

Banco Central de Chile  
Documentos de Trabajo

Central Bank of Chile  
Working Papers

N° 256

Abril 2004

**RAPID GROWTH OF MONETARY AGGREGATES  
AND INFLATION: THE INTERNATIONAL EVIDENCE**

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Working Papers of the Central Bank of Chile  
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## **RAPID GROWTH OF MONETARY AGGREGATES AND INFLATION: THE INTERNATIONAL EVIDENCE**

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### **Resumen**

Este artículo presenta evidencia empírica para países de baja inflación donde M1 ha crecido por más de un año a un ritmo más rápido que la inflación. En ninguno de estos episodios ha habido un aumento similar de la inflación como sugeriría una aplicación directa de la versión más simple de la teoría cuantitativa del dinero. Esta evidencia confirma que, aun en un mundo donde el dinero es neutral en el largo plazo, el uso de los agregados monetarios como instrumentos de política monetaria puede ser muy engañoso.

### **Abstract**

This paper presents empirical evidence for low inflation countries in which M1 has grown persistently for at least one year at rates much higher than the inflation rate. In none of these episodes has there been a similar increase in inflation, as a straightforward application of the simplest version of the quantity theory of money would suggest. This evidence confirms the idea that even in a world of long-run neutrality of money, the use of monetary aggregates to conduct monetary policy could be highly misleading.

## 1. Introduction

As most central banks around the world now use the interest rate as the main, and almost always the only, instrument of monetary policy, the role of monetary aggregates has correspondingly diminished. This change has been particularly important in economies that have adopted, implicitly or explicitly, an inflation targeting framework. Financial innovation, difficulties in defining a specific monetary aggregate, money demand shocks, and other factors have been responsible for the declining importance of monetary aggregates as a guide to monetary policy.

As the then-governor of the Bank of Canada, Gerald Bouey, put it some years ago, “we didn’t abandon monetary aggregates, they abandoned us.”<sup>1</sup> In a recent paper, suggestively titled “No Money No Inflation,” Mervyn King (2002), the current governor of the Bank of England, mentions that in the previous two years his predecessor Eddie George made only one mention of money in 29 speeches, Chairman Alan Greenspan (US Federal Reserve) made one reference in 17 speeches, and Governor Masaru Hayami (Bank of Japan) one in 11 speeches. Even Wim Duisenberg, the president of the European Central Bank, a bank that formally recognizes the use of monetary aggregates in its policy framework based on the “two pillars,” mentioned money in only three out of 30 speeches.

Moreover, Milton Friedman, long the most prominent advocate of the use of monetary aggregates, said in a recent interview in the *Financial Times* (June 7/8, 2003): “The use of quantity of money as a target has not been a success.” He continued, “I am not sure I would as of today push it as hard as I once did.”

More evidence on the diminished role assigned to monetary aggregates can be found by reviewing the statements issued by central banks after their regular monetary policy meetings. Table 1 presents evidence from monetary policy statements in a sample of countries that have implemented inflation targeting.<sup>2</sup> Statements vary widely across countries. In some cases are very long and detailed since they summarize the whole discussions of the meetings, although in most cases statements are one page justification of the policy decision, and it is in those that one would ideally examine to see whether in the decision the evolution of monetary aggregates played a role in influencing the final decision. In most cases statements are issued after the regular policy meetings, although in some of them they are issued only when monetary policy is changed.

The evidence of table 1 is consistent with the fact that monetary aggregates have largely been abandoned as guides for monetary policy around the world. In those statements, references to monetary aggregates are made roughly in 30% of them. Some cases that refer explicitly to monetary aggregates they are in the context of long summaries of the monetary policy meetings (minutes), rather than summarized statements. Indeed, they mention the

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<sup>1</sup> Cited by Blinder (1999).

<sup>2</sup> The sample of countries is the one reported in Fracasso, Genberg, and Wyplosz (2003). The sample only excludes Philippines due to difficulties obtaining the statements. The table considers statements starting in January 2000, or the earliest date on which statements were issued after that date, and July 2003.

evolution of monetary aggregates as part of the analysis of recent economic developments. This is the case of the minutes of the meetings in Brazil, the Czech Republic, and Poland. In the case of Peru, they have explicit monetary targets together with the inflation target and the quantitative targets are announced in the statements.

However rather than looking at the report of recent developments in the inflation and financial front, more important would be to look at explicit references relating inflation to monetary developments. This type of reference is much scarcer. The last column of table 1 shows the cases where the link is actually made.

The clearest case is South Africa. In their statements, they explicitly mention factors favoring lower inflation and inflation risks. And among the variables they refer as affecting inflation is the evolution of broad money supply, defined as M3. In other cases, such as the Czech Republic, Israel and Switzerland, they mention in some of their statements that the expansion of monetary aggregates has no impact on inflation, which I consider, although it could be disputed, that it is an explicit link between a money and inflation. Taking all of these cases, from all of the statements considered, only in 9% of them there is a reference to the connection, although in some cases is just to indicate that the relationship is non-existent, between inflation and monetary aggregates.

Among academics there is now wide agreement that when interest rates are used as the instrument of monetary policy, monetary aggregates play essentially no role in the decisions of monetary policy. This is the case despite broad acceptance of the idea that, in the long run, money is neutral and inflation is a monetary phenomenon.<sup>3</sup> There is no inconsistency between following a monetary policy where money could be very volatile and accepting that, in the long run, inflation is a monetary phenomenon. However, at a more applied level, as evidenced by discussions in the press among analysts and central bank watchers, there seems to be much less agreement than among academics.

Whatever the reasons for these inconsistencies between academics and practitioners, many of these inconsistencies occur exactly during those periods when there has been a rapid increase in monetary aggregates, which from a simple quantity theory would indicate a threat of inflation. The conclusion that higher inflation will follow as a result of a rapid monetary expansion leads naturally to the recommendation to raise interest rates. And from here the policy discussion goes on.

