

THE DEMAND FOR MONEY BY FIRMS*

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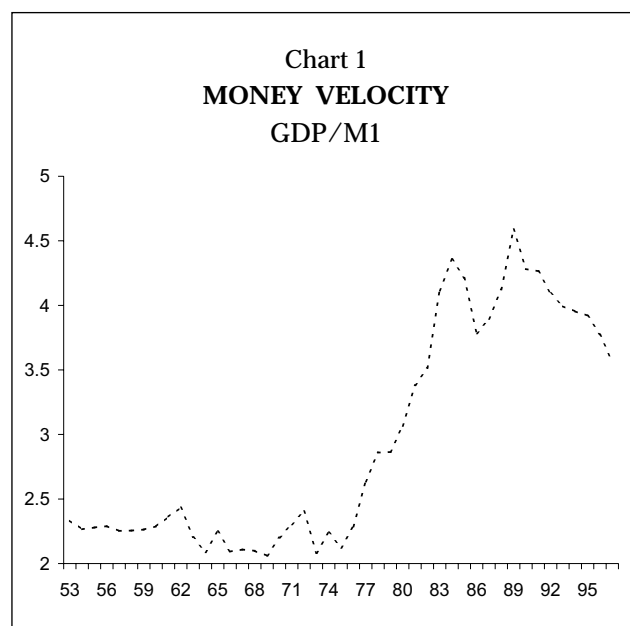
In Portugal, as in several OECD countries, since the 1980s money velocity (i.e., the ratio GDP/M1) stopped growing. This recent development is interesting for two reasons. First, because several studies indicate that money utilisation enjoys scale economies. "Ceteris paribus", GDP growth should translate into the continuation of the increase of money velocity. Second, because the level of financial sophistication seems to have been rising. This should also have raised money velocity. This article aims at understanding further this phenomenon. We estimate a money demand function for a group of economic agents — firms — in Portugal. The results reveal that firm size is important to understand the change in the velocity of money used by firms.

1. INTRODUCTION

From the mid-1970s, money velocity in Portugal has exhibited an upward trend. This growth was discontinued, eventually inverting its trend from the late 1980s onwards (chart 1). This recent development is interesting since the level of financial sophistication of the economy seems to have been improving — for instance, the expansion and availability of new products such as money market funds, investment funds, credit cards, ATM, deposit certificates, transfers and electronic payments.

Ceteris paribus, the increase in the level of financial sophistication would favour a more efficient utilisation of money, leading to the maintenance of the growth in money velocity. An additional point of interest in this phenomenon — the discontinued growth in money velocity — results from the fact that a wide range of other OECD countries have exhibited the same trend.

To identify the reasons behind this behaviour of money velocity, the factors behind economic agents money holdings — i.e., the money demand function — must be investigated on a quantitative



basis. Most studies addressing money demand have been based on aggregate time series. This approach is bound to conceal distinct behaviours resulting from different investment opportunities available to households and to firms; aggregate data may hide different patterns of money demand on the part of households and firms, and the estimation of money demand with time series data presents a number of problems which are not present in cross-section data.

* The opinions of this paper represent the views of the authors, they are not necessarily those of the *Banco de Portugal*.

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This article analyses firms' contribution to the mentioned behaviour of money velocity. The research on firms' demand for money uses data on the quantity of money held by a set comprising over 10,000 firms, drawn from the Central Balance Sheet Data office of the *Banco de Portugal*. Our results show that money utilisation enjoys significant scale economies, and that the fact that firms' money circulation velocity did not increase — despite the continued rise in the level of financial sophistication of the economy — may be due to the reduction in firms' size. The full set of results, methodological details and the relevant references are contained in the forthcoming *Working Paper* version of this article.

2. MONEY UTILISATION BY FIRMS

Firms use money to carry out transactions required by their business. The greater the amount of transactions firms make, the greater is the money quantity needed. However, the money quantity held by firms does not need to be proportional to the firms' size. Firms may exhibit different levels of sophistication in the utilisation of financial products available to them. A reason why firms might resort differently to financial products might be the existence of sizeable fixed costs on the adoption of the leading financial technologies. In this case, money utilisation may exhibit scale economies, and thus firms use a money quantity that is less than proportional to their size.

