

Increased cash holdings – reduced use of cash: A paradox?

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Outstanding cash holdings in Norway have increased in real terms since 1980 and now amount to about NOK 10 000 per person. We can only ascribe between 37 and 47 per cent of cash holdings to legal, registered, quantifiable purposes in 2000, and this share has fallen in recent years. This article aims to shed light on this situation using a new method for explaining the use of cash in Norway.

1 Introduction

Total holdings of Norwegian notes and coins, measured in nominal value, rose each year from 1980 to 1999, but fell somewhat from 1999 to 2000, to an annual average of NOK 43.5 billion. The figure for cash holdings in circulation appears on Norges Bank's balance sheet. Cash holdings are a result of the desire of various sectors outside of Norges Bank to hold notes and coins as an alternative to other forms of investment.

The use of cash cannot be traced, and payer and payee cannot be identified. This distinguishes cash from other payment instruments, which are traceable, ie both payer and payee can be identified. Due to the properties of cash, it is difficult to acquire an overview of where, how and how much is used. However, our experience in Norway indicates that the use of cash at points of sale (POS) is on the decline and that the use of payment cards is rising correspondingly. Points of sale are defined as places where goods and services are delivered in return for payment. Examples are hairdressing salons, grocery stores or cafés. Despite a reduction in the use of cash in these kinds of sales, cash holdings are increasing, both overall and per inhabitant. Kaloudis and Storberg (2000) refer to this apparent paradox and argue that the explanation is that cash is used for other purposes than registered transactions at points of sales. A study by Rogoff (1998) shows that this paradox also exists in other countries. However, few studies have directly quantified the use of cash for different purposes.

In this article, we use a new method for estimating the share of cash holdings that is necessary to perform legal, registered transactions in an economy. We are thus able for the first time to estimate the magnitude of transaction-motivated demand for cash for all sectors of the Norwegian economy. The model shown here was first published in a study carried out at Norges Bank in 2000 by Humphrey, Kaloudis and Øwre (2000). The calculations in this article are based partly on new data and some altered assumptions. Our main sources for this work have been Norges Bank's Annual Report on Payment Systems and Norges Bank's FINDATR data-

base, which contains quarterly financial accounts figures. Our calculations indicate that a large portion of cash holdings in Norway is not used in the registered economy, but is used for storing wealth or for purposes related to transactions in the unregistered sector of the economy.

In the second section, we calculate the value of cash holdings that are used in the registered sector of the economy. In the third section, we show calculations of cash holdings associated with other quantifiable purposes as well as registered storing of wealth, and summarise our findings. In addition, we describe an alternative, simpler method of calculation that largely confirms our findings. In the fourth section, we discuss how the remainder of cash holdings, which cannot be ascribed to transactions in the registered sector of the economy or other quantifiable purposes, may either be used for person-to-person transactions which are legal, but not registered, for storing wealth, or in connection with tax evasion and criminal activities, before we sum up in the final section. All figures in the article are in nominal terms, unless otherwise specified.

2 Cash holdings in the registered sector of the economy

We have divided the economy into four sectors which use cash for transaction purposes, and which therefore need to hold cash. These four sectors are:

- Banks and financial institutions
- Government authorities, public enterprises and municipalities
- Private, non-financial enterprises
- Households

Banks and financial institutions need cash holdings in order to meet their customers' (enterprises, government authorities and households) demand for cash. In addition, most banks offer night safe services, and as a result, a large portion of the cash from local business ends up in bank branches. Data on the value of cash holdings in banks come from Norges Bank's FINDATR

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database, which contains information about quarterly financial accounts. Bank holdings have increased slightly in the years since 1994.

Government authorities, public enterprises and municipalities need cash in order to serve the public. These statistics are taken from Norges Bank's FINDATR database. The public sector's need for cash holdings has declined in recent years, and holdings in 2000 were approximately halved compared with the level in the period 1985 to 1995.

