# ECONOMIC POLICY AND MONETARY POLICY: A SYSTEM DYNAMICS CONCEPTUALIZATION

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## - SUMMARY -

The progress experimented by the Systems Approach and by its instruments is in our judgement well known and undeniable. Nevertheless, the economic analysis seems to remain immune to such advances and is maintained, for the most part, within an analitical-reductionist framework quite far from reality. In this work, we intend to use the Systems Approach and, within it, the methodology offered by the stage of conceptualization of System Dynamics modeling in order to relate the different objectives of the Economic Policy in Spain ,as well as to relate those objectives with the Monetary Policy, whose goals should always be subordinated to the former. By this example, we will try to show the weaknesses and deficiencies which appear with the conventional approach traditionally used in the study of the Economy.

## 1. ANALITICAL CONVENTIONAL APPROACH VERSUS SYSTEMS APPROACH IN ECONOMICS

Traditionally, the investigations and theories elaborated in the field of Economics have been characterized by an analitical/reductionist approach. Nevertheless, the hypotheses which will make such scientific approach realistic do not happen in reality, in which one can observe: duration, irreversability, heterogeneity, non linear relations, feedback loops, etc.

Therefore, the circumstances which would make plausible the models of static equilibrium, in which the theory of Economics is usually based, do not occur. It is not surprising then, to question the use of the traditional approach as the only path for the study and investigation in Economics and to propose a different approach which recognizing the characteristics of the already mentioned social systems(heterogeneity, sinergy, etc.) will adapt itself to the complexity of the real systems, avoiding the inconsistencies of reductionism. The path we propose, which we believe represents an advance in a more realistic direction, is that of the systems approach, eclectic between the analitical position, which focuses on the parts, and the holistic one, which is focuses on the whole.

Accordingly, a structural modeling should be used, as for example the one used in System Dynamics ,so that we could consider the dynamic interrelations which are responsible for the behavior of the economic systems (D.Machuca,1990). In this way, the considerable inbalance which exists between the majority of the traditional economic analysis and the increasing complexity of the real economy could be reduced. The researcher of Economy could be therefore orientated towards the study of the feedback loops which conform the structure of the system under study.

The question of the induction as scientific approach undergoes a change of nature because it will not focus a particular causal relationship but instead it will focus to corroborate a global causal structure (Paulre,1985, p. 13).

The general evolution of the techniques of structural modeling bring

with them new possibilities of interdisciplinary dialogue and open the
field of study of the complex dynamic systems.

Despite the strong advance experimented by the Systems Approach and
the instruments for the study, explanation, and even modeling of the
social systems, it looks as though a great part of the scientific community
of Economics remains immune to such advances. It is important, therefore,
to insist on this path as being one of the reasons which justify the
present work.

## 2.  ECONOMIC POLICY AND ITS OBJECTIVES

The objectives of Economic Policy are diverse, although the importance
given to each one can vary according to the economic circumstances of each
country. It can be affirmed that the most important goals which direct
the Economic policy of developed countries are:

  * The Increase in Production.
  * The Battle against Inflation.
  * The Reduction of Unemployment.
  * The Equilibrium of the Balance of Payments.

Because of the strong interactions among the mentioned variables, it
would be useless to try to set "a priori" independent concrete goals for
them. For this reason, the various governments focus their attention on
one or some of those variables and the evolution of the rest usually derive
in indirect form from actions given to control the former ones. The path
of giving values to the different objectives and establishing a trade-off
between them will be facilitated, as we will have the occasion to see in
subsequent pages, by the proposed approach because it shades more light on
the relations between the objectives.

The loop of Figure 1 shows the relationships between three of the
mentioned variables: production, employment, and inflation, which we
proceed to comment.

