

Title	The business demand for cash in japan and its characteristics by industry
Sub Title	
Author	田村, 茂(Tamura, Shigeru)
Publisher	
Publication year	1971
Jtitle	Keio business review Vol.10, (1971.) ,p.83- 96
JaLC DOI	
Abstract	
Notes	
Genre	Journal Article
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AA00260481-19710000-03919617

慶應義塾大学学術情報リポジトリ(KOARA)に掲載されているコンテンツの著作権は、それぞれの著作者、学会または出版社/発行者に帰属し、その権利は著作権法によって保護されています。引用にあたっては、著作権法を遵守してご利用ください。

The copyrights of content available on the Keio Associated Repository of Academic resources (KOARA) belong to the respective authors, academic societies, or publishers/issuers, and these rights are protected by the Japanese Copyright Act. When quoting the content, please follow the Japanese copyright act.

THE BUSINESS DEMAND FOR CASH IN JAPAN AND ITS CHARACTERISTICS BY INDUSTRY

by

Shigeru Tamura

1. Preface;
2. Two Versions on the Business Demand for Cash;
3. The Demand of Japanese Firms for Cash;
4. Factors Affecting Cash Management of the Firms;
5. Characteristics in Cash Management by Industry;
6. Conclusion.

1. Preface

This paper is intended to explain by positive analysis what properties the demand of Japanese firms for cash generally has, and whether some features to be called particularities by industry can be observed therein. We attempted this analysis because realization of the characters of business demand for cash has basic importance in understanding modus operandi of monetary policy on business liquidity.¹⁾ Furthermore, if we could find how the levels of demand for cash are determined by firms, it would serve as a clue to settle the validity of adopting cash balances as an indicator for financial analysis or liquidity analysis.

It must at first be noted that the demand for cash to be studied in this paper

1) In the new-developed analysis of the effect of monetary policy by R. V. Roosa, L. H. Kareken et al., emphasis is placed on the effect on the availability of lender as the title of "lenders analysis" shows. However, in order to clarify the process through which monetary policy affects investment outlays of a firm, it is still necessary to examine how the demand for liquidity is affected by changes in the availability of lender, and how this effect spills over investment outlays. In this respect studies in the mechanism of deciding the demands for cash—which represents demands for liquidity—have an essential significance also in the context of analysis of the effect of monetary policy. On this point an interesting hypothesis has been proposed by T. Suzuki of the Bank of Japan. T. Suzuki, *Nihon no Tsūka to Bukka* (Money and Prices in Japan), 1964.

means that for *money* in general including bank deposits, not simply that for *cash*. So we could as well say "demand for money," but "demand for cash" is used in order to designate the demand for money to be held as cash balances, not that in the sense of procurement of money to finance some specified payments.²⁾ Hence the demand for cash mentioned here may be conceived as the demand for money in stock terms.³⁾

Since the demand for cash in this sense is materialized as holding of cash balances, we can observe a firm's demand for cash by the position of its cash balance. In this study the cash balance is defined as the amount of cash plus bank deposits, by which we will measure the demand for cash.

2. *Two Versions on the Business Demand for Cash*

Motives of holding a cash balance in a firm can be divided, following Keynes, into (1) transactions motive, (2) precautionary motive and (3) speculative motive. Since the cash balances held for (1) and (2) are demanded alike for the sake of smooth business transactions, these can be treated *en bloc* as transaction demand for cash. On the other hand the holding for (3) is a demand arising as a form of asset holding and hence may be called "asset demand for cash."⁴⁾ Thus the business demand for cash consists of the transactions demand and asset demand. Accordingly analysis has to involve these two sorts of demand but in this paper our attention will be focused on the transactions demand because, insofar as Japan's firms, on which scarcity of liquidity has been always spoken, are concerned, supposedly cash holding is limited to an amount absolutely indispensable to business operation.

