

Revisions of Estimation Methods for Cash Holdings by Households and Corporations in Japan's Flow of Funds Accounts⁺

Sayako Konno

Bank of Japan, Tokyo, Japan – sayako.konno@boj.or.jp

Naoto Osawa*

Bank of Japan, Tokyo, Japan – naoto.oosawa@boj.or.jp

Ai Teramoto

Bank of Japan, Tokyo, Japan – ai.teramoto@boj.or.jp

Abstract

In recent years, cash holdings of the private sector in Japan have risen remarkably. While interest rates remain at a historically low level, the low opportunity cost of cash holdings appears to raise the substitutability of cash and bank deposits. Given the different motivations behind the cash holdings of households and corporations, Bank of Japan's Flow of Funds Accounts (FFA) publishes the amount of cash holdings — with the detail of 50 sectors and 57 transaction items — as an independent transaction item. These statistics of cash holdings across different sectors are attracting increasing public attention and analysis. Given data limitations, however, the FFA's previous estimation method applied the ratio for transferable deposits of the two sectors to the amount of cash holdings, most likely overestimating the cash holdings of corporations and in turn underestimating that of households. In an attempt to improve estimation accuracy, given that raw data and surveys regarding corporations are more readily available than for households, this paper proposes and discusses three alternative estimation methods of the cash holdings held by corporations, estimating household cash holdings as a residual. The first method uses total cash holdings and deposits data in the survey for corporations, subtracting deposits data in the deposits statistics after adjusting for differences in definitions of the two statistics; the second method uses a sole proprietorship survey — which, despite its significantly limited coverage, publishes cash holdings data — applying the ratio of cash holdings to sales proceeds for sole proprietorship to gross up with sales proceeds of corporations; and the third method uses raw data and anecdotal evidence of sales proceeds and cash holdings in the cash register, obtained from cash collection and delivery services companies.

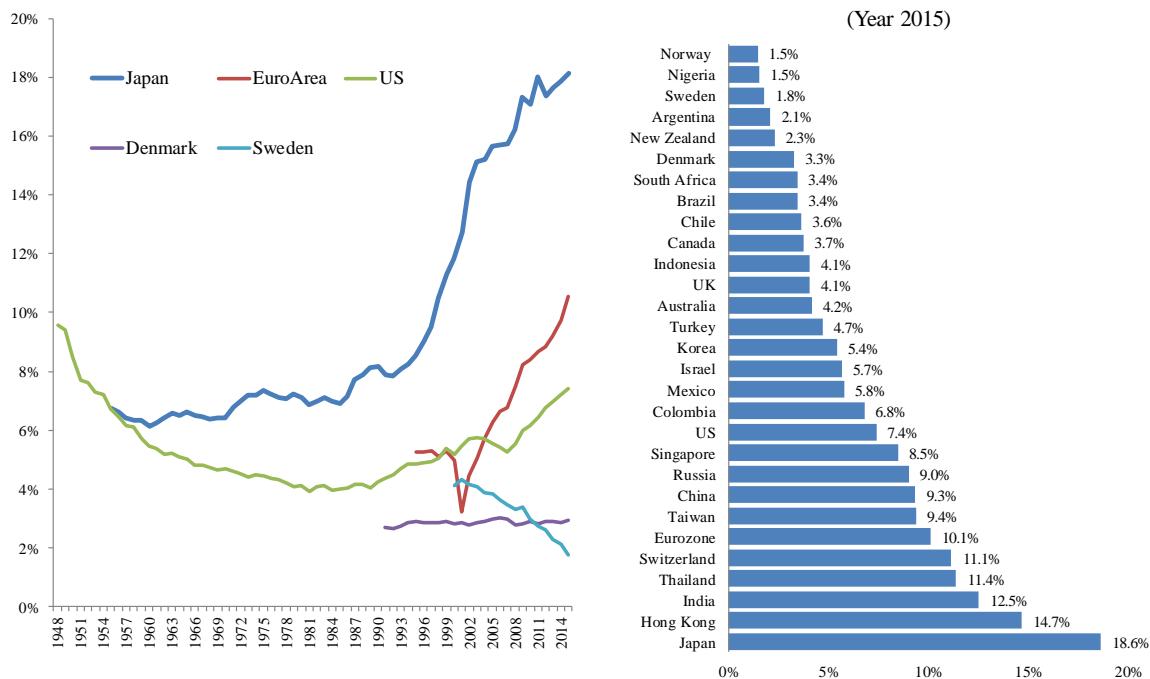
Keywords: substitutability of currency and deposits; opportunity cost of currency; low interest rates.