In general, it could be affirmed that as the **production** of a country
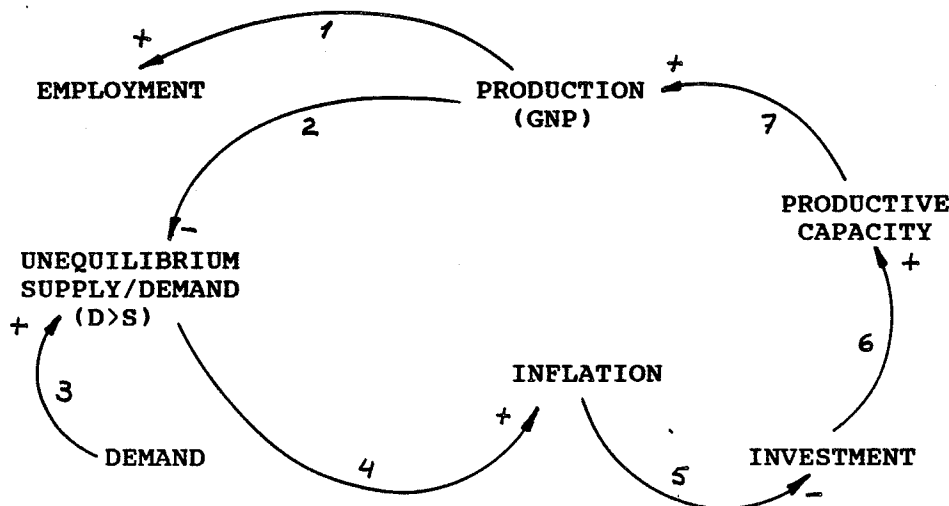increases, this should bring about(arrow 1) a subsequent rise in



FIGURE 1

employment.  On the  other  hand  (arrows  2 + 3), this will also favor the
reduction of a possible **unequilibrium  between  supply and demand** (demand >
supply) and thus,  a  decrease  of **inflation** (arrow 4).    The  decrease  of
inflation would facilitate(arrow 5) the increase of **investment**. The latter,
with some delay,  will  bring  about  (arrow  6) the increase of **productive
capacity** and with it (arrow 7) that of **production**, closing in this manner a
positive feedback loop.

It is observed, therefore, that  an  increment  in production, through
the considered loop, could produce further increases of the  same variable.
On the other  hand,  given  the  nature of the loop, a possible decrease of
GNP(Gross National Product) would tend to translate in succesive decreases.

We could have commented on the relationships  which appear in the loop
of Figure 1,  beginning by any other variable, obtaining  similar  results.
In this way,  for  example, if actions occur which make inflation diminish,
it will make possible, as we have already  seen,  the  growth of investment
and, with it,  the  growth  of  the  productive  capacity  and  therefore
production.  With the  latter,  the possible unequilibrium of supply/demand
and with it, inflation, again would be reduced.

The existing relationships among  the objectives of economic policy do
not finish here.   Figure  2  shows other relationships equally  important.
For example, the  already  mentioned reduction of the unequilibrium between
supply and demand  (arrows 2 + 3), should make possible the decrease of the
imports (arrow 8) and the increase of **exports**  (arrow 9).   This will bring
about (arrows 10 + 11) a decrease of a possible **deficit  in  the Balance of
Payments** through the  Trade Balance.   If, on the contrary, we were to be in
the presence of a greater unequilibrium  between  supply  and  demand,  the
opposite effect will  occur: increase of the imports, decrease  of  exports
and, therefore, a net increase in the deficit of the Balance of Payments.
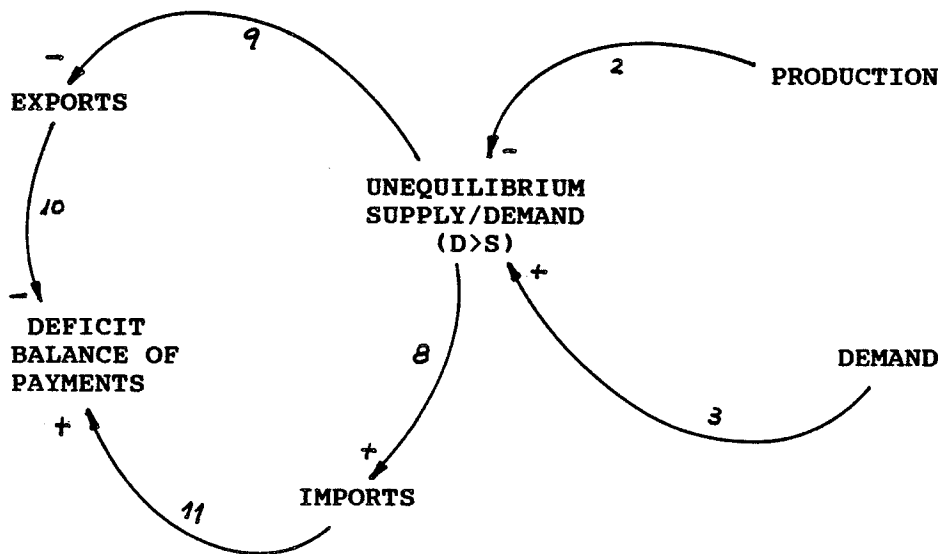