On this transactions demand for cash many studies have been published, among which most noteworthy are two versions. One is that known as the Baumol-Tobin hypothesis presented by the named two theorists in the second half of the Fifties.^{5),6)} A characteristic feature of this idea rests on the assumption that firms should manage their cash balances in the same way as in inventory control. As is well known, for keeping inventory firms pursue "economic order

2) This demand for money represents, so to speak, demand in flow terms.

3) Even when the demand for money is simply spoken, what is really meant is this demand in stock terms in most cases. This is so because a demand in flow terms makes a supply almost simultaneously, and hence demand and supply are offset each other.

4) Whalen calls this demand "investment demand" for the reason that this cash is used for investment in money markets in some days. E. L. Whalen, "A Cross-Section Study of Business Demand for Cash," *Journal of Finance*, Sept. 1965, p. 426.

5) W. J. Baumol, "The Transactions Demand for Cash: An Inventory Theoretic Approach," *Quarterly Journal of Economics*, Nov. 1952, pp. 545-56.

6) J. Tobin, "The Interest Elasticity of Transactions Demand for Cash," *Review of Economics and Statistics*, Aug. 1956, pp. 241-47.

size" in order to minimize costs for it.⁷⁾ The Baumol-Tobin hypothesis applies this way of thinking fully to firm's cash holding.

Now suppose a situation that during the period the flows of payments occur at a certain pace while the cash to fulfil them flows in all at once at the beginning of the period. This firm, we can imagine, may either hold the cash in hand throughout the period to cover payments, or reserve only a portion necessary for immediate payments and invest the rest temporarily in money markets from which a lot may be drawn back whenever the cash in hand becomes scarce. Doubtlessly investing some portion in money markets is more profitable because of interest earnings than holding all the cash from the outset. And the smaller the portion in hand, the smaller becomes the idle cash and the larger grows the interest receipts. However, in order to make the cash in hand smaller, more frequent withdrawals from money markets are required and hence expenses for such money transactions swell up. Accordingly we can not always say a smaller amount of cash in hand is more favorable. Firms should contemplate the most desirable lot size of money to be put into their cash balances. Thus similarly as the economic order size in inventory control, the optimum size to transfer into a cash balance raises a problem in cash control.

It is not a difficult task to find this optimum lot size, for the formula of obtaining the economic order size (of inventory) is applicable. Assume that a firm transfers funds into its cash balance by a lot size of C . Then on average $C/2$ cash is held in hand through the period. For this cash the firm has to abandon interest earnings from investment in money markets, and hence, letting i stand for the interest for the term, an opportunity cost of $Ci/2$ must be reckoned in order to keep the lot size at C . At the same time, assuming necessary payments of T during the period financial transactions of T/C times have to be conducted for performing investment at the beginning and withdrawals in the later. As the result, if an expense of b per transaction is required, a total cost of Tb/C must be taken into account. Thus the lot size of C charges the firm with a cost of:

$$E = Ci/2 + Tb/C.$$

Of course a value of C that minimizes E represents the optimum lot size. This is obtained by differentiating E with respect to C , positing it as zero, and solving this equation for C . Then:

$$C^* = \sqrt{\frac{2Tb}{i}}$$

7) The most classical model of the inventory control called "economic order size" or "economic lot size" has been given by Whitin. T. M. Whitin, "Inventory Control in Theory and Practices," *Quarterly Journal of Economics*, Nov. 1952, pp. 505-8.

and the optimum cash balance is:

$$C^*/2 = \sqrt{\frac{Tb}{2i}}.$$

Needless to say, this exhibits the firm's demand for cash, which must be interested to have an elasticity of $\frac{1}{2}$ with respect to T .⁸⁾ In other words, even when an increase in payment, say two-or three-fold, occurs, the demand for cash will rise at a lower rate. This holds true also in case sales S is used in place of necessary payment T , for an approximately proportionate relation is supposable between the two. Since generally business scales of firms are measured by sales, here we can draw a proposition that economies of scale play on the business demand for cash, or more exactly the transactions demand for cash. This is the most essential argument of the Baumol-Tobin hypothesis.

