, p.498), a defining characteristic of a successful financial innovation is one in which the liquidity of higher yielding assets is increased, thereby allowing yield differentials to decline.

6. As Rousseas (1992, p.94) points out, the Keynesian explanation of changes in velocity focuses on the activation of idle balances and the economizing of transactions balances in response to central bank-induced increases in the rate of interest. This explanation would entail a movement *along* a money velocity curve in money velocity-interest rate space. The effect of liability management upon money velocity would rather take the form of an upward shift of the money velocity curve.

7. A necessary condition for the estimation of an autorregressive distributed lag model - required for running a Granger causality test - is either the stationarity of the series involved in the model or the existence of a cointegrating relationship between the regressors and the independent variable. If that is not the case we would face both the possibility of running spurious regressions (Granger and Newbold, 1974) and that regression coefficients might not actually converge to constants with increasing sample size as in the standard case (Phillips, 1983). Since it is unlikely that a cointegrating relationship between reserves, money multipliers and bank lending exists -for there is no theoretical basis for expecting such a relationship to exist- making the series stationary -if they are not- seems to be the only choice we have left when trying to run a Granger causality test.

8. Our postulated hypotheses differ slightly from the hypotheses postulated by Palley (1996b, p.118). This is due to the fact that we have explicitly placed the problem in a dynamic framework. As a result of it, we understand that Palley's postulated hypotheses should be slightly modified. First, Palley does not include as an implication deriving from the accommodationist approach the hypothesis that bank lending does *not* Granger cause the various money multipliers. Second, Palley also presents as an implication deriving from the structuralist approach the hypothesis that both the monetary base and the money multipliers Granger cause bank lending, as well as the other way round (Palley, 1996b, p.118). As for the first case, we believe that, once financial innovation has been removed by making all series stationary, a necessary implication of the accommodationist approach, is that bank lending can *not* Granger cause the various money multipliers. As for the second case, Palley argues that increased lending causes liability transformations that increase the values of the money multipliers and reserves through increased non-borrowed and borrowed reserves. He goes on to argue that changes in asset preferences or changes in the supply of reserves cause changes in lending, so that both the monetary base and the money multipliers also Granger cause bank lending. Despite the plausibility of changes in asset preferences and the supply of reserves leading to changes in bank lending in Granger's sense, we do not believe that their empirical rejection would imply refutation of the structuralist approach, because the dominant causality direction, provided the endogenous money hypothesis holds, must run from bank lending to all the remaining variables. Therefore, we consider that the null hypothesis whose rejection should lead to direct refutation of the structuralist approach is that bank lending Granger causes *both* the monetary base and the various money multipliers.

9. Generally, for a pair of linear covariance-stationary time series X and Y, Granger (1969, p.428-9) proposed the following interpretation of X being causally related to Y: X causes Y if the past values of X can be used to predict Y more accurately than simply using the past values of Y. Formally, X is said to cause Y if and only if  $\sigma_1^2(Y_t, Y_{t-j}, X_{t-i}) < \sigma_2^2(Y_t, Y_{t-j})$ , where  $\sigma^2$  represents the variance of forecast error and  $j=1,2,3,\dots,n$ .

10. Before 1987 the Bank of Spain regulated banks' reserves in an attempt to hit monetary targets.

11. In March 1990 the Bank of Spain implemented a substantial reduction from 17 to 5 in the percentage of reserves banks had to keep in a central bank account at a zero interest rate as a proportion of their selected liabilities (weighted by their relative maturity period and/or their liquidity). In order to avoid the negative consequences for the system that would have derived from a sudden increase in the volume of liquidity produced by the reduction in required reserves, the Bank of Spain issued Certificates of Deposit (which could only be traded among the institutions subject to required reserves maintenance and between these institutions and the central bank) that would gradually reach maturity along a ten-year period. From March 1990 onwards, these financial assets were used by the Bank of Spain in the context of open-market operations (repurchase agreements) to regulate the volume of liquidity in the system (Servicio de Estudios del Banco de España, 1997, p.492).

12. In *striking-price* auctions bids are ranked by descending value and all successful bidders pay the uniform price of the lowest bid necessary to clear the market. In *bid-price* auctions successful bidders pay the price that they bid (Howells and Bain, 1998, p.156).
13. By using different lag lengths for each relationship we were actually reducing the risk of coming across a model specification problem. The former could arise as the result of omitting relevant lagged values of the dependent variable.
14. The monetary aggregates in Spain are defined the following way. M1 comprises currency in the hands of the non-bank private sector plus sight deposits in the Bank of Spain and commercial banks. M2 comprises M1 plus demand deposits at savings banks. M3 basically comprised M2 plus time deposits at commercial banks until May 1991. In June 1991 the Bank of Spain broadened the M3 definition and included some additional financial assets. However we kept the old definition in order to get homogeneous time series covering all the period considered. Finally, the variable Loans comprises credit granted by the banking system (deposit institutions) to the non-bank private sector.
15. Since all time series exhibit a trend, the appropriate unit root test format (see section 1.1 in the appendix) is that one which attempts to discriminate empirically between a trend-stationary process and a difference-stationary process (Johnston and DiNardo, 1997, p.224). In our case, since all variables were trending, the difference-stationary process was necessarily a random-walk with drift.
16. It has recently been argued that neglecting *level shifts* or *breaking trends* leads to spurious unit roots whereas neglecting *additive outliers* leads to a spurious finding of stationarity (Franses, 1998, p.148).
17. The selection of the lag length was done according to the lag criterion (Hendry and Doornik, 1999, p.42) which consists of selecting the highest lag with a significant t-probability. As Johnston and DiNardo (1997, p.226) point out, if the series has been generated by a higher-order autoregressive process it is not inadequate to run a simple Dickey-Fuller test. Instead an ADF test is required. Thus the purpose of the additional lags in the test specification is to "whiten" the residuals (Hendry and Doornik, 1999, p.41).
18. Since none of the two series exhibited a trend the purpose of the ADF test was not any more to discriminate empirically between a trend-stationary process and a difference-stationary process. Rather, the purpose of this ADF test was to discriminate between a series that had been generated by a pure random-walk model (non-stationary) and a series that had been generated by a AR(1) process with drift, where the autocorrelation coefficient was less than unity, that is, by a stationary process (Johnston and DiNardo, 1997, p. 225).
19. The regressions we estimated to detrend the variables had the form:
- $$y_t = \alpha_0 + \alpha_1(t \geq 1999:03) + \alpha_2 t + u_t$$
- The corresponding detrended series was  $u_t$ .
20. A similar autoregressive distributed lag model appears in Palley's work with US data (Palley,

1996b, p.118).

21. The null hypotheses for the corresponding F-tests for Granger-causality in equations (1) and (2)

are  $H_0: \sum_{i=1}^n a_{2t-i} = 0$  and  $H_0: \sum_{i=1}^n b_{1t-i} = 0$  respectively.