**FIGURE 2**

Together, the  most  important  relationships  among the objectives of
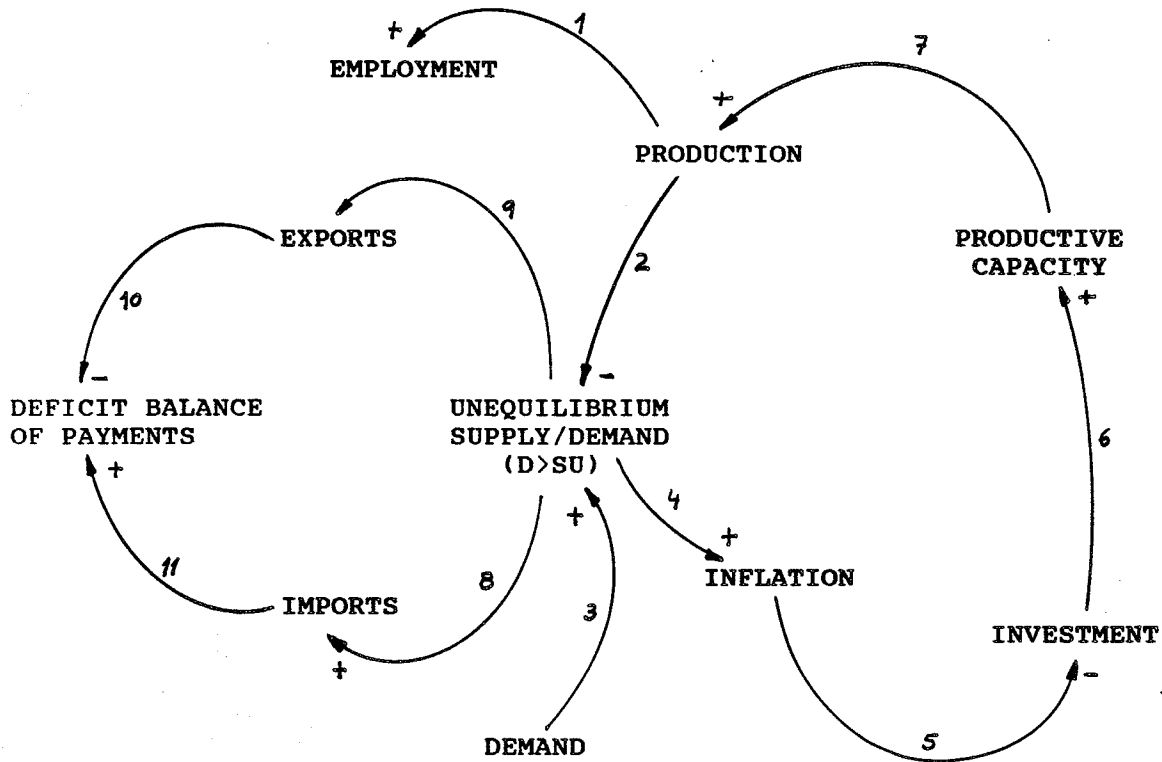economic policy appear in Figure 3,which  we  have generated from Figures 1

and 2.

**EMPLOYMENT**

**PRODUCTION**

**EXPORTS**

**PRODUCTIVE CAPACITY**

**DEFICIT BALANCE OF PAYMENTS**

**UNEQUILIBRIUM SUPPLY/DEMAND (D>SU)**

**INFLATION**

**IMPORTS**

**INVESTMENT**

**DEMAND**

FIGURE 3

The reality, however, could result more complex if we take into consideration other factors(Figure 4). In this way, an increment in