Along with the Baumol-Tobin hypothesis another noteworthy study is that of A. H. Meltzer published in 1963. This is a purely empirical study in contrast to Baumol-Tobin's. His analysis begins with postulation of a demand-for-cash function:

$$M_{ij} = k \cdot r^\alpha \cdot W_{ij}^\beta$$

where M_{ij} , W_{ij} denote respectively average cash balance and average tangible assets of i th firm of industry j , r average rate of interest during the term, and α , β are constants. It seems by this function that Meltzer regards the business demand for cash as dependent on interest rates and tangible assets. Tangible assets are linked with sales in the relation of:

$$S_{ij} = K_{ij} \cdot \rho_j \cdot W_{ij}$$

where S_{ij} denotes sales of the firm for the period P_j , average profit rate of industry j , and K_{ij} a variable with a value to be determined by the phase of business cycle whose determinants are the trend of demand for the firm's products, capital-labor ratio, etc. Using this relation postulated between tangible assets and sales, the above-demand-for-cash function can be rewritten as:

$$M_{ij} = \frac{k \cdot r^\alpha}{(K_{ij} \cdot \rho_j)^\beta} S_{ij}^\beta.$$

As a matter of fact, however, r and ρ are supposed to be identical among firms of one industry, and so also K may be looked as almost equivalent. So $\frac{k \cdot r^\alpha}{(K_{ij} \cdot \rho_j)^\beta}$ can be regarded as a constant in cross section study, and as the result the equation is simplified as:

8) By Baumol-Tobin the demand for cash has an elasticity of $\frac{1}{2}$ with respect to T and at the same time $-\frac{1}{2}$ for i . That this makes a weak point of their analysis has been pointed out by Miller and Orr. M. H. Miller and D. Orr, "A Model of the Demand for Money by Firms," *Quarterly Journal of Economics*, Aug. 1966, p. 426.

$$M_{ij} = V_{ij} \cdot S_{ij}^{\beta}.$$

Applying this equation, Meltzer measured β for fourteen industries and obtained its values of approximately 1 for all the industries. Thus he concluded that "in cross section analysis the demand for cash is a logarithmic linear function of sales, with an elasticity of unity."⁹⁾ This Meltzer's positive study revealed that economies of scale do not work on the business demand for cash; the demands varies in proportion to sales. This is right the view appearing in the traditional quantity theory of money, and here is seen a sharp opposition between the Baumol-Tobin hypothesis and the quantity theory of money about the economies of scale in the demand for cash.

Subsequently discussions on the business demand for cash in the second half of the 1960s were focused on this point. As for its theoretical aspect the theme was how the Baumol-Tobin hypothesis changes if it takes account of some neglected factors, e.g., effects of trade credit, while empirical researches were conducted to test whether any results similar with Meltzer's can be obtained on statistical data different from his. Yet the said opposition between the Baumol-Tobin hypothesis and the quantity theory has not been settled yet. A.S.R. Sastry fortified the B.T. hypothesis by verifying theoretically that economies of scale appear even when utilization of trade credit is taken into consideration.¹⁰⁾ W. J. Frazer gave support to it empirically using data other than Meltzer's.¹¹⁾ Contrastively there are such students as Whalen¹²⁾ who arrived at the same conclusion with Meltzer's that the sales elasticity of demand for cash is unity, using data of his own. Thus the problem remains still unsolved which hypothesis is valid as the explanation of business behavior about cash holding. So we will begin with this problem in analyzing the demand of Japan's firms for cash.

3. *The Demand of Japanese Firms for Cash*

In order to test whether in the business demand for cash in Japan economies of scale are observable, as is held in the Baumol-Tobin hypothesis, we assumed the demand-for-cash function $M_{ij} = \alpha S_{ij}^{\beta}$ following Meltzer and measured β . The materials used are cross-section data picked up from Nihon Keizai Shimbun-sha, *Kaisha Nenkan* (Annual Handbook of Firms), 1969 ed. S stands for sales, and M average cash balance for the period. The average balance was taken as