In Chile we have witnessed such a discussion for quite some time. M1A, a corrected version of M1, has lately been growing at very high rates. Between June 1999 and June 2003, M1A has grown at an annual rate of 14.3%, while CPI inflation has been on average about 3.2% per year. The other monetary aggregates have been growing at more moderate rates. Base money, and broader aggregates such as M2 and M3, have all been growing at

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<sup>3</sup> There are obviously some exceptions. For example, Nelson (2003) argues that monetary aggregates still play a role in terms of understanding the evolution of inflation, since, unlike short-term interest rates, monetary aggregates affect the whole term structure of interest rates. However, short-term rates, in the context of a credible and predictable monetary policy, do affect the entire term structure. See also the discussion by Svensson (2003), who discusses the idea that inflation, despite being a monetary phenomenon, in the context of inflation targeting, causes the evolution of money.

yearly rates between 6% and 7%. Of course, a natural explanation for the evolution of M1A must rely on the change in the composition of money demand. Although some explanations have been offered for why this can happen without dispensing of the long-run neutrality of money,<sup>4</sup> it is important to see whether there have been similar experiences among other low-inflation countries, and whether they have resulted in significant increases in inflation.

For most of the paper, the focus is on narrow money (M1), but I also look at broad money (M2) at the end of the empirical section to confirm that the broad conclusions hold for M2. This is an important issue, because, as already highlighted for the Chilean experience, different aggregates could have very different behavior. Indeed, as Friedman and Schwartz (1966) show, there could be large differences between different aggregates, and they could lead to different policy evaluations. While broad money was declining during the Great Depression, high powered money was expanding (Friedman and Schwartz, 1966, ch. 7.2).

McCandless and Weber (1995) found that, for 110 countries during a 30-year period, inflation and monetary aggregates are positively correlated in the long run. However, as the time horizon shortens, the correlation falls, as confirmed also by King (2002). In addition, part of this correlation is due to the presence of high-inflation countries in the sample; when the sample is limited to low-inflation countries, this correlation weakens, as shown in De Grauwe and Polan (2001). Within individual countries, recent evidence for New Zealand by Razzak (2001) and for Chile by García and Valdés (2003) shows that the time series correlation is high only during high-inflation periods and disappears when inflation is low.

The purpose of this paper is to contribute to this evidence from a different perspective, while highlighting how the correlation may be very weak in low-inflation countries. Specifically, the paper provides empirical evidence from periods when M1 grew at a rate significantly above inflation, in a sample of low-inflation countries, and for a period of at least one year. I define a period of rapid money expansion as one where M1 grew during a full year at a rate 10 percentage points above the rate of inflation, in a country with low inflation. After identifying the episodes that meet this criterion, I discuss the observed inflationary consequences. In a nutshell, the results show that in none of these cases did inflation rise as predicted by the simplest version of the quantity theory of money. This indicates that the changes must have represented increases in money demand that cannot be captured by simple specifications. The paper continues with a section where the evidence is presented and discussed, and ends with some concluding remarks.

## **2. Evidence on very rapid growth of M1 and inflation**

As already noted, an episode of rapid growth of M1 is defined here as a period in which M1 grew at a rate 10 percentage points above inflation. Because my purpose is to focus on experiences of rapid money growth under conditions of price stability, I look only at low-inflation countries. These I define as countries that had yearly inflation below 6% in all 12

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<sup>4</sup> See De Gregorio (2003) and García and Valdés (2003).

months before the beginning of the period of rapid growth of M1.<sup>5</sup> The date identified for each episode is the month that witnessed the maximum rate of expansion of M1 during an episode that lasted at least 12 months. In addition, the sample was restricted to countries with populations of more than 1 million people and annual income per capita (adjusted for purchasing power parity) of more than \$1,000. All data on M1 growth and CPI inflation are taken from *International Financial Statistics* starting in January 1976 and ending March 2002, because of limited data availability, since I examine what happened to inflation 12 months later.<sup>6</sup>

The total number of episodes is 49, and the cases are presented in table 2.<sup>7</sup> Among these episodes, the average expansion of M1 in a period of at least 12 months in a row is 23%, with a minimum of 12% and a maximum of 41%. The average inflation rate during these episodes is 2.4%, similar to the 2.2% twelve months before, and increasing to 3.2% twelve months after. These changes in inflation are far different from what one would predict by looking simply at the data on money growth, and as will be seen below, there is no systematic relationship between the expansion of M1 and the evolution of inflation.

The last column of the table shows the duration of each episode, where I have included as part of an episode periods that do not meet the criteria for defining a rapid expansion of money, but they are in the middle of a longer spell and do not last more than four months. The average duration of 22 months and the standard deviation 9 months. This reveals that the periods are not just a once-and-for-all change in the level of narrow money, which would last only for 12 months as I compare the year-on-year change of M1. These episodes are very prolonged periods of monetary expansion.

The sample includes many countries characterized by their price stability, such as Germany and Switzerland in the 1990s, which had maximum M1 expansions of 27% and 33%, respectively. Many other industrialized countries are included in the sample. Among them, Australia, Canada, Japan, Norway, and Spain all experienced two episodes of rapid monetary expansion in the last 15 years.

The phenomenon of periods of very rapid monetary expansion with low inflation is relatively new. Although the sample starts in 1976, the first episode is in 1979, and 40 out of the 49 cases have occurred since the beginning of 1990. However, the reason is not that money was more stable before, but rather that after the first oil shock in 1974 many countries did not satisfy the criteria used in this paper to define low inflation.

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<sup>5</sup> I did several sensitivity analyses to check whether the sample changed significantly when modifying the criteria for selecting the periods. The sample is very stable. Also, at the other extreme of high inflation-countries is Burkina Faso that had inflation at -6% during a period of high expansion of M1, and was also not included.

<sup>6</sup> In the case of Chile I consider data on M1A, which is a revised version of standard M1, but a better measure of narrow money. In addition, the sample period extends until today, but for finding the maximum growth of money and the date when it happened the sample was ended in July 2002 in order to have information on future 12-months inflation.

<sup>7</sup> All data used in the paper are reported in the data appendix.