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1. Introduction

In recent years, the amount of currency outstanding in the world's economies has diverged dramatically (Figure 1). On the one hand, in Scandinavian countries, notably in Sweden, the ratio of currency to nominal GDP has been low and declining, reflecting the attempt of financial institutions to reduce cash management costs and also the government's attempt to curtail illegal activities. On the other hand, in many other advanced economies such as the US, Euro Area and Japan, the ratio has been on the rise amid declining interest rates. Compared with other countries, this is particularly true of Japan, where the ratio has been sharply rising for a long period of time, apparently reflecting a more extended period of low interest rates that has resulted in the lower opportunity cost of cash and in turn a higher substitutability of cash and deposits.

Figure 1: Currency-GDP Ratio



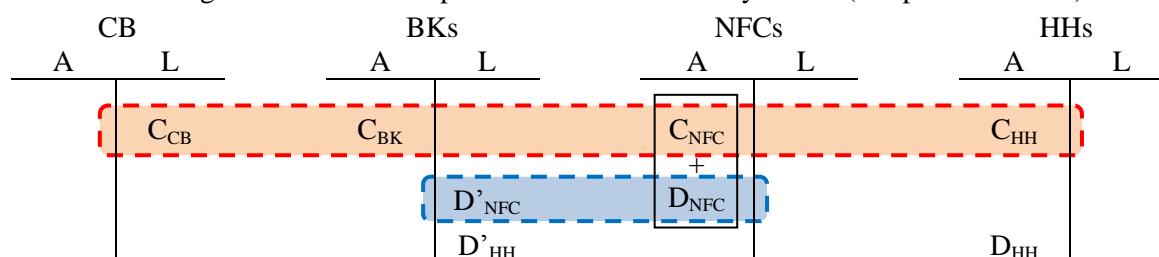
(Source) Rogoff (2016), UN, Denmark National Bank

In order to analyze these remarkable recent developments in Japan, there has been an increasing demand on statisticians from statistics end users to produce more disaggregated data, such as by sector, given for example that non-financial corporations (NFCs) and households are considered to have differing motives to have cash holdings. On the one hand, while industries such as retail trade, restaurants and amusement services hold cash with a transaction motive, others such as the manufacturing industry hold cash at a minimum level in principle, predominantly settling their

transactions by trade credits. On the other hand, households hold cash for a transaction as well as a saving motive, both of which are in general stronger than that of NFCs.

Nonetheless, in attempting to respond to the statistics users' demand, the more disaggregated data statisticians explore, the more data limitations they usually encounter. In general, in most countries, the issuance of currency is easily obtained through the liabilities side of the central bank balance sheet while the holdings amount is also easily obtained through the assets side of the financial corporations' balance sheet. However, for sectors such as NFCs and households, data is not as readily available. In fact, until it was revised in September 2016, the Flow of Funds Accounts (FFA) of Japan, compiled and published by the Bank of Japan (BOJ) (which includes 50 sectors and 57 transaction items), estimated cash holdings of households (C_{HH}) and NFCs (C_{NFC}) by applying the ratio of transferable deposits (about 7 to 3) to proportionally divide the residual amount of outstanding cash ($C_{CB} - C_{BK}$). This residual amount is calculated by subtracting that of sectors principally including financial corporations from the issuance of currency amount, as depicted by the orange area in Figure 2.¹ While issuance of currency was valued at 100.3 trillion yen at the end of March 2016, the amount of households was valued at 60.7 trillion yen and that of NFCs was at 26.1 trillion yen.

Figure 2: Cash and Deposits on Balance Sheet by Sector (Simple Illustration)



Note: CB=Central Bank, BK=Commercial Bank, NFC=Non-Financial Corporation, HH=Household;
A=Assets, L=Liabilities, C=Cash, D=Deposits

In an attempt to improve the estimation accuracy in the FFA, this paper proposes and discusses three alternative estimation methods of NFC cash holdings, all of which estimate cash holdings of households as a residual. These estimation methods make use of source data and anecdotal evidence regarding NFCs that are more readily available than that of households. The rest of the paper is organized as follows. Section 2 briefly explains the three alternative estimation methods. Section 3 presents estimation results and remaining methodological issues. Finally, Section 4 offers concluding remarks.