-
- 9) A. H. Meltzer, "The Demand for Money: A Cross-Section Study of Business Firms," *Quarterly Journal of Economics*, Aug. 1963, p. 420.
 10) A. S. Rama Sastry, "The Effect of Credit on Transactions Demand for Cash," *Journal of Finance*, Sept. 1970, pp. 777-81.
 11) W. J. Frazer, Jr., *The Demand for Money*, 1967, pp. 202-17.
 12) E. L. Whalen, "A Cross-Section Study of Business Demand for Cash," op. cit., pp. 423-39.

a simple average of the beginning and end of period. And we added all sorts of deposit held by firms to the cash balance. True it may pose a problem to include time deposit, into the cash balance. It may be the more so with the saving deposits of Japanese firms, because it involves not a few amount of compensating deposit such as so-called *buzumi-ryodate yokin* (counterpart deposit for loan). However, in view of the high substitutability between time deposit and demand deposit in the case of business firms,¹³⁾ it is not fair to ignore such compensating deposit wholly, and in addition identifying the latter is difficult because of data restrictions. So as an approximation we included all sorts of deposit into the cash balance.

We picked up 394 firms covering 13 industries and, transforming the above-mentioned demand-for-cash function into logarithmic linear form, measured parameters, first without classifying by industry. Thus we had:

$$\log M = 1.084 + 0.754 \log S \quad r = 0.860 \\ (0.018)$$

This equation may be said to have appreciable explanatory power in view of the high correlation coefficient of 0.860. And the measured value of β can be judged to be significant on account of the value of standard deviation (shown in parentheses). Accordingly it may be safe to say that as a whole in Japan economies of scale are working on the business demand for cash.

Next, by measuring for each industry we had results shown in Table 1. It is seen by this table that economies of scale are not so distinct as are by overall observation. Among the results by industry those of textile and oil

Table 1

Industry	No. of Firms	α	β	St. Deviation of β	r
Auto	29	-0.485	0.986	0.071	0.914
Shipping	17	2.428	0.533	0.061	0.925
Dept' store	20	0.074	0.877	0.054	0.928
Steel	43	0.516	0.893	0.046	0.950
Machinery	53	1.003	0.773	0.085	0.781
Textile	44	0.994	0.775	0.609	0.907
Elect. & gas	15	-0.279	0.915	0.092	0.948
Pharmacy	35	0.575	0.847	0.055	0.861
Oil refining	8	-0.428	0.939	1.278	0.949
Pulp	35	1.154	0.762	0.100	0.874
Construction	44	0.374	0.852	0.078	0.885
Nonferrous metal	24	0.928	0.870	0.063	0.918
Land transport	27	-1.440	1.128	0.189	0.865

13) Bank of Japan, *Wagakuni no Kin'yū Seido* (Banking System in Japan), 1966, p. 77.

refining cannot be said significant by reason of the large standard deviation of β , and for most of other eleven industries β is definitely above 1 or nearly 1. So only for shipping, machinery and pulp economies of scale are observed to the same extent as for the whole industry.

If economies of scale appear for such a reason as is held by Baumol-Tobin, they should be recognized in every industry. To speak basically, economies of scale mentioned in the Baumol-Tobin hypothesis stem not from particular conditions of individual industries but from a factor common to all industries, that is, existence of well-developed money market. If a money market is provided where firms can invest and withdraw at will, the larger a firm's business scale, the larger advantage is possible by utilizing the market to minimize cash in hand. This should hold regardless of the difference of industry, yet economies of scale in holding cash is clear in some industries while not in others as the table shows. And the fact that those industries with distinct economies of scale are only a few seems to suggest that in this country they arise from a cause different from that conceived by Baumol-Tobin. That is to say, the cause is not the developed money market which is common to all industries, but some factors inherent in individual industries.

Then, what factors are conceivable as such? In order to answer this question it will be necessary to clarify on what points the firms are focusing their attention in management of cash balance. Of course such study must be made with respect to each industry. If the factors affecting cash management in individual industry are found, then the reason will become clear why economies of scale play in some industries and why not in others, and also firms' behavior in cash holding will be known for each industry.

