Monetary History in the Long Run: how are Monetarization and Monetarism implicated in France, in the U.K. and in U.S.A.?

Michèle Saint Marc
Centre National de la Recherche Scientifique Paris

Monetarization is the evolution of monetary structures which themselves result from monetary institutions and from human financial behaviour towards the functions of various forms of currency, of credit and saving instruments. Although the concept is not widely known, it is a way of combining the insights of economic history and economic theory.

The concept of monetarization can be applied in a particularly illuminating way to the development of the use of money in France, in the United Kingdom and in the United States, in the XIXth and XXth centuries.

Monetarist policy which is more or less applied throughout the occidental sphere is founded on the quantitative theory which has been restated by Milton Friedman.[6] However, the basis of monetarist precepts does not appear as strong as is sometimes said. The concept of monetarization sheds light on the applicability of monetarist precepts.

1 - Monetarization

1.1 The Concept

The concept of monetarization remains sufficiently obscure to require definition. By monetarization we mean *the evolution*

* I wish to thank Barry Eichengreen, Professer in Harvard University, for comments; remaining errors are our responsibility.

of monetary structures which themselves represent the way by which different forms of currency and credit instruments are used by economic agents. It differs from the concept of "monetization" which represents the official status of an asset as money. For instance, it was said that in 1973 gold was demonetized. It differs also from the extent by which money rather than bartering provides the basis for transactions in an economy. Monetarization is more than a simple sophistication of the financial institutions that M. Friedman considered in his recent book.[6] It is a *fundamental change in behaviour towards the functions of various forms of currency and credit instruments.*

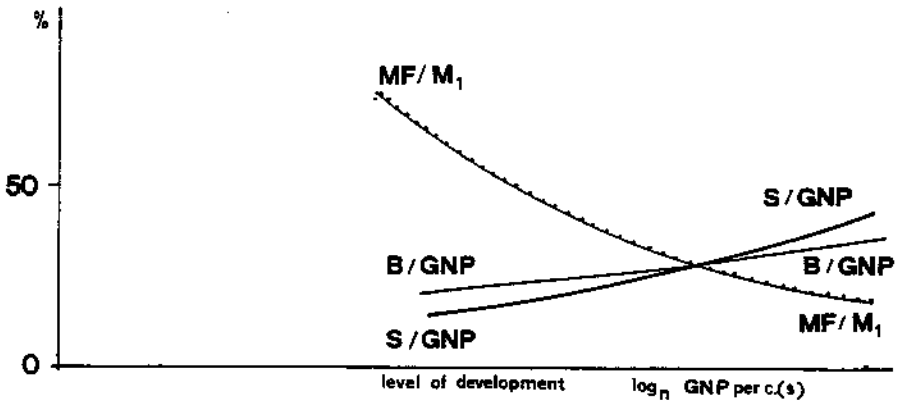
Progress in the use of money gives agents the ability to utilize different assets as means of payment, stores of value, objects of credit and standards of value. The store of value function is an outgrowth of the standard of value function because one accumulates an asset only when one believes that this asset will retain value. The credit function is an outgrowth of the means of payment function because one borrows only with the obligation to make payment.

1.2 The measure

The dualism from which the less-developed countries currently suffer existed in the advanced countries in past centuries. To illustrate this phenomenon, we choose indicators of each function of money (means of payment, store of value, instrument of credit) which, subject to error, are not unlike the indicators applied in many studies of LDCs. The ratio MF/M_1 represents the means of payment function (M_1 is the usual narrowly defined money stock which is the sum of MF, fiduciary money, and MS, scriptural money). The ratio slows down when the agents learn to handle more scriptural money than fiduciary money. The ratios S/GNP and B/GNP (S = savings, B = bank credit, GNP = Gross National Product) represent the store of value function and the credit function. In the long term they generally evolve in the following way:

Chart 1 illustrates the evolution of monetarization. It shows that it is a remarkably common phenomenon, general in time and in space. Over time, for example, France moved from a low level of monetarization to its current high level. Moreover, most countries appear to share the same evolutionary pattern. Seen from this perspective, the LDCs are simply at early stages in this evolutionary process.

Chart I



GNP per c. *(dollars)*	Localization	MF / M_1	B / GNP	S / GNP
100	Asia	65	10	5
200	Latin America	65	15	5
200	Africa	55	20	15
500	Middle East (not Opec)	45	20	20
2.000	Europe	25	25	20
2.000	United States	20	25,35	20-25
2.000	Australia	20	35	25

In the fifties, we notice that for the LDCs which have a very low GNP per capita we find this order of ratios: S/GNP < B/GNP < MF/M_1; but in the advanced countries, the order is reversed: S/GNP > B/GNP > MF/M_1. In France, in the U.K. and in U.S.A., more recent data confirm this evolution. The ratio money on near money replaces MF/M_1 because in adv-

anced countries it moves down when the agents are more aware of the cost of holding cash whereas the ratio MF/M_1 has become stable. We notice the right order: $M_1/M_2\text{-}M_1 < \Delta B/GNP < \Delta S/GNP$.

	France			United Kingdom			United States		
	$M1/M2\text{-}M1$	$\Delta B/GNP$	$\Delta S/GNP$	$M1/M2\text{-}M1$	$\Delta B/GNP$	$\Delta S/GNP$	$M1/M2\text{-}M^2_1$	$\Delta B/GNP$	$\Delta S/GNP$
Percentage growth 1975/1960	−85%	+200%	+320%	−56%	+14%	+20%	−55%	+25%	+100%

Nb. B and S are the nominal changes from 1960 to 1975.

The LDCs verify the pattern, as the following sample demonstrates: $S/GNP < B/GNP < MF/M_1$.

	TOGO			URUGUAY			PAKISTAN		
%	MF/M_1	B/GNP	S/GNP	MF/M_1	B/GNP	S/GNP	MF/M_1	B/GNP	S/GNP
1980	50	26	17	67	37	11	47	20	14

Source: I.M.F.