Private enterprises need cash in order to serve their customers, mainly private individuals. Norges Bank's FINDATR database provides data on the value of cash holdings in private enterprises with limited liability. In order to estimate the cash holdings of private enterprises with unlimited liability and non-profit organisations, we assume that the relationship between these two groups' cash holdings is equal to the relationship between the groups' sight deposits. The total indicates cash holdings in private enterprises. The cash holdings of enterprises increased each year throughout the period. However, the real value of holdings in the private sector has decreased substantially, particularly in the 1980s.

Households' cash holdings for POS transactions increased from 1980 to 1994. From 1995, holdings were substantially reduced. The calculation method used to reach this conclusion has been developed recently and is described below.

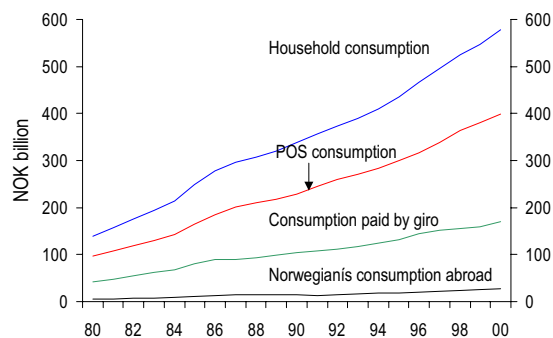
According to the national accounts, household consumption in Norway totalled NOK 139 billion in 1980. In 2000, consumption amounted to NOK 578 billion. Household consumption is the total of residents' and non-residents' consumption in Norway. This consumption is paid by giro (credit transfer), cheque, payment card and cash. However, giros are used for large payments and for payments where buyer and seller do not meet. Consumption paid by giro must therefore be kept separate in order to isolate that portion of household consumption called 'consumption at point of sale'. Consumption at point of sale is thus that portion of consumption that is paid by payment card, cheque or cash.

The following method is used to distinguish that portion of consumption that is primarily paid by giro: using common sense and simple characteristics such as that the goods or services are typically sold periodically, that they are purchased from a company that does not have branches or sales outlets, and that the goods or services are regarded as expensive, the following are defined as goods and services that are normally paid directly by giro:

- House rent
- Motor vehicles for personal use and car insurance
- Electricity and heating
- Postal and telecom services
- Costs connected with study fees etc.

The value of these goods and services was NOK 43 billion in 1980 and NOK 179 billion in 2000. When these goods and services are deducted from household consumption, we are left with 'consumption at point of sale'. In 1980, POS turnover was thus NOK 96 billion, and in 2000, it was NOK 399 billion, according to these calculations. Developments in POS consumption compared with total consumption and that portion of consumption that it is natural to pay by giro are shown in Chart 1.

Chart 1: Household consumption. In billions of NOK. 1980-2000



Source: Norges Bank

To find the value of POS consumption which is paid in cash, the value of cheque and payment card transactions must be deducted from the value of POS consumption.

Data on the use of cheques in Norway in the period covered by the survey are limited. From the existing data, we have estimated the number of personal cheques for the period 1980-2000 using regression analysis. The calculation is extensive and is omitted here for reasons of space. We know little about the value of the personal cheques that are used at points of sale. We have therefore used the average value of transactions with international credit cards in the period 1988-2000 as an estimate of the average value of cheques used at points of sale. By multiplying the average value of credit card transactions by the estimated number, we obtain an estimate of the value of cheques used at points of sale in the period 1980-2000. This is a new assumption compared with previous studies. The value is estimated at NOK 330 million in 2000, after peaking at NOK 52.8 billion in 1988. In 1980, the value was NOK 30.7 billion.