4. Factors Affecting Cash Management of the Firms

The reason for holding cash to deal with business transactions is the lack of synchronization between outflow and inflow of cash accompanying business activities. If it were known that whenever an outflow becomes necessary for payment there is always a cash inflow corresponding to it, there would be no need to hold cash. Holding of cash for transactions means inefficient use of limited funds. However, it is almost impossible that cash inflows and outflows occur always simultaneously. This is because funds that flow out in accompany with business activities do not come back immediately, but require some time till they return.¹⁴⁾ This elapse of time between outflow and inflow of cash is inevitable. It is this time gap that obliges firms to hold a certain volume of cash balance. Thus the primary aim of business cash management is to hold in hand such amount of cash as renders possible necessary payments without delay despite the time gap.

14) This corresponds with what is generally called the turnover period of capital.

In order to fulfil this requirement financial manager must first contemplate the volume of cash necessary to bridge the time gap between outlay and receipt and to maintain business. Needless to say, the size of necessary cash will be determined by the length of time gap, provided the scale of business, i.e., scale of outflows and inflows of funds, is given. Even among firms of the same scale, the longer the gap, the more must be the cash held.

Then the question is by what factors this time gap is determined. For the sake of simplicity we confine our observation to cash flows relevant to current operation, leaving extra flows arising from equipment investment out of consideration. Outflows of funds from a firm are supposed to derive from procurement of material goods and labor. The cash that thus flows out is converted into inventories of materials or labor, and further into inventories of products after elapse of a certain production period. And then, after passing a period necessary for selling it changes to accounts receivable, and remains to be so till the end of credit-collection period. Only after the end of this period it is converted into cash once again and comes back to the cash balance. These are the flows of funds attendant to current activities, and hence the time from outflow to return of cash consists of a period in which it remains at pause as inventories of materials and products (production period plus selling period) and a period at pause as accounts receivable (credit-collection period). The longer the sum of these two periods, the longer the time gap in a firm's receipt-outlay pattern.

Here is, however, one thing that must not be looked over. That is the existence of trade credit. It is very rare today that an immediate cash payment is made for every purchase of material goods from other firms. In inter-firm transactions customarily seller firms allow buyers to postpone payment of prices for some time. Accordingly, due to such trade credit, a purchase does not always mean an outflow of cash, and the total period of pausing as inventory assets and accounts receivable does not necessarily show the length of time gap. Even when it is substantially long, if the period of trade credit given by suppliers is long the time gap will not be so wide. Thus we realize that what determine a firm's pattern of receipt and outlay are the periods in which funds lie as inventory assets and accounts receivable as well as the period of trade credits. These three periods can be approached respectively by the turnover periods of inventories, accounts receivable and trade credit. As the factors affecting cash management in firms, these three turnover periods can first be mentioned.

Having thus decided the size of cash necessary for smooth current operation, financial manager will next contemplate how to hold it. This is the second task of cash management. Since cash is typical one of non-profitable assets for firms, the most efficient way of cash-holding for bridging a certain time-gap will have to be sought for. It is on this stage that the existence of developed money market has a large significance. The said developed market means one that can supply investment objects exchangeable for cash whenever desired and at a lost cost. British and American markets can be mentioned as such because they have

active transactions of Treasury bills which have high liquidity next to currency. If such a market exists, there is little need of holding cash in hand necessary for the payments during the business period from the outset. A firm with a big business scale, hence a large amount of cash required to cover the time gap, will be more ingeniously able to utilize money market and to save cash in hand. In Japan, where money market is less developed, room for such contemplation is limited and necessary cash must be held as it is.

There is still another factor that appears to affect cash management of firms. It is capability of borrowing from financial intermediaries, among others banks. The transactions demands for cash involves those from precautionary motive, so to speak, cash holdings to meet uncertainty, and hence actual need to use them may or may not arise. If it does not, the result will be useless holding. So if a condition exists that funds are able to be borrowed from banks to cover any need when it occurs, actual holding can be saved to that extent. Of course therein the rate of interest imposed on the loan will be also important. Hence the availability of bank credit as well as the rate of interest, i.e., price of loan, cannot be ignored.¹⁵⁾ Since our present concern is with cross section analysis, the availability must be considered to be a variable, yet the interest rate may be regarded as constant.