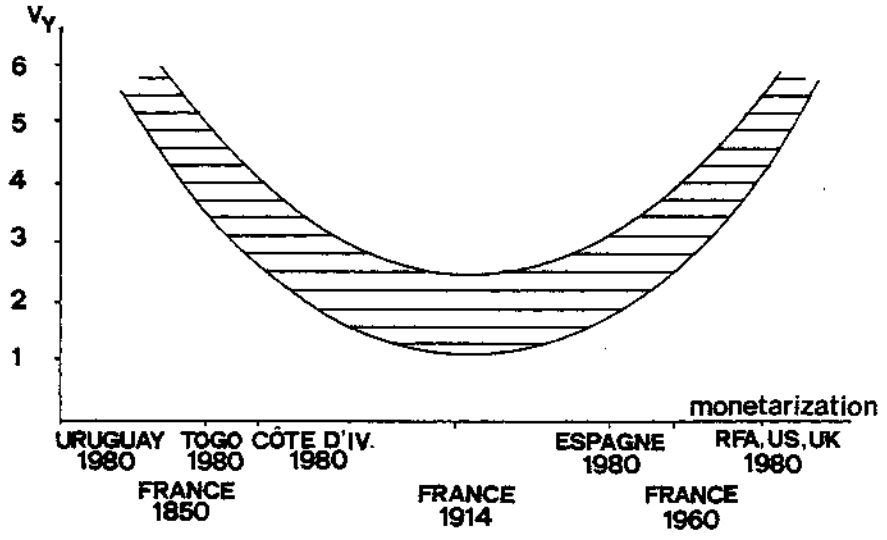
Another way to measure monetarization can be found in the evolution of income velocity.

As M.D. Bordo and L. Jonung (1981) [3] notice in their study which concerns five advanced countries, the income-velocity, V_y, displays a U-shaped pattern over the last century.

In chart II, we generalize to all countries.

The upturn of the curve in each country occurs at a different period. Certainly the two successive directions of the trend correspond to a specific level of monetarization and of development as I already showed in "Money-Space-Uncertainty, a theory of monetarization (1972)".[10] The contradiction between the dominating theory of Friedman (money is a luxury good and V_y tends to decelerate) and the reality in advanced countries where

Chart II



V_y is accelerating and in LDCs where it is decelerating, is explained by the inclusion of monetarization in the function.

The downward trend is due to the decline of bartering and payments in kind on behalf of a growing use of money,[3] other things being equal, that tends to slow down the income velocity. As a matter of fact, when the liquidity rate of the economy is very low and monetary irrigation insufficient and when the statistical evaluation of GNP is overestimated by the inclusion of the traditional sector, V_y is necessarily high. The progressive monetary irrigation of the traditional population increases the stock of money and lessens V_y.

To explain the upward trend, I refer to the universal accounting of Wicksell. The advent of sophisticated assets which permits a complete liquidity of saving, the instantaneous balance between assets and liabilities, and the growing rationality of the population, which is more aware of the cost of holding cash, lead to the decrease in cash and the acceleration of Vy.

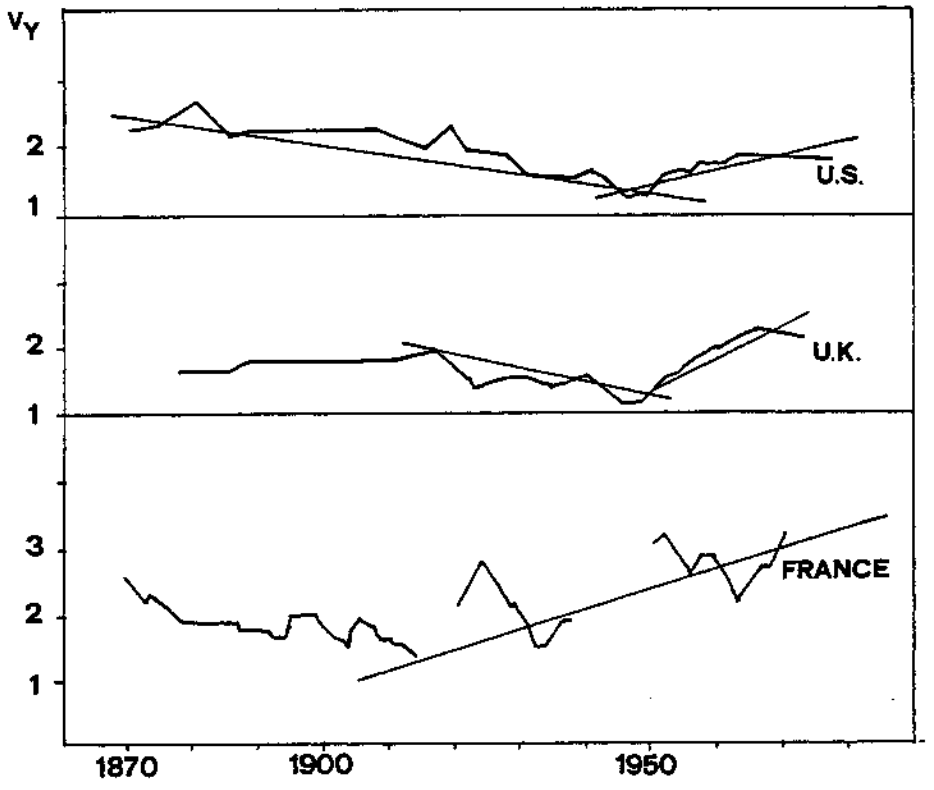
The upturn has a special significance in the evolution of monetarization. It marks the threshold from an undermoneta-

rized to a monetarized economy. In an undermonetarized economy the use of metallic and paper money permits a kind of standardization of bartering. In a monetarized economy the birth and obsolescence of successive monetary elements i.e. metallic, paper, scriptural, electronic, accelerate income velocity.

It is difficult to know when the upturn appeared in France. The localization of the two world wars in France confused economic behaviour. After each war France had to support a new decrease in V_y. People again saved and traded in kind and after wards made up lost ground. In every case, if we refer to the trends or to the absolute value, we notice that the upturn of Vy happened just before the 1st World War.

As for U.S.A. and U.K. income velocity, according to M. Friedman tables, the upturn happened after the 2nd World War.

Chart III



1.3 Monetarization: its Use in Economic Analysis

The concept of monetarization may be a useful tool for historians; it also has uses in economic analysis.

Can we determine the relationship between the various functions of money and the process of economic development,[10] or how the spread of money in its various functions stimulates physical production? We will not pretend to solve such a problem, but simply to suggest a new direction of research.

Economic growth is the growth of the sum of added value in each transaction. Although within a company, added value is created without any need for a monetary transaction between work-groups, to reach its final consumer the product must go out of the company through a transaction which is accompanied by an exchange of money. By making the payment easier, i.e. by reducing its costs, is the way in which money stimulates growth.

Money minimizes costs of payment by providing people with the means to avoid bartering, i.e. the obligation to look for a countermark and to haggle.

The transition from bartering to monetary transactions [10] firstly expands the payment *Space* by the use of the various elements which comprise the money stock: specie, banknotes, scriptural and electronic money. With the problem of transport solved, agents gain the *ubiquity* of their means of payment.

In money's other functions, its store of value and instrument of credit functions, the gain is not calibrated in space but in *Time*. The transition from specie to scriptural money provides a way to accumulate value almost without risk and to borrow bank money with no obligation but to return the principal sum and interest. Hence payments can be deferred by the function of saving, or advanced from the future to the present by the function of credit. Agents gain *permanence* in their payments.