By construction, all of the episodes had money growth above 10%, but in 29 of the episodes money grew at a rate above 20%. Any observer equipped only with the quantity theory of money would predict that a very high rate of inflation would follow so many months of monetary expansion. However, figure 1 shows that this is not the case. It shows the maximum rate of growth of M1 over 12 months and the corresponding inflation rate. All countries had inflation below 6% at the beginning of the episode, and as the figure shows, inflation was still below 6% at the peak of money growth. Moreover, there is no significant relationship between inflation and the maximum rate of growth of money.

However, it could be argued that what is relevant is not the level of inflation but changes in inflation. Indeed, it can be expected that each country has a long-run inflation rate, and that this rate differs across countries. Therefore it could be more accurate to look at changes in the rate of inflation. This is done in figures 2 and 3. In figure 2 the rate of growth of M1 is plotted against the change in inflation between the period of maximum money growth and one year before. Because one could argue that the increase in inflation occurs with a lag, figure 3 plots the growth of M1 against the change in inflation between the date of the episode and one year later. Both figures show that there is no relationship between changes in inflation and money growth. Several other simple correlations were plotted, and no significant relationship was found.

Another possible criticism of these correlations is that they do not control for monetary conditions or for the evolution of income. Indeed, one could imagine that the rapid growth of money was the result of a decline in interest rates or accelerated growth of income, or both. Therefore, part or all of the increase in money may have been the result of an increase in money demand by the public, and hence should be unrelated to any increase in inflation. To underscore this fact on a country-by-country basis, one could attempt to estimate and fit a money demand curve and compute the deviations from that curve.

Indeed, in the case of Chile, as argued in De Gregorio (2003), the sharp decline in interest rates can explain the expansion of money demand if one assumes a money demand with constant interest rate elasticity, instead of the traditional constant interest rate semi-elasticity. This specification implies that a reduction of interest rates starting at low rates is much higher than when the reduction starts at high interest rates. In addition, one has to take into account that in Chile, from 1998 to 2001, money was growing at a rate below what this money demand would predict. Repeating this exercise for each of the countries in this sample is beyond the scope of this paper, although I suspect that *some* particular specification of money demand could help explain the evolution of M1 in each country. The focus here is on more general patterns and explanations of the facts.

Figure 4 is an attempt to fit a general money demand curve and plot the growth of money in excess of that predicted by this simple relationship, and correlates it with the change in inflation in the year when a large accumulation of M1 was observed. Several parameters were examined, and figure 4 shows the plot with a relatively standard money demand curve that assumes an interest rate semi-elasticity of -0.5, and a unitary income elasticity. Because of incomplete data availability on interest rates, the sample shrinks to 36 episodes. Figure 4 shows that there is no relationship between the “excess” growth of M1 and the change in inflation.



Another, related concern could be that countries that avoided an increase in inflation due to the increase in money growth were those that tightened monetary policy. This is explored in figure 5, which plots the increase in the interest rate and the change in inflation in all the episodes. Only a slight and not statistically significant relationship is observed, but it has a positive sign. Therefore, one can conclude that it was not a systematic monetary policy response to the growth of M1 that caused inflation to remain low. This will be reinforced with some regression analysis below.

A common issue regarding monetary aggregates is the question of which aggregate to use. One might imagine that changes in the preferences of the public could explain large shifts from one form of money to others. For example, if, as a result of financial innovation, and given the opportunity cost of holding money, the public decided to shift financial wealth from savings accounts to checking accounts, we would observe a large increase in M1 but a relatively stable M2. For this reason it is useful to look also at other monetary aggregates to see whether the rapid growth of M1 was accompanied by rapid growth in these aggregates. Indeed, figure 6 shows that in many countries the growth of M1 was not accompanied by rapid growth of M2. In the case of Canada in 1985, M1 grew 38%, but M2 declined by 5%. Similarly, in Greece in 1999, M1 grew at a maximum rate of 34%, but M2 grew only 9%. Overall, in only 24 cases did the rate of growth of M2 exceeds 10%, and in the remaining 25 cases M1 grew without a sharp increase in M2. This suggests that what was happening was more of a change in the composition of monetary aggregates than a large and widespread increase in monetary aggregates generally.

In order to focus on those cases where large increases in the rate of growth of both M1 and M2 were observed simultaneously, figure 7 plots the rate of growth of M2 against the in the rate of inflation during the episode for only those countries where M2 grew more than 10%. Again, the figure shows no relationship between inflation and the rate of growth of M2. Moreover, there is no significant correlation between the rate of growth of M1 and the change in inflation when the sample is restricted to countries with M2 growth exceeding 10%.

To complete the evidence on broad money, I searched for episodes of rapid expansions of M2, using the same criteria as the one used for selecting episodes of rapid growth of M1. That is, periods of at least 12 months where M2 grew at least 10 percentage points above inflation, in low inflation countries. The cases are presented in table 3. There are 39 cases, and many of them coincide with those for M1. There are several cases of deflation and rapid growth of M2, and they are African countries and Singapore. These episodes are also very prolonged. In average, the periods of large expansion of broad money last for 31 months, even more than those of narrow money. The expansion of M2 in these cases is plotted against inflation in figure 8, and, along the same lines of the results for narrow money, there is no relationship between inflation and the rate of broad money growth.

To complete the discussion of the evidence and the correlation between monetary aggregates and inflation developments I performed also some econometric analysis. Table 4 presents regressions showing the results discussed above. The dependent variable is either inflation ( $\pi$ ), the change in inflation between the date of the peak expansion and a

year before ( $\Delta\pi$ ), or the change in inflation from the date of the peak expansion to one year after ( $\Delta\pi(+1)$ ). For each variable six regressions are presented. The first includes only growth in M1 as the independent variable, while the second adds growth of M2. In the rest of the regressions I include an indicator for inflationary pressures, which alternatively is the rate of growth of output or the output gap,<sup>8</sup> and the interest rate, which is measured in levels or as its change. The interest rate measures may have endogeneity problems, since the interest rate may be determined by a Taylor rule. However, the main purpose of the regressions is to describe the joint impact on inflation of the variables discussed in the plots at a cross-sectional level, and not to represent inflation equations.