Payment cards have become a very popular payment instrument in Norway. Norges Bank's *Annual Report on Payment Systems for 2000* presents figures for residents and non-residents use of payment cards in Norway in the years 1990-2000. We have estimated the average value per transaction for the years 1980-1989 by adjusting the average value in 1990 for inflation during the previous 10 years. In addition, we have assumed that the number of payment card transactions has increased proportionally with the number of POS terminals. This is a

Calculation of cash replenishment frequency

There are three channels of cash acquisition in Norway: at the counter in banks and post offices, ATMs and cash back at payment terminals in connection with goods purchases. In the *Annual Report on Payment Systems for 2000*, Norges Bank presented almost complete statistics on the number of cash withdrawals in Norway. Statistics on cash withdrawals from ATMs cover the entire period 1980-2000, while the statistics on cash back in connection with goods purchases only cover the year 2000. 1992 was the first year Norwegians could withdraw cash at payment terminals in connection with goods purchases. Since then, cash back in connection with goods purchases has become just as important as a channel for acquiring cash as ATMs. Therefore, we have estimated the development in the number of withdrawals in connection with goods purchases for the years 1992-1998 by assuming that annual growth in the number of cash withdrawals has been constant and equal to the growth from 1999 to 2000 (growth rate of 50 per cent). We have

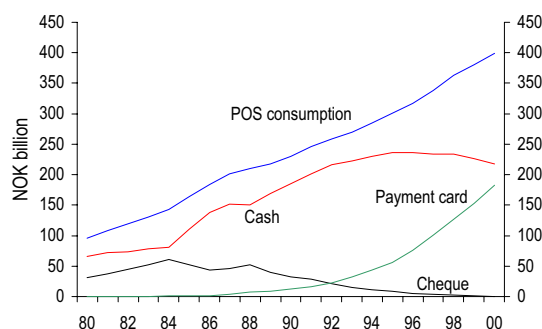
information about cash withdrawals at the counter (banks/post offices) for the period 1996-2000. We have assumed a negative correlation between cash withdrawals at the counter and cash withdrawals from ATMs and in connection with goods purchases. Based on this correlation, we have calculated the number of cash withdrawals at the counter for the years 1980-1995. By dividing the sum of the number of cash withdrawals from all three withdrawal channels by the number of Norwegians over the age of 15, we can estimate the cash replenishment frequency for the period 1980-2000. This figure tells us how often a Norwegian on average renews his cash holdings in the course of one year. Our calculations show that while the average was 38 in 1980, it rose to 66 in 2000. We see that access to additional withdrawal locations (ATMs and payment terminals) has changed the pattern of withdrawals. The frequency of cash replenishment has increased while the amount of each withdrawal has gone down somewhat.

new assumption. These assumptions were incorporated in a regression analysis which provided an estimate of the number of transactions in the period 1980-1989. We found the value of payment card transactions by multiplying the number of transactions by the average value for the period 1980-1989. The values for the first years (1980 and 1981) of the development of the EFTPOS system²⁾ are estimated to be negligible. In 2000, turnover amounted to NOK 182 billion.

We find the value of cash used at points of sale when we subtract the above estimates for checks and payment cards. The amount increases from NOK 65 billion in 1980 to NOK 236 billion in 1996. The value then declines to NOK 217 billion in 2000. Cash accounted for 68 per cent of the value of POS turnover in 1980. The share fell to 56 per cent in 1984, increased to 83 per cent in 1993 and dropped to 54 per cent in 2000. We assume that the increase and decrease in popularity of cash as a means of settlement at the point of sale depends on the use of checks and payment cards. Check use increased sharply until 1984 and declined after 1985 when banks introduced fees on check use. The use of cash increased in tandem with the decline in check use and the development of the ATM network, which provided easier access to cash. During the last half of the 1990s, payment cards increasingly replaced the use of cash as a payment instrument. The effect is particularly apparent after 1998 when the use of payment cards increased very rapidly and the rise in cash use was reversed. Developments in the distribution between payment cards, checks and cash are shown in Chart 2.

²⁾ EFTPOS = Electronic Funds Transfer at Point Of Sale is a payment terminal system for handling payment cards.

Chart 2: POS consumption by payment instrument. In billions of NOK. 1980-2000



Source: Norges Bank

The value of consumption paid in cash at points of sale is used as the basis for calculating the amount of cash holdings that is adequate to enable the public to pay for this consumption. To calculate this we must first calculate the public's cash replenishment frequency, ie how often on average individuals acquire cash. This calculation is described in a separate box.