**IMPORT POSSIBILITY OF EQUIPMENT AND ENERGY**

**PRODUCTIVE CAPACITY**

**EXPORTS**

**DEVALUATION**

**DEFICIT BALANCE OF PAYMENTS**
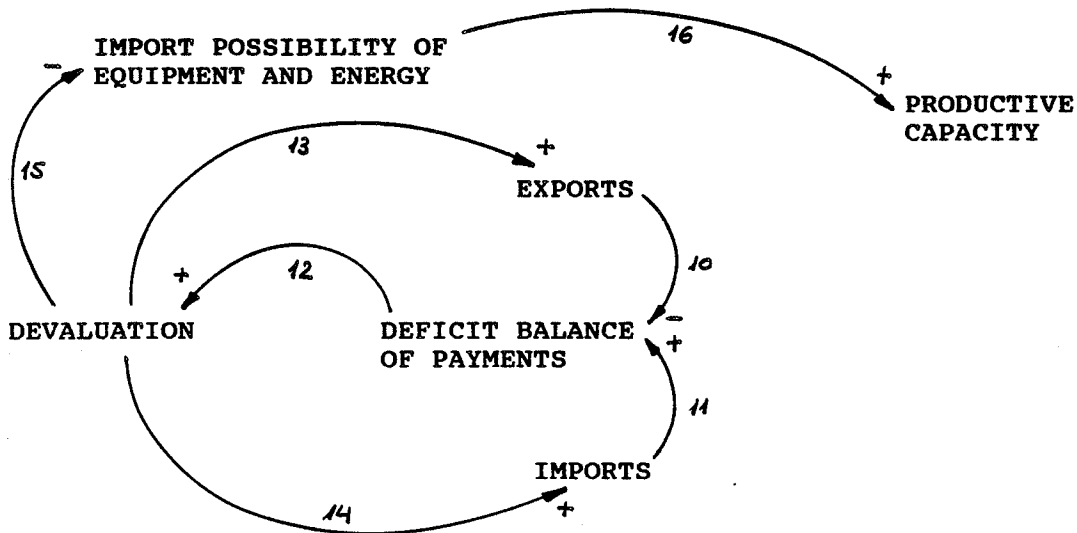
**IMPORTS**

FIGURE 4

deficit of the Balance of Payments could imply a **devaluation** of the peseta (arrow 12); this will facilitate an increase in **exports** (arrow 13) and a decrease in **imports** (arrow 14) (because the relative level of the prices of internal and external products has changed )and this could bring about in the short term a positive effect on the Balance of Payments(arrows 10 + 11). However, in the Spanish situation, one will see a reduction in the possibility of importing of equipment and energy coming from abroad(arrow 15); this would slow down (arrow 16) the growth of the productive capacity because of the raising of prices of the production factors. In this way, we would return to the previously analyzed loops, which would cause an increase of the equilibrium between supply and demand (arrows 2,7,Figure 1), of inflation(arrows 4 Figure 1), etc, producing, at short or medium term a greater deficit in the Balance of Payments(arrows 8,9,10,11, Figure 2).

## 3. ECONOMIC POLICY AND MONETARY POLICY

From the material mentioned up until this point, it is inferred that the achievment of adequate values of the objectives of economic policy must go through an increment of investment, and it is known that to this purpose the monetary policy plays a relevant role (1).

In practice, it is clear as to the difficulty of directing the actions of monetary policy directly focusing on the final goals of Economic Policy. This is due, on one hand, to the relationship among the instruments of intervention and the objectives already mentioned, which is difused and indirect, and, on the other hand, due to the fact that the information about the effects provoked in noted objectives by the different actions of monetary policy is relatively slow.

This makes the monetary authority look for **intermediate objectives** related with the latter and more easy to regulate in the short term. In our country, the dilema arose between choosing the liquid availabilities(M3) or the interest rates because their simultaneous use brings about difficulties due to the relationships between them. It was finally decided to use the liquid availability as intermediate objective, considering that its relationship with the final objectives is more clear and because the monetary authority could exert a greater control over those (Machuca,1979).

In recent years, due to the appearance of new liabilities(both bank and non-bank) of great liquidity, a displacement from the bank deposits(main component of M3) towards these new liabilities occured. The loss of meaning of M3 as an intermediate objective, causes, in 1984, the adoption of M4 or public liquid assets (Cuervo,1989), with the confidence that an increase of those will favor investment. The components of M4 and the realtionships that bind this with the former are shown in Figure 5 (2).