¹ Using notations in Figure 2, cash holdings of households are $C_{HH} = 0.7*(C_{CB}-C_{BK})$; those of NFCs are $C_{NFC} = 0.3*(C_{CB}-C_{BK})$. Figure 2 depicts asset-liability relationships of currency and deposits among different sectors: currency issued by central bank (C_{CB}) is held by commercial banks (C_{BK}), non-financial corporations (C_{NFC}), and households (C_{HH}); and deposits of non-financial corporations (D_{NFC}) and of households (D_{HH}) appear on the liabilities side of commercial banks (D'_{NFC} , D'_{HH}).

2. Three Alternative Estimation Methods

2.1. Use of Corporations' Financial Statements Statistics

In many countries, surveys of NFCs measure the sum of currency and deposits, but not currency itself. The liabilities side of financial institutions (mainly commercial banks), however, shows deposits by different individual sectors such as households and NFCs. The first alternative estimation method uses total holdings of cash and deposits ($C_{NFC} + D_{NFC}$) (from the survey for NFCs “Financial Statements Statistics of Corporations by Industry” published by the Ministry of Finance), and subtracts deposits (D'_{NFC}) (from “Amounts Outstanding of Deposits by Depositor” published by the BOJ), as depicted by blue in Figure 2. The following simple equation describes the estimation method:

$$C_{NFC} = [C_{NFC} + D_{NFC}] - D'_{NFC}$$

Note that insufficient adjustments for differences in definitions between the two sets of statistics as well as estimation errors inherent in the corporation survey — whose samples are used to infer population parameters — could lead to estimation errors of NFC cash holdings.

2.2. Use of Sole Proprietorship Statistics

In many countries, a survey to measure currency itself does not exist. As indicated in the previous subsection, surveys for corporations commonly measure only the sum of currency and deposits. However, in Japan a survey, albeit for sole proprietorship (that is, the “Unincorporated Enterprise Survey” published by the Ministry of Internal Affairs and Communications), measures currency by itself.² Taking into account the likely proportional relationship between sales proceeds and cash holdings, the second alternative estimation method, multiplies a) sales proceeds of NFCs at an industry level by b) the ratio of cash holdings to sales proceeds for sole proprietorship at an industry level to derive c) cash holdings of NFCs at an industry level. Adding up cash holdings for selected “cash-oriented industries” yields total cash holdings of NFCs.³ The following simple equation depicts this estimation method:

$${}_i C_{NFC} = {}_i (C/S)_{SP} * {}_i S_{NFC} ; C_{NFC} = \sum {}_i C_{NFC} ,$$

where S=Sales, SP=Sole Proprietorship, i=industry.

² The “Unincorporated Enterprise Survey” selects limited samples of about 4,000 enterprises in four industries: manufacturing; wholesale and retail trade; accommodation and food services; and services. Note that these industry categories are applied to respective subcategories or similar ones in the later estimation process.

³ Based on information about cash collection and delivery services companies' client corporations (see subsection 2.3), “cash-oriented industries” including retail trade, accommodation and food services, and amusement services are considered as holding large cash balances for their transactions. In contrast, “non cash-oriented industries” including manufacturing, construction, utilities, and, information and communications industries hold significantly less cash balances than “cash-oriented industries”. Note that “non cash-oriented industries” account for about 50% of all industries in terms of sales proceeds in 2014.

Note that this method could lead to estimation bias in both directions. On the one hand, the ratio of cash holdings to sales proceeds for sole proprietorship — which tends to make business transactions by cash rather than other means such as trade credits — is likely to be higher than average NFCs, leading to upward bias. A questionnaire item on cash in the survey for sole proprietorship includes checks as well as cash, also leading to upward bias. On the other hand, excluding “non cash-oriented industries” such as manufacturing from the estimation is likely to be too strong an assumption, leading to downward bias.

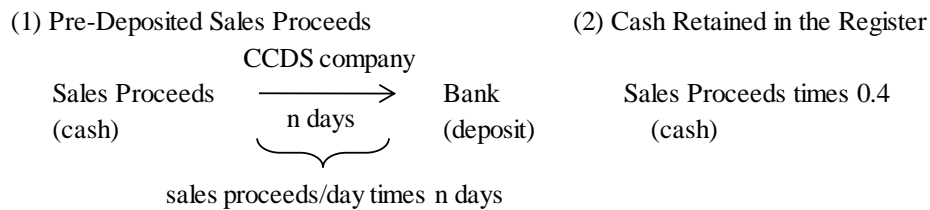
2.3. Use of Cash Collection and Delivery Services Companies

A direct survey of NFCs to measure cash holdings, albeit as a natural and promising estimation method, would impose a reporting burden and cost in order to conduct the survey and compile data. However, in Japan, cash collection and delivery services (CCDS) companies collect sales proceeds from corporations and deposit them at the bank, and deliver cash to corporations for transactions. As a less costly method, surveying CCDS companies could provide information regarding cash holdings of NFCs without needing to directly survey individual NFCs.