The first thing to note is that the overall adjustment is extremely poor, in particular when only the monetary aggregates are included in the equations. Narrow money is significant at the 10% level in only a couple of regressions, and broad money in none. However, this may be more related to trend inflation, because of the long run correlation between inflation and money growth, than a result of the direct change in the rate of growth of M1. This is highlighted in the second and third panels, which attempt to measure whether inflation changed as a result of the monetary expansion. In those regressions all monetary aggregates turned out to be not significant. The quantitative importance of the expansion of M1 on inflation in the first two regressions is also far from proportional, since it implies that a 10-percentage-point increase in the rate of growth of M1 results in only a 0.7-percentage-point rise in inflation. Finally, the significance of this result depends largely on the two observations for Cameroon, which in the 1990s had one of the most rapid expansions of M1 and inflation, whereas the opposite happened in the 1980s.<sup>9</sup>

Regarding M2, this variable is not significant in all specifications. In the fourth equation in the first panel and in the last two in the middle panel, there is a positive relationship between output growth and inflation, which could be interpreted as increasing short-run pressures coming from a reduction of the output gap, that is movements along a short run Phillips curve.

The results for the interest rate are sometimes significant, but of different signs. Regarding the first panel, the fact that higher interest rate is associated to higher inflation may be the result from a Fisher equation. In the last equation of that panel, the results show, as expected, that countries that increased interest rates had lower inflation. But after controlling for output growth and the change in the stance of monetary policy, the expansion of monetary aggregates do not help to explain inflation.

It is possible that what really matters is not the magnitude of the expansion of money, but how persistent was it. For this reason, in all of the regressions of table 4, the duration of the monetary expansion was also included as a regressor, and in none of the regression it was significant and did not change the results, or the significance, of the other estimated parameters. I also included the variable interacting with the expansion of money, and the results were also not significant.

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<sup>8</sup> For output growth and for the output gap I use annual data on GDP. To compute the gap I estimate a trend using a HP filter.

<sup>9</sup> If Cameroon is excluded from the sample, the coefficient declines to 0.048 and the standard error is 0.037.

Overall, the regression results do not show that monetary aggregates, despite its very large expansion, do not help to explain the cross-country patterns of inflation.

Finally, this investigation also looked at sharp contractions in monetary aggregates, treating them in a manner analogous to monetary expansions. That is, periods of at least 12 months when M1 declined at a rate 10 percentage points or more below the rate of inflation were considered. Whereas 50 episodes of monetary expansion meeting the specified criteria were identified, for monetary contractions only 4 episodes were found, and all four occurred in less developed countries: Cameroon (1993), Kuwait (1984), Malaysia (1998), and Panama (1988). Cameroon and Panama are the only cases where also severe contractions of M2 were observed. Therefore, periods of intense monetization are more common than periods of demonetization.

### **3. Concluding Remarks**

This paper makes a simple point: even very rapid growth of money is not necessarily linked to higher inflation. There are many factors that may push the rate of growth of monetary aggregates far from the inflation rate, in either direction, without resulting in exceptional pressure on inflation. Indeed, the evidence presented in this paper does not show any explosion of inflation consistent with the explosions of monetary aggregates observed in the sample.

From the point of view of monetary policy, this evidence reinforces the idea that, if the ultimate goal is price stability, going through the intermediate step of targeting monetary aggregates, and even paying very much attention to their evolution, may be misleading, especially during periods of rapid expansion of money when the magnitude of the needed tightening could be too great.

Finally, it must be pointed out that this evidence says nothing about the long-run neutrality of money growth. Indeed, most of the evidence shows that, in the long run, there is no relationship between money growth and output growth. If anything, in the long run higher inflation hinders growth and reduces welfare. However, even accepting long run neutrality of money, what this evidence confirms, is that the volatility of money could be so large that the time for targeting monetary aggregates has passed, and a much better route is to directly target inflation.

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**Table 1: Monetary Policy Statements in Inflation Targeting Countries**

	IT Since	Initial date	Number of statements revised	Number of statements mentioning monetary aggregates	Number of statements linking inflation and money
Australia	Sep-94	Jan-00	12	0	0
Brazil *	Jun-99	Jan-00	44	43	0
Canada	Feb-91	Jan-00	26	0	0
Chile	Jan-91	Jan-00	41	1	1
Colombia	Sep-99	Jan-00	51	14	8
Czech Republic *	Jan-98	Jan-00	44	17	15
Hungary	Jul-01	Jan-00	34	1	0
Iceland	Mar-01	Nov-01	12	0	0
Israel	Jan-02	Jan-00	43	14	8
Korea	Apr-98	Jan-00	43	2	0
Mexico	Jan-99	Jan-00	23	0	0
New Zealand	Apr-88	Jan-00	30	0	0
Norway	Mar-01	Jan-02	12	5	0
Peru	Jan-02	Jan-00	30	30	0
Philippines	Jan-02	Jan-00	n.a.	n.a.	0
Poland *	Oct-98	Jan-01	30	30	0
South Africa	Feb-00	Jan-00	23	21	21
Sweden	Jan-93	Jan-00	30	0	0
Switzerland	Jan-00	Jan-00	18	5	3
Thailand	May-00	May-00	28	0	0
United Kingdom	Oct-92	Jan-00	44	0	0
<i>Total</i>			<i>618</i>	<i>183</i>	<i>56</i>

Note: The list of countries is not exhaustive of all countries with inflation targets, but the one examined in Fraccasso, Genberg and Wyplosz (2003). The initial date of the Inflation target regime is the one reported by the country.

\* Countries that release minutes rather than statements.