It is clear that if one wishes to regulate the level of public liquid assets, it would be necessary to act upon its components. The capacity of action of the monetary policy is centered in bank deposits and in what we have named "other bank liabilities" (OBL) which are the most important ones. The main instrument for their control is the **legal reserve coefficient**,which obliges the Banks to maintain inactive liquidity proportionaly to the coefficient. This does not necessarily mean that the rest of the components are completely autonomous, rather that in order to act upon them it is necessary to use other economic policies such as in the case of cash in the hands of the public, the fiscal policy.
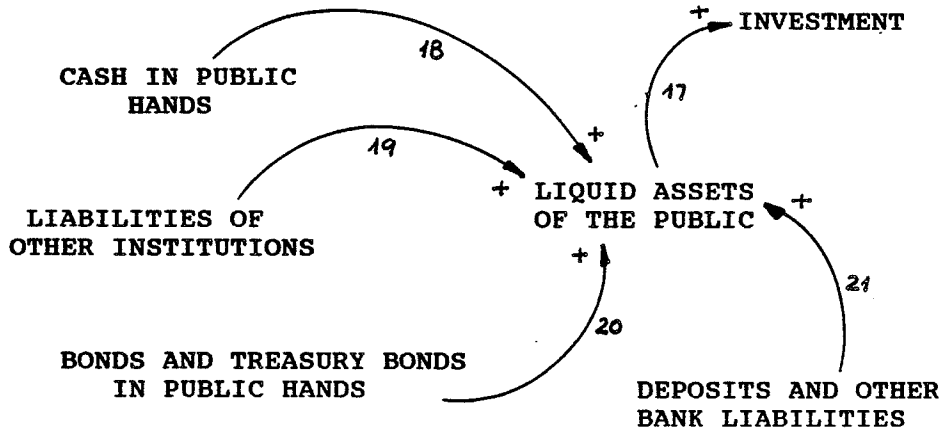
CASH IN PUBLIC
HANDS

LIABILITIES OF
OTHER INSTITUTIONS

BONDS AND TREASURY BONDS
IN PUBLIC HANDS

LIQUID ASSETS
OF THE PUBLIC

INVESTMENT

DEPOSITS AND OTHER
BANK LIABILITIES

**FIGURE 5**

Figure 6 shows how a difference between the desired value (3) and the real value of M4 (which we assume negative for our example) could provoke an elevation of such coefficient (arrow 24). This will translate into an increase of the **retention of liquidity** (arrow 25), which would carry with it a decrease of the **free liquidity** which can be used in the process of expansion(arrow 26) reaching therefore the desired contractive effect(arrow 27). If the difference between the desired and real value of M4 would have been positive, the process would have changed signs, originating an expansive effect.

On the other hand, for a given value of the legal reserve coefficient, an increment(decrement) in the deposits and OBL will also bring about an increase(decrease) of the liquidity(arrow 28).

LIQUID ASSETS OF
THE PUBLIC, M4

LEGAL RESERVE
COEFFICIENT

DEPOSITS AND OTHER
BANK LIABILITIES

FREE LIQUIDITY

LIQUIDITY RETAINED BY
THE LEGAL RESERVE COEFFICIENT

DIFFERENCE BETWEEN
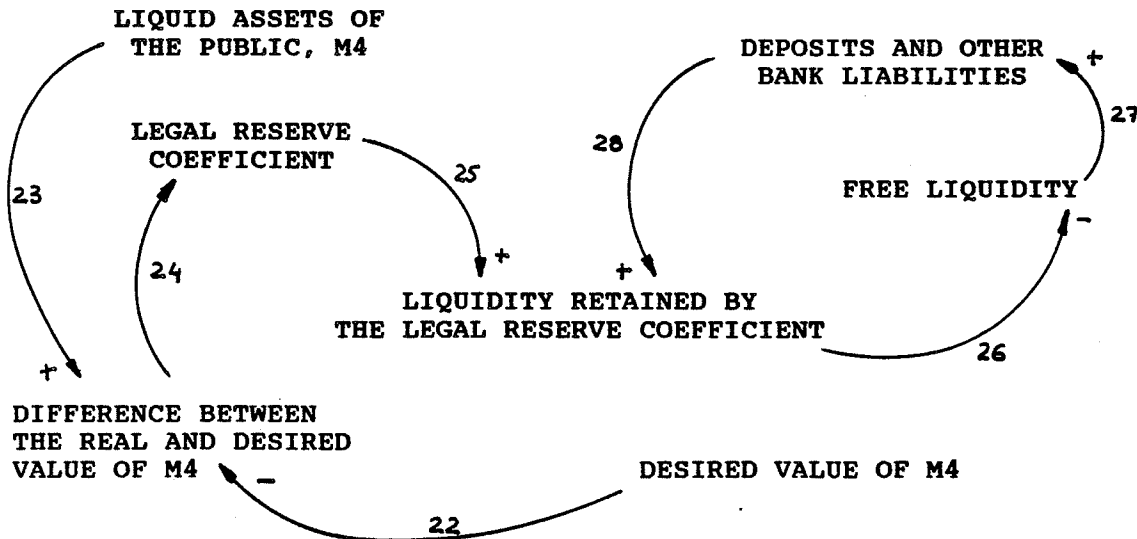THE REAL AND DESIRED
VALUE OF M4

DESIRED VALUE OF M4

**FIGURE 6**

This closes a negative feedback loop which will allow the control of the above mentioned process. Frequent changes in the legal reserve coefficient would provoke uncertainty in the Bank System, which normally would adjust the inactive liquidity to the higher predicted limit. This type of action could provoke excessive and unnecessary decrements of the active liquidity and with it, of M4. For this reason, the legal coefficient is modified for ample periods(discontinued action).