Firms neither need nor want to hold all their reserves in the form of money. Firms wish to hold smaller quantities of money since those amounts can be invested in financial products that generate greater income. *Ceteris paribus*, the higher the interest rate raised by these assets, the smaller is the amount of money firms will want to hold.

However, holding lower amounts of money forces the firm to support more frequently the costs due to withdrawing the cash required to perform transactions. In the past these withdrawals implied a visit to the bank; nowadays these may take the form of a phone call. Nonetheless, if the firm holds lower quantities of money, it will probably incur in higher costs measured in terms of the effort its staff dedicates to the management of these resources. These costs increase with the wage paid by the firm.

These arguments suggest that the amount of money held by each firm is a function of its size (of its sales), the interest rate and average wages paid. It is important to measure quantitatively the relevance of each factor to understand the changes that have occurred in firms' utilisation of money. The aim of this exercise is to obtain estimates for the relationship between money held by each firm and each of these three variables.

3. THE DATA

The data used in this paper were drawn from the Central Balance Sheet Data Office of the *Banco de Portugal*. The *Banco de Portugal* has gathered data on firms' accounts since 1986. The data available at the date this research was carried out ran up to 1995. The survey supporting the data collection was changed in 1990, implying that for some variables figures are unavailable for the whole period. As regards the current research, the major change deals with the fact that from 1990 onwards the Balance Sheet no longer separates the bank deposits in demand deposits and time deposits. This fact prevents us from employing the M1 definition, forcing us to use M2 instead — although we are ultimately concerned with analysing the circulation velocity of M1.

The distinction between time deposits and demand deposits has become increasingly blurred over time. Up to the 1970s, time deposits could not be converted into demand deposits at face value prior to their date of maturity. This is possible nowadays, requiring only that the bank is addressed the respective request. This transfer became simple and direct, and is made at the face value of the time deposit. Since time deposits are close substitutes for demand deposits as means of exchange — assuming that firms wish to use the former to this end — it seems reasonable to conclude that this asset should be included in the definition of a variable that measures the amount of money held by firms. However, this does not imply that households' time deposits should also be considered among the assets used by households as a means of settlement. It is known that, in the sample period, households resorted to time deposits as a reserve of value to a greater extent than firms.

The analysis of the data for the period for which the breakdown of deposits into demand deposits and time deposits is available suggests that the utilisation of M2 instead of M1 will not influence the results decisively. Indeed, in the period 1986-1989 demand deposits never accounted for more than 13 per cent of total deposits. Furthermore, both kinds of deposits behaved quite similarly in the firms of our sample. The logarithm of both monetary aggregates considered exhibit a correlation coefficient above 0.99.

Therefore, the concept of money used in our analysis corresponds to the sum of the item "cash" with the item "bank deposits" at the end of each year. Firm size is measured by firms' annual sales, while wages are measured by staff costs divided by the number of employees at the end of the year. Capital cost is measured by financial costs paid over the course of the year, divided by total liabilities at the end of the corresponding year.

All variables are expressed at constant prices of 1991, and are defined consistently for the whole period. The set of firms for which it was possible to observe all these variables comprises over 11,866 firms, observed over the course of the period 1986-1995. However, not all firms are observed every year. This explains that the total number of observations is 47,550. Chart 2 plots the behaviour of the sample mean of the relevant variables.

4. RESULTS

The basic equation estimated includes money in the left-hand side and the firms' size, labour cost and capital cost measures in the right-hand side (all variables are in logarithms).

Beyond these variables, two additional kinds of variables were added to control for non-observed effects that may affect the quantity of money held by firms. The first of these consists of a set of annual fixed effects, namely to take into account the possibility that the increase in the financial sophistication of the economy through time has led to a reduction in the utilisation of money by firms taken as a whole. The second consists of a set of firm-specific effects to control for the possibility of firms having some idiosyncrasy leading them to use amounts of money persistently different from

Table 1

ESTIMATED ELASTICITIES

Elasticity	Estimate
Scale	[0.5 0.7]
Interest rate	[-0.026 -0.024]
Wage	[0.08 0.13]

what their size, capital cost and labour cost would indicate.

Table 1 presents the intervals of change of the estimated elasticities, obtained through different estimation procedures. The results are relatively robust and are qualitatively identical regardless of the estimation method and the specification used. All estimates were obtained with high accuracy.