Monetarization furnishes payments with ubiquity and permanence. Of course promoting such payments is not a sufficient condition for growth but it is a necessary one: it is the

reason why LDCs must stimulate monetarization to stimulate their development.

2 - Monetarism revisited?

2.1 Elementary principles of monetarism according to M. Friedman

Curiously, M. Friedman in his latest book does not focus on the relation between the basic variables of the quantitative equation he restated in 1956.[6] However, the monetarism he promotes takes as its basis this familiar quantity equation and is in fact practised by most advanced countries, France included. Consequently it is crucial to determine whether or not monetarist predictions are supported by the data.

The features of monetarism differ between Friedman himself,[6] the pros,[1] and the cons.[5,8,9,12] and it is difficult to define the concept exactly. For the sake of brevity, we have concentrated on the traditional variables: the money stock, M, income velocity, V, the price level, P, and the GNP (or Y, national income, whose precise definition depends on the availibility of statistics) to which we add, as does Friedman [7] the interest rate, i. In the interest of accuracy we quote Friedman's own summary from the last chapter of his book.

1) Between M and GNP (or Y)

"The movements in the level of income parallel extraordinarily closely for more than a century the contemporaneous movements in the quantity or money... the parallelism means that the adjustment comes about primarily through the other nominal magnitude rather than through the yields or other variables entering the demand of money. The process is two-way;

yet that gives consistency to the century as a whole is the influence from money to income" (p. 624).

2) Between M and P

"The response of prices is distributed over a long period. Except for U.S.A. Inter-War Period, the ultimate effect of monetary change is absorbed by prices" (p. 627).

3) Between M and GNP

"Keynes' emphasis on aggregate demand as the prime mover in economic fluctuation led to the expectation that output and prices would move together. We were surprised to find that the typical relation is the reverse, that prices and output tend to be related negatively" (p. 622).

4) Between M and i

"According to the simple Keynesian theory, changes in the quantity of money would be reflected first in change in the opposite direction in interest rates... that has been thoroughly discredited by the simultaneous upward trends of the past several decades in the quantity of money, nominal income, inflation and interest rates. Our empirical analysis does not yield any simple empirical generalization enabling an observer to predict the effects of monetary changes on interest rates" (p. 627).

5) Between P and i

"K. Wicksell was impressed that prices and interest rates move together and suggested an explanation in term of the slowness with which banks adapted their anticipations to changes in the productivity of physical capital. Wicksell's and Keynes's

suggested explanation is clearly contradicted by the evidence. Fisher's (anticipation on the very long term) is not" (p. 630).

2.2 *An informal Analysis Using Diagrams*

In chart IV we note immediately many divergences from usual theories.

1°. As for proposition 1, we do observe that the GNP*M relation reveals a reasonably close parallelism. In the three countries even during the exceptional period 1920-38, the turning points in M and in GNP occur in the same years: 1931 and 1935.

2°. As for proposition 2, the relationship between M and P is far from confirmed.

In France, from 1870 to 1898, from 1926 to 1933, the long run monetary expansion and the long run price decline are at odds with monetarist theory. After 1945, during the inflationary pauses of 1952-55, 1959-60, 1964-66, we observe no break in the trend rate of growth of money supply. If we focus on the period 1871-1970, as Friedman does, we can calculate that out of 84 years (war periods excluded), in 43, money and price trends did not converge. In fact, in France, the convergence of price and money movements appears to be a specific characteristic of the last period, 1950-70.

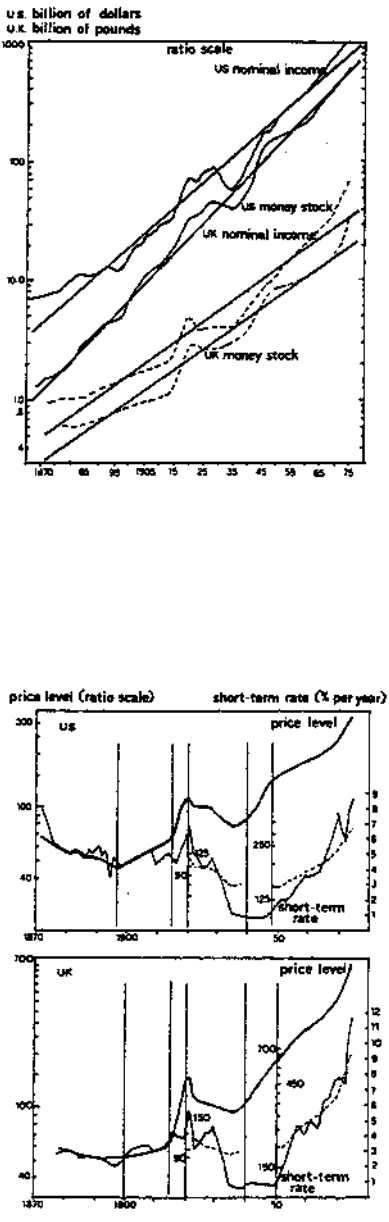
In the United Kingdom and in the United States, we observe the same divergence from 1870 to 1898; we can notice the same feature from 1920 to 1937 in United Kingdom, and from 1920 to 1930 and from 1936 to 1940 in the United States. After 1945 a positive relationship can be observed in both countries.

On the whole, the expected quantitative relationship can only be observed during the half of the century.

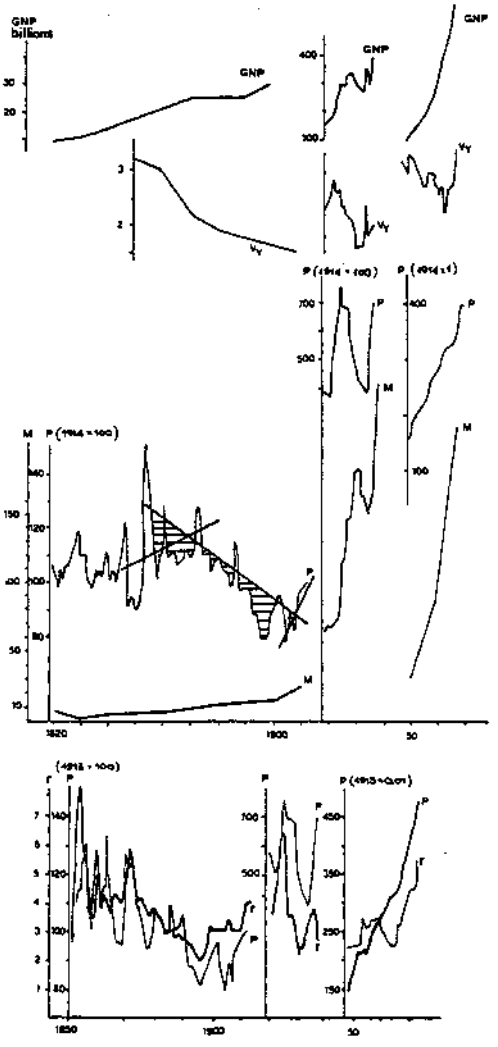
3° Proposition 3: The relationship between GNP and P appears to be generally positive.