In order to compensate for the possible variations of the liquidity in the short term and the effects that it brings about over M4, monetary instruments of continued action are used, which are the **auction of loans for monetary regulation** and **the buying and selling of Treasury Bonds** (arrows 29, 30, Figure 7).

It is known that the former allows the monetary authority the daily injection of liquidity(arrow 31, Figure 7), taking advantage of the necessity of the banks to cover the daily unbalances with respect to the legal reserve coefficient, which are normally produced by the unexpected withdrawls by the clients.

The auction of loans can be used to drain liquidity(renewing less loans than those that mature); nevertheless, the basic procedure to achieve this is the selling of Treasury Bonds from the Bank of Spain's portfolio, with a commitment of rebuying(arrow 32, Figure 7). This procedure, which is mainly used to counteract the increments of liquidity created by the independent factors, is also useful to help finance the public deficit.
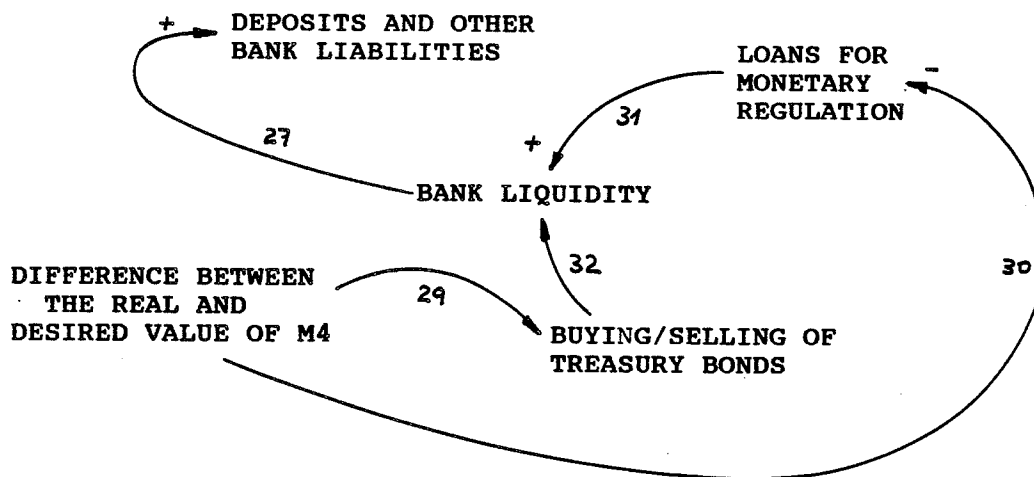


FIGURE 7

Figure 8 assembles in a single causal diagram all the stated information dealing with the monetary policy.

The fact that the Spanish Monetary Authority has concentrated its attention over the control of M4 with priority over other variables, such as interest rates, does not mean that the latter should be ignored; one example could illustrate the importance of this statement.

Let us suppose, that in trying to increase the liquidity of the

CASH IN PUBLIC
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LIABILITIES OF OTHER
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BONDS AND TREASURY
BONDS IN PUBLIC HANDS

INVESTMENT

LIQUID ASSETS OF
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DEPOSITS AND OTHER
BANK LIABILITIES

LEGAL RESERVE
COEFFICIENT

FREE LIQUIDITY

LIQUIDITY RETAINED
BY THE LEGAL RESERVE
COEFFICIENT

DIFFERENCE BETWEEN THE
REAL AND DESIRED VALUE
OF M4

LOANS FOR
MONETARY REGULATION

BUYING/SELLING OF
TREASURY BONDS

DESIRED VALUE
OF M4

FIGURE 8

system(M4) to a certain level, we act with the mentioned instruments of
monetary policy with the purpose that an increase in the assets of the bank
system could translate into the desired increase of M4. If we judge this
from a conventional-analitical standpoint it could appear to be totally
correct, however, this is only the assesment of a partial aspect of a more
complex reality.