The estimates for the size elasticity (i.e., regarding real turnover) range between 0.5 and 0.7, indicating that substantial economies of scale exist in firms' utilisation of money. The signs of the estimated elasticities of the interest rate and the (real) wage confirm our expectations: higher interest rates lead to lower money utilisation and higher wages yield the opposite effect. However, the absolute value of these estimates indicates that these are quantitatively unimportant. The estimates for the interest rate elasticity are particularly surprising since former analyses using different methodologies and data estimated substantially higher values for this parameter⁽¹⁾.

5. BEHAVIOUR OF MONEY VELOCITY

Overall money velocity behaved similarly to firms' money velocity. The data in our sample (chart 2) suggest that the circulation velocity of firms' money, defined as the ratio of firms' sales to the money held by these, decreased from the late 1980s onwards.

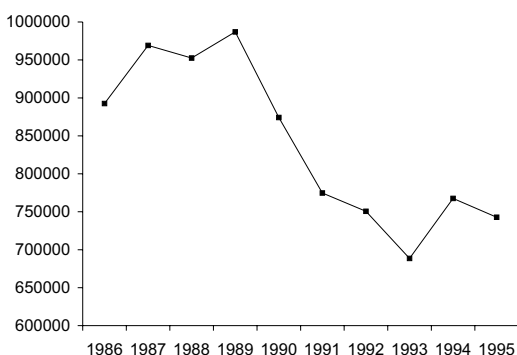
As an alternative definition — comparable with the usual definition of money circulation velocity

(1) However, it should be noted that in the current approach the interest rate elasticity is identified after the inter-temporal and idiosyncratic interest rate variability have been isolated. The crucial assumption underlying this identification is that firms have the same reaction to interest rate changes regardless of changes being specific to the firm or common to all firms.

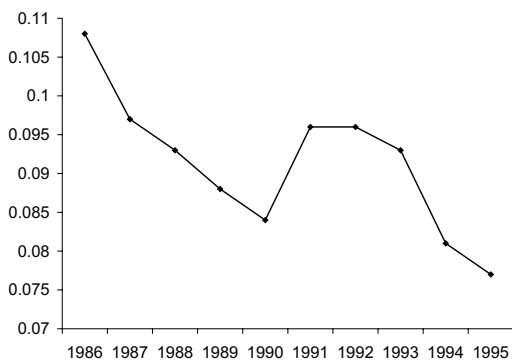
Chart 2
MONEY CIRCULATION VELOCITY
Sales/ M2



Firms' size



Capital cost



Wage

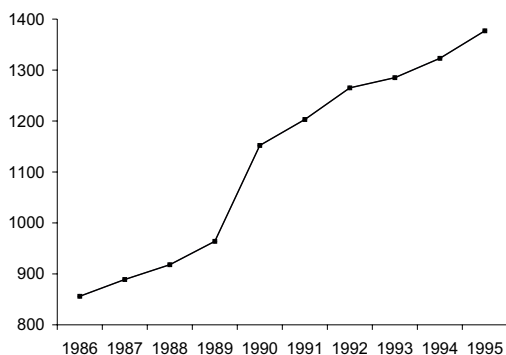
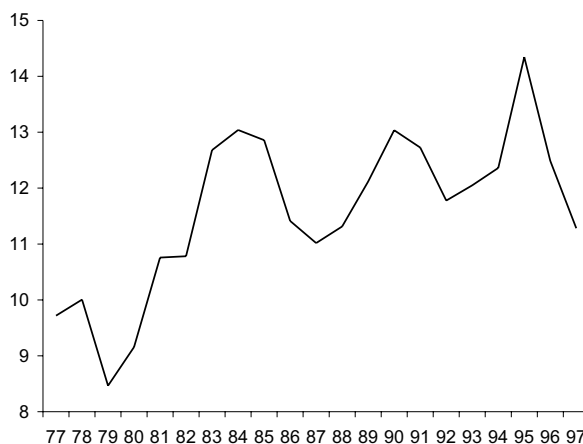


Chart 3
CIRCULATION VELOCITY
GDP / M1 firms



— would be ratio $GDP/(M1 \text{ of firms})$, where firms' M1 sums demand deposits with bank notes and coins held by the firms in the economy. The data on firms' demand deposits are drawn from the *Statistical Bulletin of the Banco de Portugal*. Since no data exists on bank notes and coins held by firms, this amount was estimated using the relationship between currency and deposits in our sample. Chart 3 depicts this velocity. As chart 3 shows, except for 1995 money velocity for firms in Portugal ranged between 11 and 13 in the period 1983-1997, and did not present a clear trend. However, even a constant behaviour would be difficult to explain in the light of the observed increase in financial sophistication.