Chart IV

USA and UK
(source: (7))



FRANCE
(source: (11))



4° and 5° Between short interest rates and prices, in France, and in the U.K. and in U.S.A., the diagram verifies Fisherian synchronized movements. Between short interest rates and money stock the diagram indicates varying relations. In fact, money stock is always growing, even when interest rates move in different ways.

2.3 A further econometric investigation

When variables are defined in levels, we note that the correlations are, in most cases, quite poor: the D.W. is hardly ever acceptable and is at best in the underdetermined range, the coefficient of variation (C.V.) is often higher than 10%, and the errors are autocorrelated. But, while a more sophisticated treatment would certainly correspond better to usual practice, it would probably also be more confusing.

For example, calculating the function $Y=a+bY\_1 + b'Y-2 + cX + c'X-1 + \ldots$ as might be done, instead of calculating $Y=a+bX$, as we do here, has several disadvantages. Firstly it masks the actual (if rough) phenomenon; secondly it uses annual data (and not trimestrial averages as Friedman does in his similar researches [7] which are not in the earlier period sufficiently accurate for demanding calculations, thirdly, using a rational expectation model may be inappropriate for a period when there was no periodical publication of statistical data.

Given the nature of present results, we focus upon the most robust relationships and we enter no sophisticated but rough data in the computer, that is: nominal level (X_t for variable X), amount of increase ($(X_t-X_{t-1}) = \Delta X$) rate of growth

$$\frac{(X_t-X_{t-1})}{X_{t-1}} = tX$$

1° For the relationship between GNP and M, the econometric relationship corroborates the diagram.

At a nominal level, in the three countries, table 1 indicates a high coefficient of determination and rather significant statistical tests, but nearly always the residuals are autocorrelated.

Calculating the correlation in delta-terms partly avoids the autocorrelation in the residuals. Table II indicates a clear improvement caused by the elimination of the time-trend in the Durbin-Watson test However, when in France R-square is so low that it has no more significance, in the Anglo-Saxon countries R-square becomes more and more significant from one period to another.

Using rate of growth term, tX, the quotient of tX on another rate of growth tY gives the elasticity of one variable, X, to another one, Y. In this case, the elasticity may be a good indicator of the importance of the effect of a change of X on Y.

As for the relationship between tGNP and tM, table III also shows a great difference between France and Anglo-Saxon countries. France has a positive and well tested relationship from 1920 to nowadays. The U.K. and U.S.A. have a positive but not such a determined relationship from 1898 to 1940; the worst is observed in the U.K. This diversity can be interpreted by taking in account the countries' respective economic history: in France, economic growth has been bound to monetary expansion because it entered into an inflationary process (the problem of causality is not discussed in the present paper because it needs a special econometrical treatment); in the U.K. and in U.S.A., the relatively high R-square in 1898-1940 may be explained by their strong need for money stock caused by the process of extension of monetarization (we saw that the up-turn of the U-shaped curve occured in 1945-50); after 1950, the complete rigidity can be interpreted as the result of economic growth which was not as rapid as in France and which was not inflationary.

2° Proposition 2, i.e. the relationship between M and P, is the core of the quantitative theory and of monetarist policy.

Table 1

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>ITI a b	SEE a b	n.	D.W.
GNP	M	France	1870-97	20.4	0.43	0.28	0.0001	1.81	28	0.56
				(11.2)	(3.1)		0.003	0.13		
			1898-1913	15.3	0.90	0.73	0.0002	3.08	16	0.98
				(4.9)	(6.1)		0.0001	0.14		
			1820-40	101.6	1.2	0.73	0.001	27.2	18	1.3
				(3.7)	(6.7)		0.0001	0.1		
			1850-70	4.082	2.1	0.99	0.0001	575.1	19	0.6
				(7.1)	(44.1)		0.0001	0.04		
		UK	1870-97	118.4	1.5	0.89	0.11	71.5	28	0.67
				(1.6)	(14)		0.0001	0.10		
			1898-1913	−370	2.2	0.96	0.003	105.2	16	1.3
				(−3)	(20.8)		0.0001	0.10		
			1920-40	84.0	1.44	0.67	0.89	647.6	21	0.6
				(0.13)	(6.3)		0.0001	0.22		
			1950-70	− 15.895	3.4	0.98	0.0001	1229.1	21	0.24
				(−12)	(31.8)		0.0001	0.10		
		USA	1870-97	5.85	1.4	0.82	0.0001	0.41	28	0.63
				(14.1)	(11.0)		0.0001	0.13		
			1898-1913	3.08	1.93	0.97	0.002	0.81	16	2.2
				(3.8)	(25.7)		0.0001	0.075		
			1920-40	10.3	1.44	0.45	0.50	15.2	21	0.3
				(0.6)	(3.9)		0.0008	0.36		
			1950-70	−59	1.9	0.99	0.0001	7.7	21	0.86
				(−7)	(65)		0.0001	0.03		

Table II

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>|T| a b	SEE a b	n.	D.W.
GNP	M	France	1870-97	0.21 (1.4)	−0.26 (−0.5)	0.03	0.16 0.34	0.15 0.27	28	2.15
			1898-1913	0.65 (0.78)	−0.22 (−0.25)	0.004	0.44 0.80	0.84 0.90	16	2.08
			1920-40	9.88 (0.82)	0.53 (0.62)	0.02	0.42 0.54	12.0 0.8	18	2.71
			1950-70	12.10 (3.4)	0.90 (2.5)	0.33	0.0003 0.009	345.7 0.3	15	1.53
		UK	1870-97	7.88 (0.8)	0.88 (2.0)	0.14	0.41 0.05	9.47 0.4	26	1.25
			1898-1913	−14.1 (−0.8)	3.0 (4.2)	0.56	0.42 0.0008	17.1 0.7	16	2.0
			1920-40	−58.5 (−0.9)	2.0 (4.1)	0.47	0.33 0.0005	58.8 0.49	21	1.5
			1950-70	632 (4.5)	1.9 (6.7)	0.70	0.0002 0.0001	139 0.2	21	1.5
X		USA	1870-97	−0.1 (−0.5)	2.79 (3.4)	0.31	0.34 0.001	0.15 0.80	28	2.6
			1898-1913	−0.1 (−0.1)	2.05 (2.3)	0.28	0.88 0.03	0.69 0.86	16	2.8
			1920-40	−2.16 (−1.9)	2.3 (6.7)	0.70	0.07 0.0001	1.13 0.35	21	1.9
			1950-70	8.1 (2.1)	1.4 (5.5)	0.62	0.04 0.0001	3.79 0.25	21	2.4