From a systemic standpoint, as we have been presenting our work, we
should not forget other variables and relationships which could play a
prominent role in some situations. This is the case of the **interest rates.**

In this manner, if the increase in the free liquidity of the Bank system
carries these assets to high levels, this could lower the interest rates
(Figure 9 arrow 33) and therefore increase the demand and concession of
loans. This could bring about an increase of the deposits(arrow 35) and M4
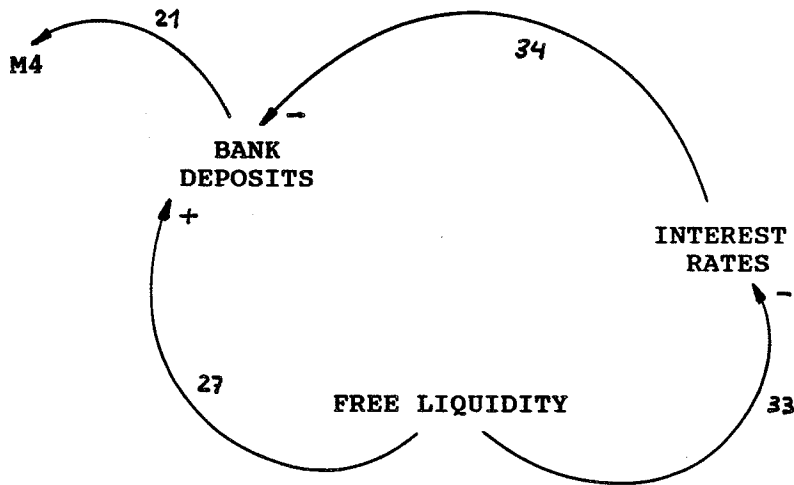above the value considered as objective.

**FIGURE 9**

Following this approach, we should point out that the economic reality
is even more complex and that the achievment of the final objectives of
economic policy is even more difficult that we could assume by reading the
former pages. At this juncture, it could be thought that the control of M4
will bring us to a level of investment considered adequate to reach the
final objectives. Indeed, the recent evolution of the Spanish Economy
constitutes an excellent proof that this does not have to be true.

The causes of this phenomenon should be sought in the fact that the
increases of the liquid assets represented by M4 do not have to translate
finally into productive investment. It could be that the increment so
provoked in the public **adquisitive capacity**(arrow 35 Figure 10) generates
an increase in the **demand** of the goods of consumption(arrow 36) which can
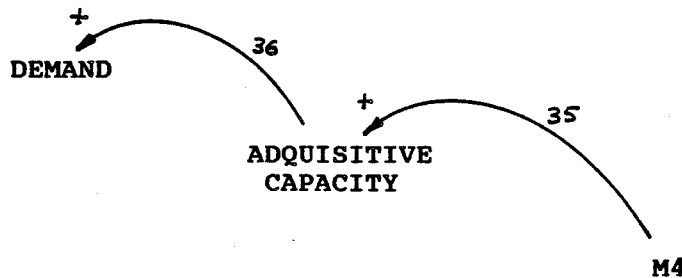allow a deviation of a considerable part of the liquid assets mentioned
before.

**FIGURE 10**

If the national productive system is in no condition to answer the
increment of demand(together with a decrease in investment opportunities
due to the deviation of M4 towards consumption (4), it is highly probable
that the latter will be satisfied with the imports of goods.(see Fig. 3
arrows 3 + 8).

The negative effect over the objective equilibrium of the Balance of
Payments is evident(Fig. 3 arrow 11). If we were to analyze again Figure
3, we would also see the negative consequences that this phenomenon has for
the rest of the objectives sought in Economic Policy.

Another problem which alternatively or simultaneously could make even
more difficult reaching the objectives of Economic Policy that we are
searching is the possible existence of a **budgetary deficit**(which is a fact
that has characterized the Economy of several countries, amongst them
Spain, in recent years).

The public deficit logically derives from the unequilibrium which
exists between the **revenues** and **expenses** of the government(arrows 39 + 40
Fig. 11). The level of both is narrowly bound to the volume of
production (arrows 41 + 42 Fig.11), although this is not the only
determinant factor.