**Table 2: Episodes of Rapid Growth of M1**

Country	Date	Max M1 growth	Inflation	Duration	Country	Date	Max M1 growth	Inflation	Duration
Argentina	nov-97	19.3	0.1	26	Malaysia 3	Dec-92	26.0	5.0	43
Australia 1	nov-92	22.5	0.8	34	Malaysia 4	nov-96	23.1	3.4	17
Australia 2	oct-97	16.4	-0.3	23	Morocco	oct-98	18.8	2.3	17
Bangladesh	sep-00	18.5	2.2	16	Nepal	oct-00	21.4	2.4	25
Cameroon 1	Dec-97	36.0	4.6	14	Netherlands	jul-96	16.4	2.0	15
Cameroon 2	may-00	20.6	-2.2	26	New Zeal.	sep-99	23.8	-0.5	14
Canada 1	oct-85	37.8	4.1	32	Norway 1	nov-93	31.1	2.0	14
Canada 2	Apr-00	19.0	2.6	12	Norway 2	nov-99	17.9	2.5	18
Chile	jul-01	18.3	3.5	27	Pakistan	may-87	20.2	3.5	19
Czech Rep.	mar-00	17.1	3.7	13	Panama 1	Jan-91	41.0	1.0	54
Denmark	nov-88	22.5	4.4	13	Panama 2	oct-98	16.1	0.8	24
Estonia	feb-00	32.1	3.4	19	Portugal	oct-98	17.9	3.1	23
Finland	nov-96	18.3	0.7	19	Saudi Arabia	feb-82	23.0	1.8	24
Germany	feb-91	27.3	1.3	13	Senegal	Apr-00	20.2	1.1	27
Greece	nov-99	34.0	2.3	19	Singapore 1	jul-87	26.8	0.8	17
Honduras	nov-87	27.7	2.0	18	Singapore 2	oct-92	19.6	2.3	29
Iceland	may-99	23.9	1.7	26	Spain 1	sep-88	23.6	5.4	17
Israel	mar-02	30.2	3.1	28	Spain 2	feb-98	13.8	2.0	19
Japan 1	Aug-96	15.5	0.2	16	Switzerland	aug-97	33.6	0.5	26
Japan 2	nov-99	12.0	-0.7	12	Thailand 1	dec-87	23.7	3.2	51
Jordan	Dec-00	13.4	-1.1	18	Thailand 2	sep-94	21.8	5.4	23
Korea	nov-87	23.0	5.0	21	Tunisia	feb-00	19.2	3.1	28
Kuwait	mar-03	20.8	2.9	19	UK	jul-97	29.8	3.0	14
Malaysia 1	feb-79	18.9	3.6	26	US	Dec-86	17.4	1.3	12
Malaysia 2	may-90	20.2	2.8	25					

Source: IMF, *International Financial Statistics*. Episodes are defined as described in the text.

**Table 3: Episodes of Rapid Growth of M2**

Country	Date	Max M2 growth	Inflation	Duration	Country	Date	Max M2 growth	Inflation	Duration
Argentina	jan-98	30.8	0.2	40	Nepal	Oct-99	23.4	5.0	25
Austria	Jun-79	18.3	3.2	14	Netherlands	Nov-78	20.8	4.2	20
Cameroon	aug-00	27.2	-2.9	27	New Zealand	Jul-96	20.5	2.0	13
CAR	Jun-89	26.6	1.8	24	Panama	Mar-99	16.7	1.3	27
Cyprus	aug-90	20.7	5.2	75	Rwanda	Feb-86	30.6	-3.5	68
Egypt	Mar-02	14.7	2.5	17	Saudi Arabia	May-82	65.7	1.0	52
Ethiopia	aug-96	25.2	-8.0	35	Senegal 1	Jul-88	13.8	-3.4	16
Honduras	Mar-88	23.0	2.6	16	Senegal 2	Feb-03	20.6	1.7	24
Iceland	May-99	19.0	1.7	19	Singapore 1	Sep-89	30.5	2.5	75
Indonesia	jan-86	38.5	4.9	20	Singapore 2	jan-99	38.7	-1.3	44
Japan 1	Feb-88	14.1	0.8	18	Thailand 1	May-83	31.4	3.1	49
Japan 2	May-90	17.2	3.0	13	Thailand 2	aug-89	23.9	5.9	34
Jordan	Sep-83	27.5	1.3	73	Thailand 3	jan-92	20.9	4.7	43
Korea 1	aug-82	30.7	5.6	21	Togo	May-85	39.8	-4.9	46
Korea 2	apr-86	20.1	2.7	33	Tunisia 1	dec-97	19.5	3.7	21
Malaysia 1	jan-85	18.0	1.4	15	Tunisia 2	Jun-03	24.0	1.5	29
Malaysia 2	Sep-92	29.5	5.2	36	Uganda	Oct-00	24.6	2.1	18
Malaysia 3	May-96	28.9	3.5	40	UK 1	aug-97	33.6	3.3	33
Malaysia 4	Jul-99	19.5	2.5	16	UK 2	Jun-00	24.1	3.1	13
Morocco	aug-89	19.0	3.7	22					

Source: IMF, *International Financial Statistics*. Episodes are defined as described in the text.

**Table 4: Regression Results**

	M1 Growth	M2 Growth	Interest rate	Change in Interest rate	GDP Growth	GDP Gap	No. of obs.	R2
Dependent Variable: Inflation ( $\pi$ )								
	0.0672 (0.0372)*						49	0.065
	0.0696 (0.0382)*	0.0026 0.0199					48	0.071
	0.0308 (0.0457)	0.0004 (0.0233)	0.2702 (0.1244)*		0.1242 (0.1167)		34	0.350
	0.0109 (0.0499)	0.0066 (0.0202)	0.3865 (0.1223)*			0.0316 (0.0739)	33	0.340
	0.0223 (0.0470)	0.0342 (0.0284)		-0.2764 (0.1266)*	0.2796 (0.1032)*		34	0.351
	0.0512 (0.0545)	0.0403 (0.0305)		-0.1931 (0.1475)		-0.0676 (0.0769)	33	0.156
Dependent Variable: Change in Current Inflation ( $\Delta\pi$ )								
	0.0519 (0.0365)						49	0.041
	0.0580 (0.0371)	-0.0079 (0.0194)					48	0.053
	0.0378 (0.0411)	-0.0074 (0.0209)	-0.0459 (0.1120)		0.2208 (0.1051)*		34	0.194
	0.0435 (0.0430)	0.0152 (0.0174)	0.0472 (0.1055)			0.0655 (0.0637)	33	0.102
	0.0289 (0.0424)	-0.0041 (0.0256)		-0.0239 (0.1143)	0.2028 (0.0932)*		34	0.190
	0.0532 (0.0418)	0.0136 (0.0233)		0.0175 (0.1128)		0.0548 (0.0588)	33	0.097
Dependent Variable: Change in Future Inflation ( $\Delta\pi(+1)$ )								
	0.0034 (0.0381)						46	0.000
	-0.0015 (0.0406)	0.0201 (0.0200)					46	0.023
	-0.0082 (0.0516)	0.0116 (0.0263)	0.1025 (0.1406)		-0.1060 (0.1318)		34	0.028
	-0.0158 (0.0564)	-0.0057 (0.0228)	0.0206 (0.1383)			-0.0726 (0.0835)	33	0.038
	-0.0132 (0.0448)	0.0136 (0.0238)		0.4197 (0.1600)*	-0.0887 (0.1052)		34	0.200
	-0.0240 (0.0478)	-0.0041 (0.0208)		0.3476 (0.1526)*		-0.0884 (0.0706)	33	0.188

Standard errors in parenthesis.