Table III

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>ITI a b	SEE a b	n.	D.W.
tGNP	tM	France	1870-97	0.008 (1.3)	−0.10 (−0.8)	0.02	0.18 0.41	0.005 0.12	28	2.14
			1898-1913	0.02 (0.7)	−0.13 (−0.2)	0.003	0.46 0.83	0.02 0.62	16	2.08
			1920-40	−0.08 (−1.3)	2.12 (13.3)	0.92	0.21 0.0001	0.06 0.15	17	2.16
			1950-70	−0.07 (−4.4)	1.51 (303)	0.99	0.0004 0.0001	0.01 0.004	19	1.67
		UK	1870-97	0.005 (0.6)	0.55 (2.4)	0.19	0.49 0.08	0.007 0.22	28	1.15
			1898-1913	−0.008 (−0.9)	1.7 (−4.2)	0.56	0.38 0.0008	0.009 0.40	16	1.93
			1920-40	−0.01 (−0.7)	1.2 (3.8)	0.43	0.45 0.001	0.01 0.33	21	1.50
			1950-70	0.06 (9.5)	0.08 (0.4)	0.01	0.0001 0.62	0.006 0.17	21	1.81
		USA	1870-97	−0.01 (−0.68)	0.68 (3.4)	0.31	0.48 0.002	0.01 0.20	28	2.50
			1898-1913	−0.005 (−0.18)	0.86 (2.7)	0.34	0.86 0.01	0.03 0.32	16	2.57
			1920-40	−0.02 (−1.8)	1.44 (7.5)	0.74	0.08 0.0001	0.01 0.19	21	1.66
			1950-70	0.05 (2.6)	0.25 (0.8)	0.03	0.01 0.42	0.01 0.36	21	1.85

Table IV shows a similarity between the three countries. R-quare is high, although it is weaker in France than in other countries, but the residuals are auto-correlated, except for U.S.A., 1898-1913. The same computation using a lagged M, M−1, according to the Friedmanian delay, 12-18 months does not change the results, so it is not reported here.

To eliminate the bias caused by time, we use the delta-term and, afterwards, the rate of growth term.

Tables V and VI indicate that when good D.W. tests are obtained, then the R-square is weak. The best results concern France in 1950-70 for tM* tP. In the Anglo-Saxon countries, the relationship is always either weak or badly tested.

The only period when in the three countries the results check the quantitative theory is the Inter-War Period; in France, the decades 1950-70 also present a good econometric record between tM and tP... with auto-correlation in the errors.

So, we are compelled to conclude that the quantitative theory is certainly a theory but not a law because its exceptions are more frequently observed than its rule.

3°. The relation between *GNP* and *P* is at the core of the Keynes-Friedman controversy. According to Friedman (proposition 3, p. 9) "Keynes's theory implics that *GNP* and *P* move together but the typical relation is the reverse: prices and output tend to be related negatively".

Chart IV presents a varying relation, as we explected from more information from the econometric analysis.

When studying the relation between money stock and prices we concluded that money stock is neither a significant determinant nor the only determinant of the level of prices. Is there a rival in the quantity equation?

In nominal level (table VII), the relation between GNP and P in the three countries has satisfactory coefficients and good test-statistics, except for D.W., during the last period. The Anglo-Saxon countries enjoy the same results during the 1898-1913 period. Otherwise, R-square and test-statistics are poor.

Table IV

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>ITI a b	SEE a b	n.	D.W.
P	M	France	1870-97	189.4	−6.6	0.62	0.001	13.3	28	1.19
				(14.2)	(−6.6)		0.0001	1.0		
			1898-1913	72.5	0.87	0.29	0.0001	7.5	16	1.05
				(9.6)	(2.4)		0.02	0.3		
			1920-40	473	0.48	0.02	0.0003	103	18	0.37
				(4.5)	(0.6)		0.51	0.7		
			1950-70	16943	0.88	0.92	0.0001	740.0	19	0.46
				(22.8)	(14.1)		0.0001	0.06		
		UK	1870-1897	73.3	−0.02	0.41	0.0001	4.68	28	0.32
				(15.6)	(−4.1)		0.0003	0.007		
			1898-1913	33.2	0.02	0.85	0.0001	2.32	16	1.37
				(14.3)	(9.0)		0.0001	0.002		
			1920-40	107.1	−0.001	0.000	0.004	33.4	21	0.23
				(3.2)	(−0.09)		0.93	0.01		
			1950-70	−6.3	0.02	0.96	0.63	13.3	21	0.27
				(−0.4)	(21.8)		0.0001	0.001		
		USA	1870-97	70.8	−5.5	0.74	0.0001	1.93	28	0.43
				(36.3)	(−87)		0.0001	0.64		
			1898-1913	37.3	1.65	0.97	0.0001	0.72	16	2.55
				(51.3)	(24.5)		0.0001	0.06		
			1920-40	104.0	−0.31	0.02	0.0001	20.0	21	0.23
				(5.15)	(−0.6)		0.52	0.47		
			1950-70	14.9	0.34	0.96	0.0001	3.63	21	0.38
				(28)	(24.1)		0.0001	0.01		

Table V

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>ITI a b	SEE a b	n.	D.W.
P	M	France	1870-1897	−1.7	3.17	0.04	0.24	1.49	28	2.40
				(−1.1)	(1.1)		0.25	2.72		
			1898-1913	1.6	−0.67	0.005	0.46	2.23	16	2.15
				(0.7)	(−0.2)		0.78	2.40		
			1920-40	3.17	1.94	0.08	0.89	23.6	18	1.17
				(0.13)	(1.16)		0.26	1.6		
			1950-70	1370	−0.35	0.05	0.002	390.8	19	1.57
				(3.5)	(−1.0)		0.31	0.3		
		UK	1870-1897	−0.85	0.04	0.23	0.01	0.31	28	1.6
				(−2.6)	(2.8)		0.008	0.01		
			1898-1913	−0.13	0.03	0.22	0.71	0.38	16	2.2
				(−0.3)	(1.9)		0.06	0.01		
			1920-40	−3.8	0.006	0.57	0.02	1.59	21	1.6
				(−2.4)	(5.0)		0.0001	0.01		
			1950-70	6.3	0.01	0.33	0.005	1.9	21	1.3
				(3.1)	(3.0)		0.006	0.004		
		USA	1870-97	−1.71	5.9	0.17	0.001	0.47	28	2.65
				(−3.6)	(2.3)		0.02	2.55		
			1898-1913	+1.38	−0.3	0.02	0.01	0.49	21	3.23
				(2.8)	(−0.6)		0.55	0.61		
			1920-40	−2.7	1.35	0.41	0.03	1.19	21	2.03
				(+2.3)	(3.6)		0.001	0.36		
			1950-70	2.53	0.20	0.26	0.03	1.13	21	1.18
				(2.2)	(2.6)		0.01	0.67		