The third estimation method uses data and anecdotal evidence from CCDS companies; first, for each “cash-oriented industry” it, (1) calculates the interval in days at which CCDS companies collect sales proceeds to be deposited at the bank (sales proceeds collection interval), and (2) assumes the ratio of cash holdings for the purpose of business operations as that stored in the cash register to sales proceeds per day to be equal to 40% (cash retention ratio), as depicted in Figure 3⁴. Second, this method calculates the sales proceeds remaining at corporations before they are deposited (pre-deposit sales proceeds) for each individual “cash-oriented industry” by multiplying the sales proceeds collection interval by sales proceeds per day, which is derived using the corporations survey (“Financial Statements Statistics of Corporations by Industry”). It also calculates the balance in the cash register by multiplying sales proceeds per day by the cash retention ratio, that is, 0.4. Finally, adding up the amount of pre-deposit sales proceeds and cash retained in the cash register across “cash-oriented industries” yields total cash holdings of NFCs.

⁴ While sales proceeds collection intervals differ across industries, an average interval is about 3.3 days.

Figure 3: Pre-Deposit Sales Proceeds and Cash Retained in the Register



Note: CCDS = Cash Collection and Delivery Service

Note that this method could lead to estimation bias in both directions. On the one hand, as in the second method, excluding “non cash-oriented industries” from the estimation is likely to be too strong an assumption, leading to downward bias. On the other hand, selecting client corporations of CCDS companies tends to result in sampling corporations which make transactions in relatively large cash amounts (selection bias), leading to upward bias.

3. Estimation Results and Remaining Issues

These three alternative estimation methods, albeit mutually independent, in fact yield similar estimation results. The share of NFCs’ cash holdings declines from the pre-revised 30% to 10%, revealing that households, not NFCs, hold most of the cash in the economy; cash holdings of NFCs are 9 trillion yen while those of households are 80 trillion yen in 2015. From a statisticians’ point of view, the BOJ revised estimates of cash holdings at a higher level of accuracy, allowing researchers to analyze the outcome of these estimates.

Still, some challenges remain for the statisticians, as a result of directly estimating cash holdings of NFCs and consequently leaving those of households as a residual; the estimate of households may well contain estimation errors. For example, assuming overseas’ currency holdings as zero is likely to overestimate households’ cash holdings while estimating overseas’ holdings poses a significant challenge for statisticians due to data limitations.⁵

A direct survey of households could overcome these challenges arising from possible estimation errors. Nonetheless, an estimate based on a survey for households grossed up to the population yields only about 10 trillion yen in 2014. This appears to be a significant underestimation when compared with 80 trillion yen of above, potentially reflecting underreporting by households and/or sample bias.

⁵ While the portion of overseas’ cash holdings is estimated to be some 40% in the US, that of Japan is considered to be significantly smaller, given that Japanese Yen is not nearly as internationalized as the US Dollar.

4. Concluding Remarks

This paper proposes and discusses three alternative estimation methods of NFC cash holdings by estimating household cash holdings as a residual, in an attempt to improve the estimation accuracy of Japan's Flow of Funds Accounts. Those methods make use of a combination of published statistics, source data and anecdotal evidence regarding NFCs, which are more easily available than that of households. Albeit mutually independent, all three methods yield similar estimates; the share of NFCs is revised from 30% to 10%. Equivalently, cash holdings of NFCs are 9 trillion yen while that of households are 80 trillion yen in 2015, revealing that households hold most of the cash in the economy.

Amongst these three methods, the BOJ has chosen the second, which uses the sole proprietorship survey. This method applies the ratio of cash holdings to sales proceeds for sole proprietorship, grossing up with sales proceeds of NFCs to derive cash holdings of NFCs. On the one hand, the other two methods pose some practical challenges for statisticians: the third method of using cash collection and delivery services companies would impose a reporting burden and survey costs for periodical estimation updates; and the first method which uses two sets of statistics, that is, corporations' financial statement statistics and deposit statistics, tends to lead to relatively large estimation errors as a result of subtracting two independent statistics whose definitions can never completely converge even after meticulous adjustments. On the other hand, the second method would benefit from the use of published statistics, making periodical updates of estimates relatively less costly.

References

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