In the face of a situation of public deficit, the State has to elect
one of the possible alternatives of financing or a combination of those,
although we will center ourselves only in the emission of public
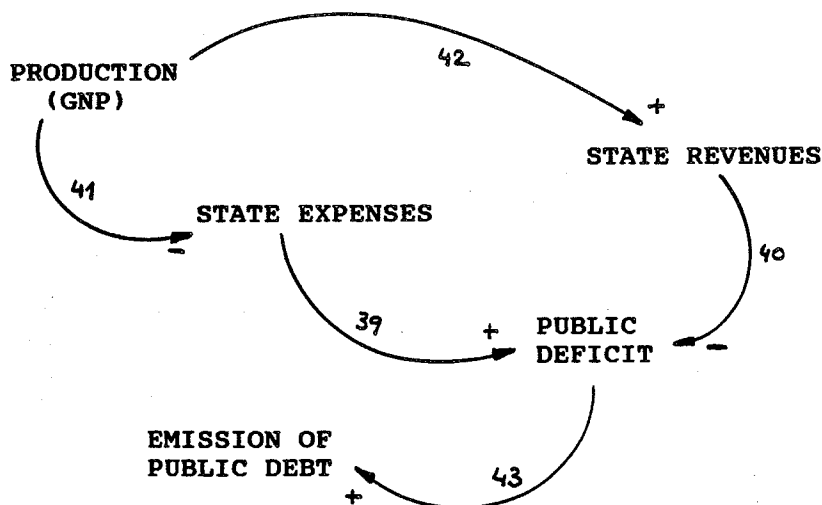debt(arrow 43 Fig. 11) eliminating others which could have a more direct
inflationist effect.



**FIGURE 11**

The monetary implications of this fiscal phenomenon are evident. By
issuing public debt to resolve its budgetary problems, the State competes
with other money seekers capturing a part of the money and decreasing,
therefore, the assets in the hands of the public which, otherwise, would
have gone towards investment through the habitual channels(arrow 44 Fig. 12
and arrow 17 Fig. 5). As an example we have reflected in Figure 12 (arrow
45) one of the possible paths of materialization of the emission of public
debt.

Obviously, such a situation would make even more complicated the functioning of the mechanisms through which investment is stimulated. It should be pointed out that, because of space restrictions, we have excluded from our discussion the probable impact of the increase experimented by the interest rates due to the competition between public and private agents for the obtention of liquid assets (5).
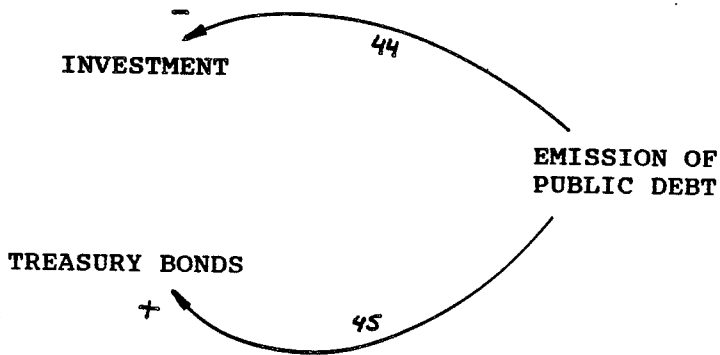


INVESTMENT

EMISSION OF
PUBLIC DEBT

TREASURY BONDS

FIGURE 12

Figure 13 combines all the stated in the present work.

## FINAL CONSIDERATIONS

In the present work we have studied the relationships between the final objectives of Economic Policy and also those existing between them and the Monetary Policy through an approach such as the one offered by System Dynamics; we have tried to prove its explicative power and, at the same time, show the weaknesses and deficiencies which appear with the conventional approach traditionally used in the study of the Economy.

We have only used one of the stages of the process of System Dynamics modeling, the conceptualization, through which we arrived to a representation of the reality under our study in the form of a causal diagram which, in our judgement, results in a more realistic view than others provided by conventional approximation.

We could have gone further and continued with the phase of formalization which, in addition to allowing the consideration of differences of intensity of the interrelations, would take us to the obtention of a simulation model of the case under study.

This would have forced us to go deeper in the knowledge of the system and to facilitate the process of decision making in the system. However, that was not our purpose nor have we had enough time to carry it out.

FIGURE 13

**NOTES**

(1)Obviously, the achievment of the ultimate objectives mentioned before will need the coordinated and simultaneous action of other policies such as fiscal and income.
(2) An analysis of these components can be seen in Cuervo 1.989, p.98.
(3) This value is determined by the monetary authority in the form of a band inside of whose margins the value M4 should be located.
(4) However, it should be taken into consideration that also the increment in consumption could push investment(positive 'dragging' effect, arrows 37 + 38 of the figure).
(5) See, for example, Jose A. D. Machuca 1989.

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