Table VI

TEST OF RELATIONS BETWEEN X AND Y: Y=a+bX+e

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>ITI a b	SEE a b	n.	D.W.
tP	tM	France	1870-1897	−0.015 (−1.15)	0.33 (1.16)	0.04	0.26 0.25	0.01 0.28	28	2.42
			1898-1913	0.02 (1.02)	−0.29 (−0.53)	0.01	0.32 0.60	0.02 0.55	16	2.25
			1920-40	−0.06 (−1.32)	1.7 (13.0)	0.91	0.20 0.0001	0.05 0.13	17	1.16
			1950-70	−0.13 (−7.1)	1.53 (275)	0.99	0.0001 0.0001	0.01 0.005	19	1.58
		UK	1870-97	−0.01 (−3.0)	0.52 (3.5)	0.33	0.005 0.001	0.005 0.14	28	1.84
			1898-1913	−0.003 (−0.5)	0.64 (2.0)	0.23	0.62 0.05	0.007 0.30	16	2.29
			1920-40	−0.02 (−2.5)	1.6 (5.8)	0.64	0.01 0.0001	0.011 0.28	21	1.52
			1950-70	0.042 (4.7)	−0.018 (−0.08)	0.0003	0.0001 0.93	0.008 0.22	21	1.34
		USA	1870-1897	−0.03 (−4.1)	−0.32 (3.2)	0.28	0.0003 0.003	0.007 0.09	28	2.7
			1898-1913	0.02 (2.2)	−0.0007 (−0.01)	0.000	0.04 0.99	0.009 0.10	16	3.14
			1920-40	−0.02 (−2.7)	0.58 (4.5)	0.52	0.01 0.0002	0.01 0.12	21	1.94
			1950-70	0.02 (2.6)	0.08 (0.5)	0.01	0.01 0.59	0.008 0.15	21	1.42

Table VII

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>|T| a b	SEE a b	n.	D.W.
P	GNP	France	1870-1897	−2.78	.67	0.43	0.0001	39.7	28	0.81
				(−7.1)	(−4.5)		0.0001	1.4		
			1898-1913	75	0.44	0.08	0.0001	13.2	16	1.29
				(5)	(1.1)		0.26	0.3		
			1920-40	2.68	0.98	0.24	0.04	121.7	18	0.41
				(2.2)	(2.2)		0.03	0.43		
			1950-70	150 77	0.42	0.95	0.0001	603.6	19	0.49
				(24.8)	(20.1)		0.0001	0.02		
		UK	1870-1897	71	−0.01	0.33	0.0001	4.85	28	0.34
				14	(−3)		0.001	0.004		
			1898-1913	37.4	0.009	0.82	0.0001	2.07	16	1.29
				(17.9)	(8.1)		0.0001	0.001		
			1920-40	55.7	0.01	0.15	0.04	25.7	21	0.11
				(2.1)	(1.8)		0.07	0.006		
			1950-70	111	0.007	0.98	0.0001	4.48	21	0.41
				(24)	(39)		0.0001	0.00		
		USA	1870-97	87.4	−3.2	0.66	0.0001	4.56	28	0.77
				(19.1)	(−7.2)		0.0001	0.44		
			1898-1913	34.9	0.8	0.97	0.0001	0.87	16	2.11
				(39.8)	(23)		0.0001	0.03		
			1920-40	50.6	0.57	0.34	0.001	13.9	21	0.12
				(3.9)	(3.1)		0.005	0.18		
			1950-70	114	0.17	0.98	0.0001	2.53	21	0.40
				(45)	(31)		0.0001	0.005		

Moreover, in the first period, when prices are declining we observe in the three countries a *negative* and rather well-tested relation.

So, an interpretation of the correlation between GNP and P is difficult. However, the errors being auto-correlated and suspecting that it is not possible to determine by studying table VII, what the contribution of prices and of output is to the evolution of GNP, we observe the delta-terms.

In delta-terms, table VIII indicates that in France the results are not worth thinking about. In the Anglo-Saxon countries, this computation brings something new. The Inter-War Period presents satisfactory correlation coefficients and good test-statistics. So, the above mentioned results can be corrected. The increase in GNP and in P are well-correlated from the end of W.W.I., nevertheless the residuals are still auto-correlated. We notice an exceptional result in the U.S. in the period 1898-1913 when R-square is high and test-statistics good, D.W. included.

The analysis in elasticity-term, i.e. the relation between tP and tGNP, justifies attention to the French case. Table IX indicates that the elasticity is nearly equal to unity from the end of W.W.I. and has very good test-statistics, D.W. included. On the contrary, the Anglo-Saxon countries obtain less significant determinants.

An interpretation is still more difficult when we consider the three different ways of treating the variables that we used. In nominal terms, we record satisfactory results, excepting the auto-correlation of the residuals, in the three countries only during the period 1950-70. In delta-terms, we observe an additional good correlation, D.W. excepted, in the Anglo-Saxon countries during the I.T.W. Finally, in rate of growth terms we establish a very good correlation in France from 1920.

To summarize the results from a theoretical point of view, it is only in France from 1920 and in U.S.A. during the exceptional period of 1898-1913 that we check the Keynesian relation,

Table VIII

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>ITI a b	SEE a b	n.	D.W.
Δ P	Δ GNP	France	1870-1897	−93	−0.42	0.001	0.51	1.40	28	2.53
				(−0.6)	(−0.2)		0.82	1.93		
			1898-1913	0.80	0.79	0.08	0.55	1.31	16	1.74
				(0.61)	(1.1)		0.25	0.67		
			1920-40	7.4	0.75	0.15	0.71	19.9	18	1.38
				(0.3)	(1.6)		0.12	0.47		
			1950-70	360	0.31	0.10	0.47	488.	19	1.39
				(0.7)	(1.4)		0.16	0.2		
		UK	1870-1897	−0.74	0.01	0.27	0.01	0.28	28	1.71
				(−2.6)	(3.1)		0.00	0.00		
			1898-1913	0.21	0.005	0.12	0.48	0.29	16	2.09
				(0.7)	(1.4)		0.17	0.00		
			1920-40	−1.57	0.02	0.63	0.25	1.34	21	1.1
				(−1.1)	(5.7)		0.0001	0.00		
			1950-70	1.64	0.006	0.53	0.48	2.2	21	1.1
				(0.7)	(4.6)		0.000	0.0		
		USA	1870-97	−1.29	1.4	0.27	0.001	0.35	28	2.14
				(−3.6)	(3.1)		0.004	0.47		
			1898-1913	−0.75	0.27	0.21	0.02	0.29	16	3.2
				(2.5)	(1.9)		0.07	0.14		
			1920-40	1.5	0.56	0.57	0.12	0.95	21	2.03
				(−1.6)	(5.0)		0.0001	0.11		
			1950-70	1.2	0.14	0.45	0.24	1.08	21	0.96
				(1.1)	(3.9)		0.008	0.03		