Thus we must consider the availability of bank credit as another factor beside the above-said three turnover periods, but it is a very difficult task to decide the variable to represent the credit availability. Generally banks set a certain ceiling of loans to each firm. So a firm's possible extent of reliance on bank credit is given by what portion of available amount under such ceiling has been utilized already. Hence the availability remaining for a firm cannot be grasped unless the credit ceiling given to it and its present balance of bank borrowings are known. It is impossible, however, to know the ceiling for individual firms, so we have to measure the availability of bank credit for each firm with the present balance of loans alone. And the balance pertinent to this purpose must be that of short-term borrowings.

As above we have had four factors affecting the business cash management, namely the turnover periods of inventories, accounts receivable and trade credit, and in addition the balance of short-term loans. If cash management is moved by these four factors, so also the demand for cash should be explained by these, but in Japan there is an additional factor to be taken into account. That is to say, because of the scarcity of profitable and liquid money market instruments, earnings of firms are kept as cash until they grow large enough to reinvest

15) E. L. Whalen also recognized the importance of bank credit for cash management and built a model taking account of the possibility of covering by bank loans, along with the possibility of withdrawal from investment mentioned by Baumol-Tobin. This may be looked as an extension of the Baumol-Tobin model but is not so large a contribution to the problem of economies of scale in the demand for cash. E. L. Whalen, "An Extension of the Baumol-Tobin Approach to the Transactions Demand for cash," *Journal of Finance*, March 1968, pp. 113-34.

in themselves. This is not a factor affecting the process of decision-making in cash management but works to increase cash balances as a result. In this sense the size of earnings cannot be neglected.

Thus the business demand for cash must be examined with respect to five factors of (1) business earnings, (2) turnover of inventory assets, (3) turnover of accounts receivable, (4) turnover of trade credit and (5) balance of short-term borrowings.

5. *Characteristics in Cash Management by Industry*

Now having understood the five factors which serve as keys to investigate the business demand for cash, let's consider the problem why in some industries economies of scale are clearly in play whereas in others not.

We express the cash balance (the variable to be explained) as well as the above five factors (the explanatory variables) in the form of ratios to sales, putting aside the factor of business scale for the sake of convenience. Symbols are as follows.

Ratio of average cash balance to sales

m =average cash balance/sales,

Ratio of net earnings to sales

x_1 =net earnings/sales,

Turnover rate of inventories

x_2 =average amount of inventories/sales,

Turnover rate of accounts receivable

x_3 =average accounts receivable/sales,

Turnover rate of trade credit

x_4 =average balance of accounts payable/sales,

Ratio of short-term borrowings to sales

x_5 =average balance of short-term borrowings/sales.

The average value of m for each industry is shown in Table 2. This m , which can be conceived as Marshallian k by industry in another view, varies appreciably among industries. In order to find the cause for such differentials we calculated the correlation coefficients of each variable (x_1, \dots, x_5) with m for every industry, and picked up those variables that have the closest correlation with m .

Table 2. Average Cash Balance Sales (Marshallian K)

Auto	0.23	Pharmacy	0.37
Shipping	0.26	Oil refining	0.13
Depart' store	0.11	Pulp	0.29
Steel	0.26	Construction	0.18
Machinery	0.29	Nonferrous metal	0.21
Textile	0.24	Land transport	0.49
Elect. & gas	0.13		

Table 3

Industry	Net Earnings/ Sales	Inventory Turnover	Account Receivable Turnover	Trade Credit Turnover	Short-Term Borrowings Sales
Auto			0.627		
Shipping					0.671
Dept. store	0.773			0.462	
Steel					
Machinery					0.660
Textile			0.508		
Elect. & gas	0.407				
Pharmacy			0.578		
Oil refining			0.709		
Pulp					0.561
Construction			0.714		
Nonferrous metal				0.528	
Land transport		0.773			