\* Significant at 10% level.



## Data Appendix

Country	Date	Max M1 gr.	M2 growth	Inf(t-1)	Inf(t)	Inf(t+1)	i(t-2)	i(t-1)	i(t)	i(t+1)	GDP growth
Argentina	Nov-97	19.3	30.0	0.3	0.1	0.9	6.9	6.6	8.4	7.3	8.1
Australia 1	Nov-92	22.5	2.8	3.2	0.8	2.2	13.0	8.9	5.7	4.7	2.1
Australia 2	Oct-97	16.4	8.2	2.1	-0.3	1.3	7.5	6.6	5.0	4.9	3.6
Bangladesh	Sep-00	18.5	20.3	5.0	2.2	2.2	N.A.	N.A.	N.A.	N.A.	-5.5
Cameroon 1	Dec-97	36.0	-3.3	2.1	4.6	4.6	N.A.	N.A.	N.A.	N.A.	5.0
Cameroon 2	May-00	20.6	15.4	2.3	-2.2	3.2	N.A.	N.A.	N.A.	N.A.	N.A.
Canada 1	Oct-85	37.8	-4.6	3.6	4.1	4.3	9.4	11.6	9.4	8.3	5.1
Canada 2	Apr-00	19.0	15.0	1.0	2.6	2.9	4.7	4.7	5.6	4.6	5.0
Chile	Jul-01	18.3	5.4	3.7	3.5	2.2	9.8	9.5	7.5	4.0	3.9
Czech Repub	Mar-00	17.1	5.0	2.9	3.7	4.1	15.5	7.6	5.4	5.1	1.7
Denmark	Nov-88	22.5	-5.8	3.8	4.4	4.9	9.7	9.9	8.0	11.8	N.A.
England	Jul-97	29.8	28.8	2.2	3.0	3.8	6.0	5.2	5.5	5.5	3.0
Estonia	Feb-00	32.1	10.2	4.2	3.4	5.6	15.4	9.2	3.8	5.5	1.4
Finland	Nov-96	18.3	-22.7	0.2	0.7	1.7	5.5	5.0	3.1	3.6	4.0
Germany	Feb-91	27.3	13.6	3.0	1.3	4.9	6.2	8.3	9.1	9.6	8.3
Greece	Nov-99	34.0	9.2	4.7	2.3	3.7	N.A.	N.A.	N.A.	N.A.	3.6
Holland	Jul-96	16.4	2.9	2.0	2.0	2.0	5.2	4.3	2.8	3.0	2.8
Honduras	Nov-87	27.7	19.0	4.1	2.0	6.2	N.A.	N.A.	N.A.	N.A.	5.0
Iceland	May-99	23.9	19.0	2.2	1.7	6.0	7.7	8.0	8.7	11.6	5.1
Israel	Mar-02	30.2	4.9	0.3	3.1	-	N.A.	N.A.	N.A.	N.A.	N.A.
Japan 1	Aug-96	15.5	-0.8	0.0	0.2	2.0	2.1	1.4	0.5	0.5	3.3
Japan 2	Nov-99	12.0	0.2	0.2	-0.7	-0.1	0.5	0.2	0.0	0.3	0.8
Jordan	Dec-00	13.4	4.9	1.2	-1.1	N.A.	N.A.	N.A.	N.A.	N.A.	4.2
Korea	Nov-87	23.0	18.7	1.6	5.0	6.5	9.1	9.3	9.1	9.4	11.5
Kuwait	Mar-03	20.8	0.0	1.0	2.9	N.A.	5.7	3.3	-	-	N.A.
Malaysia 1	Feb-79	18.9	21.5	4.2	3.6	6.0	3.8	3.7	3.5	3.1	6.7
Malaysia 2	May-90	20.2	15.8	3.4	2.8	4.0	3.4	4.6	6.6	7.9	10.7
Malaysia 3	Dec-92	26.0	21.2	4.2	5.0	3.3	6.8	7.8	8.0	6.5	9.0
Malaysia 4	Nov-96	23.1	26.7	3.4	3.4	2.5	4.7	6.4	7.3	7.4	10.1
Morocco	Oct-98	18.8	7.7	2.4	2.3	1.2	8.2	7.6	6.3	4.4	6.8
Nepal	Oct-00	21.4	21.1	5.0	2.4	2.7	N.A.	N.A.	N.A.	N.A.	5.8
New Zealand	Sep-99	23.8	0.9	1.7	-0.5	3.0	7.4	3.7	4.7	6.5	3.8
Norway 1	Nov-93	31.1	-29.5	2.1	2.0	1.7	10.6	19.6	6.1	6.3	2.7
Norway 2	Nov-99	17.9	-11.6	2.3	2.5	3.3	3.9	8.6	6.0	7.5	0.8
Pakistan	May-87	20.2	5.3	3.1	3.5	7.8	8.3	7.0	6.25	6.3	6.0
Panama 1	Jan-91	41.0	35.5	0.4	1.0	1.0	N.A.	N.A.	N.A.	N.A.	8.1
Panama 2	Oct-98	16.1	13.4	1.1	0.8	1.1	N.A.	N.A.	N.A.	N.A.	4.2
Portugal	Oct-98	17.9	N.A.	1.6	3.1	2.0	6.9	5.3	3.7	2.8	3.5
Saudi Arabia	Feb-82	23.0	0.0	3.6	1.8	1.1	N.A.	N.A.	N.A.	N.A.	1.7
Senegal	Apr-00	20.2	15.0	1.3	1.1	1.4	4.8	5.0	4.95	5.0	N.A.
Singapore 1	Jul-87	26.8	16.4	-1.9	0.8	1.5	5.0	4.9	4.3	3.8	6.5
Singapore 2	Oct-92	19.6	9.4	3.0	2.3	2.2	5.7	3.6	2.2	2.6	6.4
Spain 1	Sep-88	23.6	5.7	4.6	5.4	6.9	12.1	17.7	10.5	15.1	5.5
Spain 2	Feb-98	13.8	-4.2	2.8	2.0	1.6	8.9	6.0	4.9	3.0	3.7
Switzerland	Aug-97	33.6	4.7	0.6	0.5	0.1	3.2	2.1	1.2	1.5	1.0
Thailand 1	Dec-87	23.7	17.9	1.6	3.2	3.6	13.8	6.2	6.2	10.8	9.5
Thailand 2	Sep-94	21.8	11.3	2.9	5.4	5.6	7.4	6.3	7.4	9.2	9.0
Tunisia	Feb-00	19.2	20.7	2.7	3.1	1.9	6.9	6.3	5.9	6.1	6.1
United States	Dec-86	17.4	8.3	3.5	1.3	4.4	9.3	8.1	6.3	6.9	3.4