To find the value of cash holdings which is adequate to cover household POS consumption, we divide the value of consumption paid in cash at points of sale by the frequency of cash replenishment. The concept behind this method came from Baumol (1952). In Baumol's model for the transactions demand for cash, cash is considered an ordinary good and cash holdings are considered ordinary inventory. Time and transport costs and withdrawal fees induce a rational user to make as few withdrawals as possible for as large an amount as possible. On the other hand, large cash holdings imply

lost interest income and increased security costs (costs connected to the risk of loss or theft of cash holdings). The net effect of these costs affects the individual's choice of cash holdings for transaction purposes.

We assume that Norwegians withdraw a fixed amount each time they make a withdrawal to cover cash needs for a certain number of days. The amount changes from year to year in step with the change in the number of days between each withdrawal and with the increase or decrease in the value of consumption paid in cash.

Estimated cash holdings increased from 1980 to 1994, probably because of the transition from the use of checks to cash in this period. From 1995, cash holdings declined substantially, which may be explained by the fact that after 1992, the EFTPOS system provided access to cash without time and transaction costs or additional withdrawal fees.

With our new data, we can establish a shift in the payment system: when checks were used most often, in 1984, about half of household consumption was paid in cash. This was more than twenty years after the check became common. A reduction in the use of checks increased the cash share to more than 80 per cent in 1993. In 2000, the cash share was lower than in 1984, about ten years after payment card use became widespread. Assuming that there will be no significant changes that reduce the use of payment cards and at the same time stimulate the use of cash, it appears that the use of cash for transactions will continue to decline in the next few years. However, cash will probably not disappear from daily use in the foreseeable future.

3 Cash holdings for other quantifiable purposes

Cash held abroad accounts for 0.7 per cent of outstanding cash holdings, based on a survey conducted by Statistics Norway.

The tax authorities have figures for 1996-1999 for cash holdings declared in tax returns. These figures represent taxpayers' year-end cash holdings in excess of NOK 3000, information which should be provided in tax returns. We assume that this cash is held for other reasons, eg storing of wealth, than cash that is held for POS transactions. We assume that the value prior to 1996 was the same as in 1996 and that the value in 2000 was the same as in 1999.

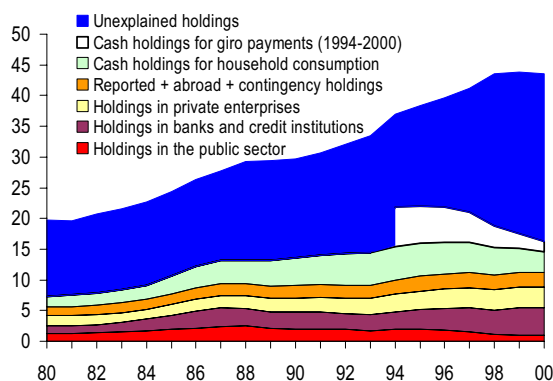
We also assume that there are costs involved in running out of cash, so that everyone will want to have a certain cash reserve at all times in addition to and independent of the cash holdings that are used to cover POS consumption. We call this contingency holdings. For 2000, we assume that this amount was NOK 400. For the previous years, we assume that the average individual held an inflation-adjusted amount equivalent to NOK 400 in the year 2000. We further assume that this applies to that por-

tion of the population that is 15 years or older. These three items combined give an increasing nominal amount from one year to the next throughout the period.

Cash is not only used for POS consumption. It is also used to pay giro payments at the counter. The cash holdings required to complete these giro transactions may be calculated on the basis of the payments throughout the year. The amount has diminished substantially in the last five years. By using the cash replenishment frequency in connection with giro payments in the same way that we calculated cash holdings for consumption, we determine the holdings that are adequate to pay the giros that are paid in cash at the counter.³⁾ Unfortunately, there are no statistics for giros paid in cash before 1994 and we have not made an estimate for the previous years.