Both the interest rate and the real wage rendered a negligible contribution to the behaviour of the circulation velocity of firms' money. Both variables recorded significant changes — i.e., the real wage increased and the interest rate decreased — in the period. Both effects contributed to an increase in the amount of money held by firms. However, the overall effect was very small according to the estimated elasticities of the interest rate and the real wage⁽²⁾.

We now analyse the effect of scale economies on circulation velocity. Usually, the interest in knowing if scale economies exist in money utilisation

(2) The conclusion that interest rate reductions cannot explain reductions to circulation velocity is strengthened if it is assumed that interest rate reductions yield a positive effect on GDP.

tion has to do with the fact that optimal money growth can be less than proportional to GDP growth. If the number of economic agents is constant and both economic growth and scale economies in money utilisation exist, money velocity should be expected to show an upward path. It seems reasonable to admit that the number of households does not change significantly, though the same might not hold true as regards firms.

According to our estimates, the change in firms' size is the most plausible explanation for the behaviour of firm's money velocity. Since scale economies exist, the reduction in sales per firm may lead to a reduction in money velocity. This sales reduction did indeed happen, calculations made from the *Quadros de Pessoal* — the most comprehensive survey to firms carried out in Portugal — reveal that between 1987 and 1994 real sales per firm grew -3.7 per cent in annual average terms for the same period, the firms in our sample recorded — a -2.7 per cent growth rate. Unfortunately, no comparable data exist for the previous decades, which could allow to test if during that period the change in the trend of growth in velocity can be linked to a change in the pace of growth of sales per firm. However, the Industrial Census data available for 1971 and 1984 show that average sales per establishment in manufacturing industry grew 4.5 per cent in annual average terms between both censuses. This suggests that in periods where velocity increased, the size of industrial establishments has also grown, while in periods of decreasing velocity, firms' size decreased as well⁽³⁾.

To estimate the effect of firm size on money velocity we calculate between 1983 and 1996 the per-

centage change in velocity that would result from a given reduction in firms' size. To attain this, we took into account that GDP grew 2.7 per cent in annual average terms in the period, and that the ratio "GDP/aggregate sales" implicit in the National Accounts rose from 0.49 to 0.55. Using the scale elasticity estimated, we found that annual reductions in firms' size between 2.7 per cent and 3.7 per cent would yield velocity reductions between 6 and 12 per cent over the course of the period⁽⁴⁾.

6. CONCLUSION

The estimation of a money demand function for firms revealed substantial scale economies in money utilisation and small effects of both wages and the opportunity cost of capital. Given the presence of scale economies, the reduction in the average size of firms recorded over the course of the period explains a significant part of the reduction in firms' money velocity.

A more complete explanation of the behaviour of aggregate money velocity would require a money demand function for households. Empirical evidence shows that households' money velocity behaved similarly to that of firms. Furthermore, given the real growth recorded by GDP, the amount of transactions carried out by each household shall have increased. Assuming that households do not exhibit diseconomies of scale in money utilisation, our research suggests that changes in both wages and the interest rate will have greater effects on the quantity of money held by households than those found for firms.

(3) It is also curious to notice that the pattern observed in Portugal is quite similar to that recorded in the USA, increasing up to the 1980s, decreasing onwards, while the revenue of firms (resident in the USA) reported per corporate income tax return grew at an annual rate of 0.2 per cent in the 1960s, 0.6 per cent in the 1970s and -3.4 per cent in the 1980s. Reductions in both firm size and money velocity appear to be phenomena widespread to many other developed countries.

(4) This analysis follows several steps. In 1983 we take index 100 for sales per firm and for the referred ratio "GDP/aggregate sales" to calculate Gross Value Added per firm. Using this value we calculate the "number of firms" required to generate 1983 GDP. Meanwhile, using sales per firm and the estimated elasticity we calculate the money quantity used by each firm. Multiplying the latter by the "number of firms" yields total money demand for the corporate sector. The exercise is repeated for 1995, using for firms' size the figure compatible with the referred rate of growth of firms. Finally, the rate of growth for velocity is calculated using total money demand in both years and the observed GDP growth.