Source: IMF, *International Financial Statistics*.

Figure 1: M1 Growth and Inflation

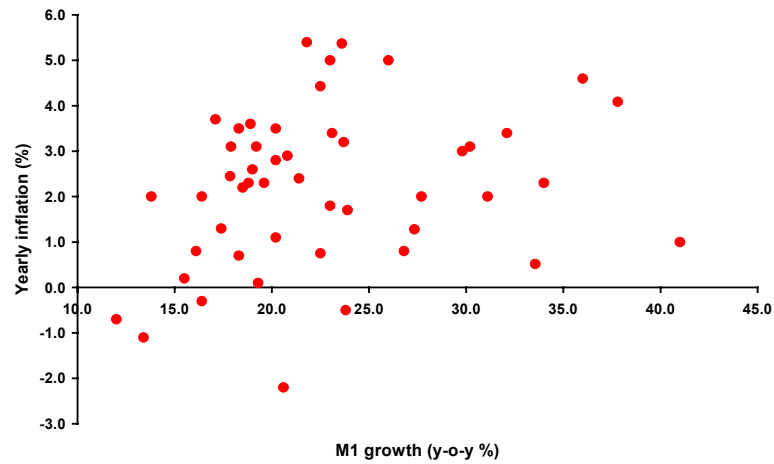


Figure 2: M1 Growth and Change in Current Inflation

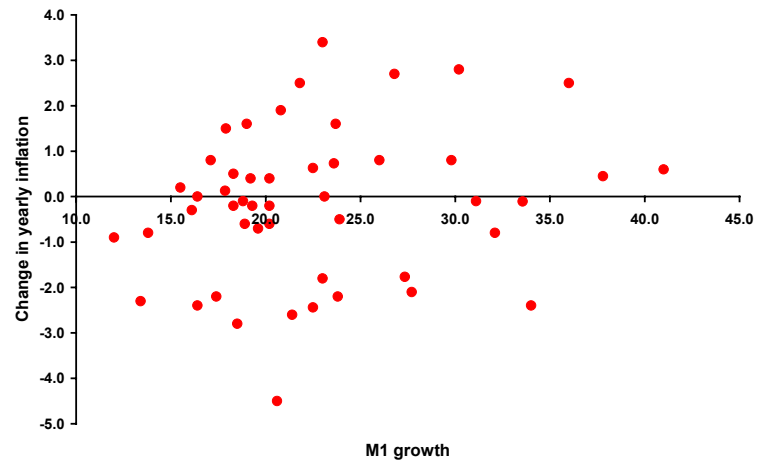


Figure 3: M1 Growth and Change in Inflation Next Year

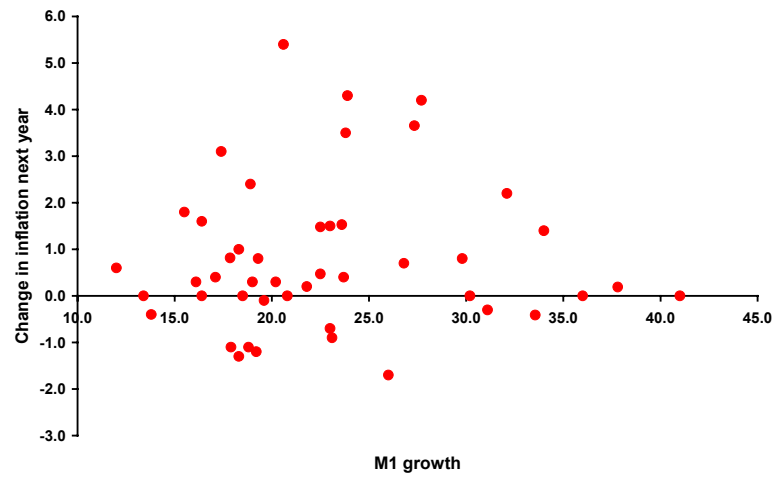


Figure 4: Excess change in M1 and Change in Inflation

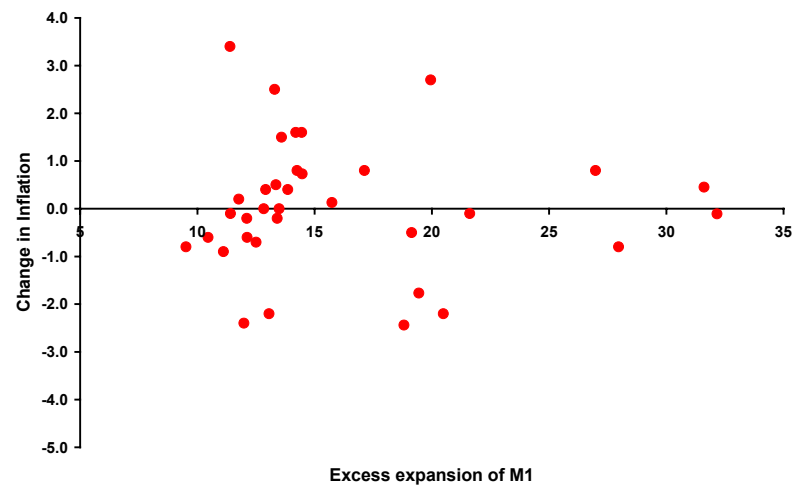