When we add up all the different components of cash holdings, we conclude that the sum only explains a relatively small share of total outstanding cash holdings (see Chart 3, which shows developments measured in billions of NOK).

Chart 3: Cash holdings by sector and for different types of transactions. In billions of NOK. 1980-2000



Source: Norges Bank

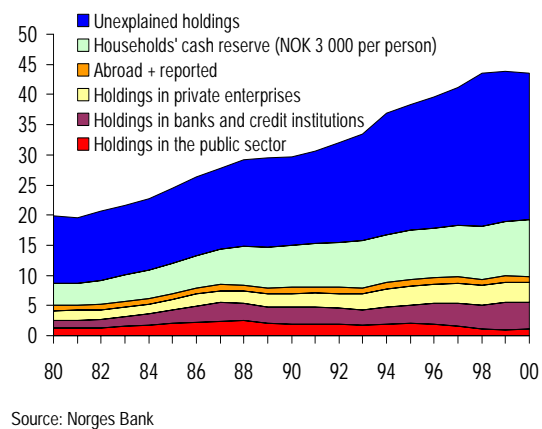
Total cash holdings have increased throughout the period 1980-2000, while the portion that may be accounted for is more variable, especially measured as a percentage of the total. Cash holdings that are accounted for (excluding giros paid at the counter) rose from 37 per cent in 1980 to 46 per cent in 1991 but fell again to 33 per cent in 2000. The time series for cash holdings used to pay giros at the counter is shorter and is included after 1994. Giros paid at the counter increase the share of cash holdings that is accounted for to 59 per cent in 1994 and 37 per cent in 2000. The remaining 63 per cent represents cash holdings for unregistered purposes.

³⁾ The public's behaviour in connection with paying giros in cash is not necessarily the same as behaviour in connection with using cash at points of sale. It is possible that by using the estimated cash replenishment frequency we underestimate the household sector's real need for cash to pay giros. The cash replenishment frequency is primarily calculated to determine the household sector's need for cash holdings to cover consumption paid in cash.

Alternative estimation of the public's cash holdings

We can also use a more direct method for estimating an upper limit of the value of the public's cash holdings, regardless of the purpose. We mentioned earlier that all taxpayers are required to report year-end cash holdings in excess of NOK 3000. Let us assume that all individuals in Norway who are 15 years or older have a cash reserve of exactly NOK 3000. This is the same limit stipulated in the tax return as the amount that may be held before it is subject to wealth tax, in this connection an unreported cash holding. We deduct the contingency holding of NOK 400 (as assumed in the text) from this amount. This gives us NOK 9.4 billion in public cash holdings, which combined with the other items can explain 47 per cent of the outstanding cash holdings in Norway in 2000. Chart 4 shows developments during the period 1980-2000. We see from the chart that this calculation method does not explain how large portions of cash holdings are used.

Chart 4: Alternative calculation of the explained portion of cash holdings. In billions of NOK. 1980-2000



4 The unexplained portion of cash holdings

As we have mentioned, we can explain the use of between 37 and 47 per cent of cash holdings in 2000 on the basis of statistics and estimations. The unexplained portion can probably be tied to:

- Legal person-to-person transactions that are not registered in the national accounts
- Storing of wealth
- Tax evasion and criminal activity

The majority of cash holdings is thus used for unregistered (legal and illegal) activities in Norway.⁴⁾ This is also the case in most other OECD countries, according to a study by Rogoff (1998). He also shows that as in Norway, cash holdings as a share of GDP have increased the last 10-15 years in all OECD countries. Boeshoten and Fase (1992) refer to a survey in the Netherlands from 1986 and conclude that only a small portion of cash holdings is used for legal transactions in the Netherlands. Some 60-70 per cent of Dutch banknotes with the highest denomination (1000 guilders) is used for storing wealth, and this is primarily related to tax evasion and criminal activity, according to the survey. Our analysis indicates that the same is true in Norway.