Table 3 presents the result. It may be seen that such variables are fairly different by industry, that is, x_1 for department store and electric-power & gas, x_2 for land transport, x_3 for auto, textile, pharmacy, oil refining and construction, x_4 for steel and nonferrous metal, and x_5 for shipping, machinery and pulp. These variables are considered to have important part in the decision-making for cash management in respective industries. However, it will not be safe to apply this interpretation to x_1 for electric-power & gas and x_4 for steel whose correlation coefficients are below 0.5. Again even if the correlation is high, for department store, where x_1 has the closest correlation, it would be impossible to connect this with any consciously-carried cash management. It is because, as has been mentioned already, a state that m is moved primarily by x_1 does not mean conscious cash management. By Table 4, which compiles relevant financial data, for department store the turnover of accounts receivable is faster than that of trade credit. And in addition the turnover of inventories is very fast, i.e., 0.66 months. So it seems that in the case of department store the time gap is only a little, if any. In this industry the primary role of cash management—securing of cash to cover the time gap—is of less significance. This is the reason for the lowest m of 0.11. Anyhow, in department store m seems to be derived as the result of natural flows of business earnings rather than of cash management.

Contrastively x_2 for land transport, and x_3 for auto, textile, pharmacy, oil refining and construction tell clearly conscious cash management. By Table 4, in land transport collection of accounts receivable is fast but payment of accounts payable is also speedy. Hence the time gap is determined by the turnover of inventories. Because of this very slow inventory turnover, cash holding must be made in harmony with it. The high m of this industry, 0.49, is not accidental but a result of deliberate cash management. And those industries with high correlation of x_3 with m have slow credit collection and speedy debt

Table 4

Industry	Net Earnings/ Sales	Inventory Turnover	Account Receivable Turnover	Trade Credit Turnover	Short-Term Borrowings
	(%)	(months)	(months)	(months)	(%)
Auto	7.40	0.78	4.13	1.72	19.7
Shipping	5.07	0.12	1.08	1.18	8.7
Dept. store	3.52	0.66	0.63	0.78	7.0
Steel	4.79	2.54	2.21	2.60	11.4
Machinery	9.57	2.19	4.34	2.92	18.8
Textile	5.14	2.22	2.11	2.20	10.5
Elect. & gas	9.89	0.42	0.52	0.47	2.8
Pharmacy	15.28	1.60	4.53	2.07	-3.1
Oil refining	2.19	1.22	2.17	1.82	-1.0
Pulp	3.06	1.52	2.00	2.89	12.8
Construction	5.29	5.11	2.18	2.29	9.7
Nonferrous metal	4.38	2.18	2.29	2.51	13.8
Land transport	7.07	6.87	0.20	0.28	9.6

Source: Bank of Japan, *Shuyō Kigyō Keiei Bunseki*, 2nd-half 1968.

payment. Auto, machinery and pharmacy are well known for their slow pace of credit collection, and if payments prior to collection are necessary, cash to fill the time gap is inevitably required. As the result accounts receivable turnover, x_3 , comes to have an essential influence on the decision-making in cash management. Accordingly in these industries there is born the close relation between m and x_3 , it seems.

Another fact can be found by contrasting Table 3 and 4. That is, in such industries as are unattractive to banks—shipping, textile, pulp—the strongest correlation to m is shown by x_5 . Table 4 tells that in these industries the ratio of net earnings to sales is low, and in addition loans to shipping tend to become long term while those to textile and pulp are already of substantial amount; for these reasons banks are not so active in financing to them. Thus the availability of bank credit for them is limited, and hence remaining capability of borrowing should make an essential consideration in deciding cash holding. A further interesting fact is that the industries with strong effect of x_5 mentioned here exactly coincide with those showing distinct economies of scale in the demand for cash (in the previous analysis). This seems to be not a simple incident. In Japan, where money is constantly tight there is seen a strong tendency of credit rationing by banks which generally results in larger benefit of credit for big firms.¹⁶⁾ This tendency must be all the more distinct with industries which are unattractive to banks. As the result in shipping, textile and pulp there seems to lie large differences of bank credit availability by business scale, and accordingly it is supposed that bigger firms are able to do with smaller cash

16) H. Kawaguchi, *Nihon no Kin'yū* (Banking Structure in Japan), 1966, Chapt. 6.

holding. If this is tenable, it is quite natural that economies of scale should emerge among these industries.