Figure 5: Changes in Inflation and Interest Rates

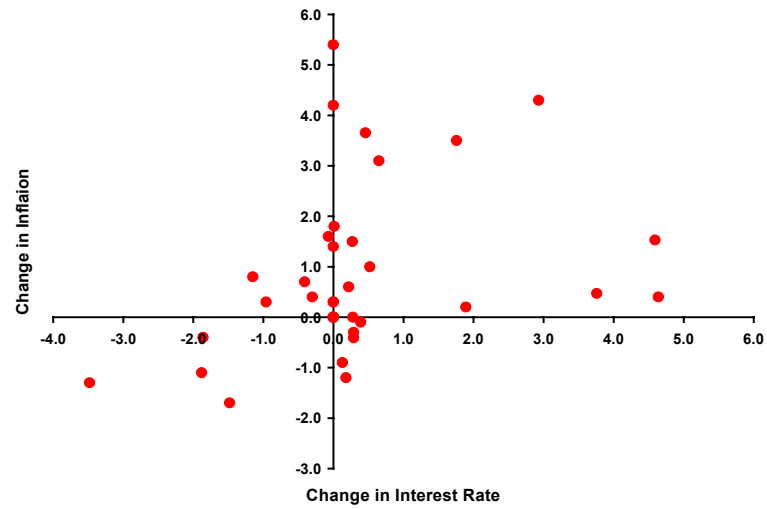


Figure 6: Evolution of M1 and M2

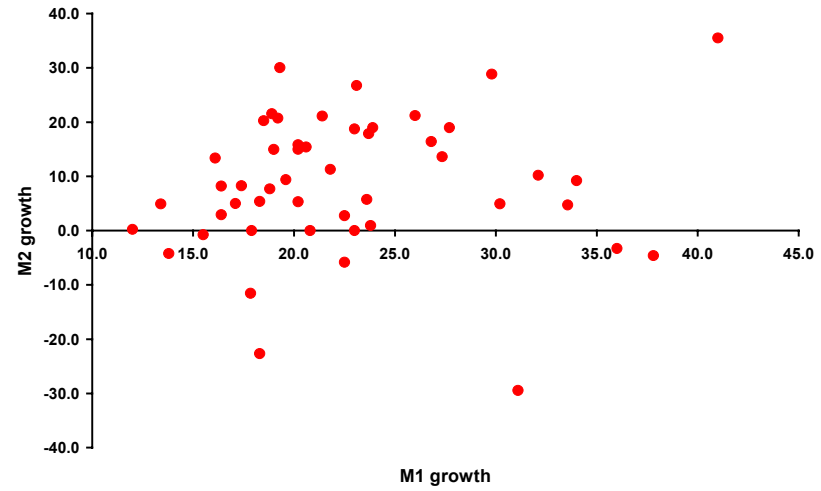


Figure 7: M2 Growth and Inflation  
(Countries with high growth of M1)

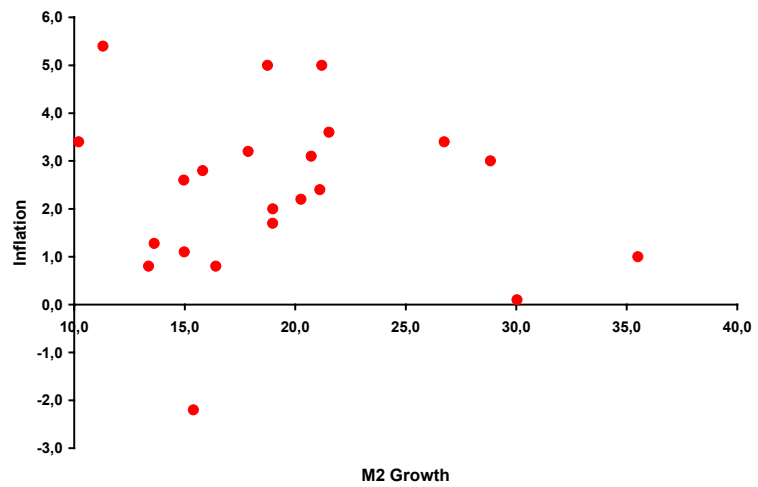
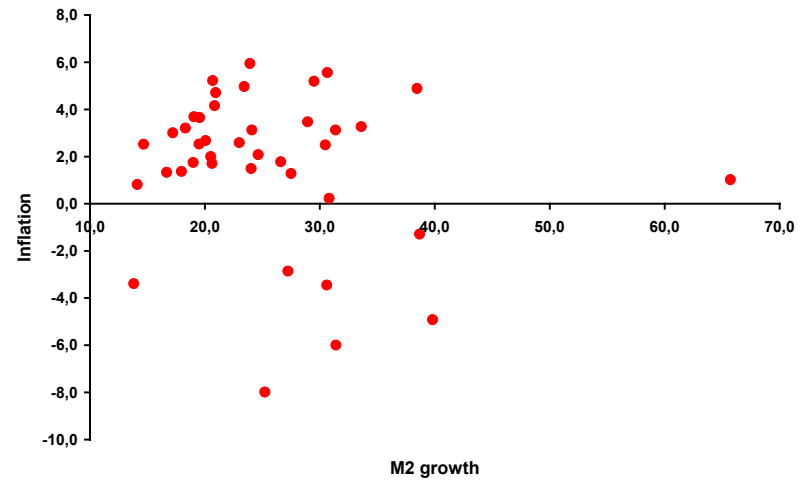


Figure 8: M2 Growth and Inflation  
(Full sample)



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