Table IX

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>|T| a / b	SEE a / b	n.	D.W.
tP	tGNP	France	1870-1897	−0.007	−0.16	0.005	0.56	0.01	28	2.54
				(−0.58)	(−0.36)		0.72	0.45		
			1898-1913	0.01	0.29	0.11	0.50	0.01	16	1.77
				(0.68)	(1.34)		0.20	0.22		
			1920-40	0.003	0.77	0.94	0.93	0.04	17	1.91
				(0.09)	(15.5)		0.0001	0.05		
			1950-70	−0.5	1.01	0.99	0.0001	0.006	19	2.17
				(−9.4)	(838)		0.0001	0.001		
		UK	1870-1897	−0.013	0.36	0.28	0.01	0.004	28	1.76
				(−2.6)	(3.2)		0.003	0.11		
			1898-1913	0.004	0.19	0.11	0.48	0.005	16	2.05
				(0.7)	(1.3)		0.20	0.14		
			1920-40	−0.01	0.81	0.58	0.35	0.01	21	1.17
				(−0.9)	(5.1)		0.0001	0.15		
			1950-70	0.005	0.54	0.16	0.77	0.01	21	1.31
				(0.29)	(1.9)		0.06	0.27		
		USA	1870-97	−0.02	0.26	0.30	0.001	0.006		
				(−3.6)	(3.3)		0.002	0.099	28	2.15
			1898-1913	0.01	0.10	0.15	0.02	0.008	16	3.33
				(2.4)	(1.6)		0.13	0.06		
			1920-40	−0.017	0.38	0.61	0.06	0.008	21	1.9
				(−1.9)	(5.5)		0.0001	0.06		
			1950-70	0.01	0.22	0.27	0.07	0.006	21	1.05
				(1.8)	(2.6)		0.01	0.08		

moreover this relation is verified only in increase-terms. During other periods, in the three countries, the Friedmanian proposition indicating that prices and Gross National Product tend to be related negatively is no longer verified. The only period when the relation is negative (1870-1897), the econometric results are very poor.

4°. Is proposition 4 (p. 9) confirmed by an econometric investigation about the relation between M and i?

The Keynesian theory which predicts that a change in the quantity of money would be reflected in changes in the opposite direction of interest rate is observed in France during two periods (1870-97) and 1920-40) out of four (Table X). In the U.K. and in U.S.A. where the negative relation is also observed, the errors are always highly auto-correlated. This is the reason why we try to calculate the relationship in delta-terms and in rate of growth terms.

In delta-terms and in rate of growth terms in the three countries, the results are so bad that we have shown only the table using delta-terms (Table XI).

5°. As for proposition 5 (p. 9), the relationship between P and i, was an unstable one in the diagram. This further econometric investigation produces a few interesting results: in nominal terms, for the whole of the century, the relationship has higher coefficients of determination and better tests, France excepted, than in the previous investigation, but it remains insufficient for proper analysis; in terms of increase, the econometric results are also very bad. So, to save space we have put aside most of the results and have concentrated on those which are interesting (Table XII).

6°. On propositions 4 and 5, we can conclude that the Keynesian liquidity effect was verified in two periods (1870-97 and 1920-40) out of four, but the Friedmanian motion which emphasizes the relation between interest rate and prices had a

Table X

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>ITI a b	SEE a b	n.	D.W.
P	M	France	1870-1897	17.3	−1.2	0.67	0.0001		28	1.0
				(29.3)	(−7.3)		0.001	0.17		
			1898-1913	0.81	6.42	0.36	0.90	7.0	16	0.49
				(0.12)	(2.8)		0.01	2.2		
			1920-40	241	−26	0.75	0.0001	16.1	18	0.50
				(14.9)			0.0001	3.7		
			1950-70	1598	3264	0.20	0.78	5831	19	0.28
				(−0,2)	(2.0)		0.05	1563		
		UK	1870-1897	825	−63	0.39	0.0001	44.2	28	0.64
				(18.6)	(−4.0)		0.0004	15.6		
			1898-1913	856	39.2	0.10	0.0001	102	16	0.14
				(8.3)	(1.2)		0.22	31		
			1920-40	3091	−10.3	0.38	0.0001	97.5	21	0.38
				(31)	(−3)		0.002	29.9		
			1950-70	6424	1010	0.77	0.0001	632.	21	0.76
				(10.5)	(8.1)			124		
		USA	1870-97	4.9	−0.38	0.25	0.0001	0.73	28	0.36
				(6.7)	(−3.0)		0.006	0.12		
			1898-1913	3.20	1.5	0.12	0.54	5.18	16	0.21
				(0.62)	(1.4)		0.18	1.08		
			1920-40	44.4	0.9	0.11	0.0001	2.38	21	0.34
				(18.6)	(−1,5)		0.13	0.63		
			1950-70	834	41.7	0.89	0.0001	13.9	21	1.5
				(6.0)	(12.5)		0.0001	3.3		

Table XI

TEST OF RELATIONS BETWEEN X AND Y: $Y=a+bX+\varepsilon$

(t - statistics in parentheses)

Dependent	Independent	Country	Period	a	b	R^2	PR>ITI a b	SEE a b	n.	D.W.
Δ i	Δ M	France	1870-1897	−0.08	0.28	0.05	0.51	0.13	28	1.25
				(−0.67)	(1.2)		0.24	0.23		
			1898-1913	0.20	−0.10	0.05	0.14	0.12	16	1.43
				(1.5)	(−0.7)		0.47	0.13		
			1920-40	0.09	−0.003	0.31	0.02	0.18	18	1.22
				(0.51)	(−2.6)		0.01	0.01		
			1950-70	0.008	0.0001	0.09	0.98	0.42	19	1.70
				(0.02)	(0.4)		0.69	0.0003		
		UK	1870-1897	−0.14	0.008	0.03	0.43	0.008	27	2.0
				(−0.79)	(0.97)		0.334			
			1898-1913	−0.54	0.035	0.36	0.09	0.012	16	1.9
				(−1.81)	(2.8)		0.01			
			1920-40	−0.23	0.002	0.03	0.42	0.002	21	2.2
				(−0.82)	(0.86)		0.39			
			1950-70	0.39	−7.67	0.00	0.29	0.00	21	2.0
				(1.0)	(−0.10)		0.91			
		USA	1870-97	−0.10	−0.99	0.008	0.80	0.39	27	2.43
				(−0.2)	(−0.47)		0.64	2.12		
			1898-1913	−0.34	0.68	0.10	0.43	0.42	16	2.48
				(−0.80)	(1.28)		0.22	0.53		
			1920-40	−0.34	0.10	0.11	0.13	0.21	21	2.06
				(−1.5)	(1.58)		0.13	0.06		
			1950-70	−0.01	0.02	0.06	0.96	0.32	21	2.59
				(−0.04)	(1.1)		0.26	0.02		