Thus by inquiring into those factors working strong effects in each industry, we can find characteristics by industry in the demand for cash and throw light upon phenomena that have been unable to explain from the standpoint of general conditions. In this analysis, however, we were unable to give a reasonable explanation to the cause for the strong influence of x_4 for the nonferrous metal industry. Possibly, in view of the correlation coefficient of x_4 to m , 0.528, the reason is not that x_4 has a particularly strong influence, but that a number of variables are moving m with almost equivalent powers. This can be ascertained to some extent by Table 5 which shows significant regression equations of m

Table 5

Auto	$m = -0.053 + 0.890x_1 + 0.137x_3 + 0.377x_4$ (0.358) (0.036) (0.093)	R=0.809
Shipping	$m = 0.251 - 1.533x_3 + 0.883x_5$ (0.515) (0.216)	R=0.815
Dept. store	$m = -0.032 + 2.373x_1 + 0.199x_5$ (0.427) (0.216)	R=0.834
Steel	$m = 0.019 + 0.312x_4 + 0.258x_5$ (0.090) (0.098)	R=0.574
Machinery	$m = 0.077 + 0.509x_1 + 0.127x_4 + 0.295x_5$ (0.211) (0.069) (0.048)	R=0.713
Textile	$m = 0.111 + 0.628x_3 - 0.218x_4$ (0.152) (0.138)	R=0.548
Elect. & gas	$m = 0.046 + 0.483x_1$ (0.300)	R=0.407
Pharmacy	$m = 0.144 + 0.351x_3$ (0.086)	R=0.578
Oil refining	$m = -0.072 + 0.573x_3$ (0.233)	R=0.709
Pulp	$m = -0.053 + 1.392x_1 + 0.335x_4 + 0.162x_5$ (0.375) (0.092) (0.066)	R=0.762
Construction	$m = -0.048x_1 + 0.847x_1 + 0.098x_2 + 0.345x_3 + 0.276x_4 + 0.332x_5$ (0.289) (0.032) (0.103) (0.111) (0.087)	R=0.896
Nonferrous metal	$m = -0.031 + 1.439x_1 + 0.335x_2 + 0.373x_4 + 0.296x_5$ (0.358) (0.139) (0.059) (0.092)	R=0.839
Land transport	$m = 0.253 + 0.274x_2$ (0.045)	R=0.773

by step-wise method. Excepting steel, textile, electric-power & gas and pharmacy, all equations are significant with explanatory power. Hence we could say the business demand for cash in Japan can be explained to some extent by appropriate selection of the five variables studied here.

6. Conclusion

Now we have realized that the business demand for cash is controlled according to (1) a firm's pattern of receipt-outlay which is determined by the turn-

over of inventories, accounts receivable and trade credit, and (2) the availability of bank credit, and lastly it is affected also by (3) business earnings because cash is the only liquid form of assets in which they are accumulated. And it has been known that the difference in the character of demand for cash among industries stems mainly from the difference in the receipt-outlay pattern and the availability of bank credit. This clearly reveals that in Japan economies of scale in the demand for cash are deriving from causes quite different than Baumol-Tobin's.

For those industries with intense economies of scale, it is impossible to appreciate a firm's liquidity or solvency by the value of m . Rather, it should be judged that a firm with a low value of m has high liquidity and solvency, because it can so readily obtain bank credit. Analysis of the demand for cash as is intended here will have significance for reasonable appraisal of financial position of business firms, and again will afford us an important clue for studying how monetary policy affects on different industries.

(This study was conducted under the aid of the Academic Promotion Fund of Keio Gijuku University for 1970, and given cooperation by Mr. Mitsuo Fujimori of the Faculty of Business and Commerce of the university.)