Table XII

EXTRACT FROM TEST OF RELATIONS BETWEEN SHORT-TERM INTEREST RATES AND PRICE INDEX

Period	France : b(±)	R^2	n	DW	UK: b(±)	R^2	n	DW	US: b(±)	R^2	n	DW
1st relation: $I = a + b\,P + e$												
1870-97	+	0.50	28	1.0	+	0.50	28	1.1	+	0.48	28	1.9
1898-1913	+	0.18	16	1.2	+	0.13	16	1.6	+	0.11	16	1.5
1920-40	+	0.03	20	0.2	+	0.42	21	0.4	+	0.81	21	1.0
1950-70	+	0.25	20	1.4	+	0.84	21	1.3	+	0.87	21	1.7
2nd relation: $\Delta I = a + b\,\Delta P + e$												
1870-97	+	0.00	28	1.3	+	0.25	28	2.4	+	0.04	28	2.4
1898-1913	−	0.00	16	1.5	+	0.12	16	2.0	+	0.20	16	1.9
1920-40	+	0.08	20	1.1	+	0.41	21	2.6	+	0.31	21	2.3
1950-70	+	0.05	20	1.8	+	0.02	21	2.1	+	0.19	21	2.5

higher R-square than the episodic previous Keynesian effect. So, both theories have been verified.

In fact, the actual coexistence is paradoxical only from the quantitative point of view. According to Friedman, an additional expansion of money induces a supplement of inflation which involves a higher rate of interest, whereas in the Keynesian liquidity effect, monetary expansion induces lower interest rates.

The explanation of this spurious paradox is easy when the quantitative theory is set aside. In fact, monetary expansion does not always involve inflation. We noticed that it was only during the Inter-War Period that the three countries followed the quantitative rule in term of elasticity and not even in nominal level terms. So, if prices are determined partly or most of the time independent of monetary expansion, it is obvious that rational expectations, which internalize the rising of prices, induce a higher rate of interest.

This explains the convergence between interest rates and prices.

3 - Some careful conclusions

The new neo-classical and the new neo-Keynesian schools agree in recognizing that neither the extreme quantity nor the Keynesian theories are right. For extreme quantity theorists, the entire change in nominal income, due to an additional money stock, is reflected in prices, while output remains at its permanent level. In contrast, extreme Keynesians assume that the entire change in nominal income is in output so long as there is unemployment, and in prices once there is full employment.

Our observations indicate that the extreme theories are verified in very few cases if we put aside the poor econometric results, i.e. those which have auto-correlated residuals and R-square below 0.50:

The exceptional periods which confirm* Friedmanian propositions are: regarding the relation between money stock and GNP:

in nominal level: U.S.A. 1898-1913;
in delta term: U.S.A. 1920-1940, 1950-1970;
in elasticity term: France: 1920-1940, 1950-1970;
regarding the relation between money stock and prices:
in nominal level: no period;
in delta-term: no period;
in elasticity term: U.S.A. 1920-40;
regarding the relation between GNP and prices:
in nominal level: U.S.A. 1898-1913;
in delta term: U.S.A. 1920-40;
in elasticity term: France 1920-40, 1950-70 U.S.A. 1920-40.

We notice that the typical Friedmanian transitional process-change in money stock induces change in both *GNP* and change in prices-is never entirely observed when we use homogeneous computation terms. However, the transitional relation is observed in one period when we use non-homogeneous terms: in U.S.A. in the period 1920-40. But it is this very period that has been named as "idiosyncratic" by M. Friedman himself. Is this the recognition that his own theory is exceptionally difficult to prove?

Finally, the present summing up indicates that the relation which forms the basis of monetarist policy, the relation between money stock and prices, obtains the worst results whatever computation terms are used.

Would these bad results about the quantitative theory lead to a renewal of the Keynesian pattern?

The key role of cheap money policy is founded on the negative relation between money stock and short interest rate. If we put aside again the poor econometric results shown above, we must admit that no relation is good enough to be representative of the Keynesian theory, even in delta or elasticity terms.

On the other hand, monetarization is useful for explaining the good results we have obtained for the relation between money stock and Gross National Product. This relation illustrates both theories. It can be interpreted as the first stage of the Friedmanian sequence, but also as the illustration of the importance of the Keynesian transaction monetary function.

Monetarization in advanced countries localizes the income-velocity on the rising slope of the U-shaped curve. France which was the first to have stepped over the up-turn of the curve also presents the most elastic relation between P and GNP. That means that the increasing use of sophisticated means of payment leads to a reduction in idle cash. But there is a limit due to the inflationist tendancy: nominal GNP is highly correlated to money stock (elasticity = 0.99 in 1950-70). So, since we have observed that the relation between prices and money is much lower, in France a monetarist policy which reduces monetary expansion can induce more the stagnation of GNP than the restraining of inflation. Thus, we interpret the relation from a Keynesian point of view. The case of the U.S.A. is quite different. It attained the up-turn of the U-shaped curve only after W.W.II. Its monetarization was not complete either between 1898-1913 or between 1920-40. When U.S.A. became a highly monetarized country the R-square of the relation between ΔM and ΔGNP began to decline. So, in the United States, a monetarist policy is less likely to induce stagnation than in France. The Friedmanian pattern fits the U.S.A. case.

If we considered LDCs, it would be quite obvious that a monetarist policy takes a risk in stopping the monetarization process which needs a growing money stock; as in France, but not for the same reason, the Keynesian pattern seems to be appropriate.

In conclusion, in this paper, we have tried to show the need to temper the universality of monetarism, firstly, because its basis is not as strong as sometimes said; secondly, because it is

not applicable to all countries but must take into account the level of monetarization.

* The very good monetarist score obtained by Florin Aftalion and Patrice Poncet are computed only during the last ten years (middle period) and using the average of annual rates of growth (See 1)

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