The unexplained portion of cash holdings may be used for unregistered person-to-person transactions which include purchases and sales of goods or services that do

⁴⁾ Some cash disappears from circulation. Some is lost, in particular small denomination notes and coins. Some cash is held by collectors and disappears out of circulation in this way. The available statistics are rather incomplete, partly because the period of validity for old notes and coins is long. An estimated 1-5 per cent of cash holdings disappears from circulation.

not have to be registered. There are legal transactions, such as the purchase of used pleasure boats, cars, motorcycles, PCs and other sales that do not go through a dealer. However, the pattern of cash use for these kinds of transactions is probably different from the pattern of daily, registered transactions. The purchase of a used car or boat normally involves a relatively large amount of money so that a cash withdrawal from an ATM (normally, ATMs have a withdrawal limit of NOK 9 900) or cash back in connection with goods purchases (withdrawal limit is NOK 1 000) cannot be used to procure cash. Cash must be obtained from a bank or post office. It is also assumed that individuals are not comfortable keeping large amounts of cash over a long period of time. Cash is probably used after one to three business days, ie more quickly than cash that is kept for ordinary transactions. We have estimated turnover in two large markets, the used car market and the market for small used pleasure boats. Combined turnover in these markets amounted to approximately NOK 30 billion in 2000. If we assume the extreme case where all transactions are paid in cash, including sales through dealers, the need for cash holdings will still be small. If cash is held for two business days (one day by the buyer and one day by the seller) the need for cash holdings would be NOK 164 million daily throughout the year. This is roughly 0.4 per cent of the value of total cash holdings. We can define several markets that need cash for legal transactions, but it is difficult to imagine that this would noticeably improve the degree of explanation. There will still be a large, unexplained portion that consists of the need for cash for storing wealth and for illegal activities.

We assume that the unexplained portion of cash holdings – 63 per cent in 2000 – is primarily connected with the storing of wealth, tax evasion and criminal activity.

The storing of wealth may be divided into two main categories: voluntary storing of wealth ('savings under the mattress' which in principle is legal) and forced storing of wealth due to tax evasion or criminal activities.

Voluntary storing of cash wealth that is not connected directly to illegal behaviour is legal, provided that the amount is reported to the tax authorities. Some of this is probably not reported. Some people hold large amounts of cash savings which are not reported. We do not have any figures on which to base an estimate of the amount involved.

Tax evasion and criminal activities probably account for a large portion of cash holdings. The reason may lie in the cash transaction pattern. In the registered segment of the economy, there is a well-developed network that handles cash turnover and distribution. It is not always possible to use the infrastructure that facilitates cash circulation in the legal segment of the economy when making transactions that are directly connected with illegal activities. In addition, illegal transactions generate gains that can quickly attract the attention of the tax authorities and banks (banks are required to report any suspicious transactions that may suggest money laundering) if the money is deposited directly in Norwegian bank accounts. As a result, there is a need to store cash for longer periods in connection with illegal activities than in connection with legal activities. One might say that illegal activities lead to forced storing of cash wealth. Therefore, it is natural to assume that cash changes hands more frequently in the registered segment than in the illegal segment of the economy.

Unexplained cash holdings are large, more than NOK 27 billion, and it may seem strange that a large portion of this amount may be tied to activities in the black economy. However, this is not necessarily unreasonable. The tax authorities have estimated the scope of the black economy to approximately 10 per cent of GDP, or just over NOK 140 billion. Let us assume that this is correct. In addition, total cash holdings used in the illegal economy could at the most amount to the figure that we are unable to explain in our calculations, ie NOK 27.3 billion. Assuming that cash is the only payment instrument used in the illegal economy, every krone in the illegal economy changes hands 5.18 times during the year, or every 70 days. This is less frequently than in the legal segment of the economy, where one krone changes hands legally 66 times during the year, or every 6 days, according to our calculations. If the velocity of circulation is much lower in the illegal segment than in the legal segment of the economy, then the need for cash holdings will also be larger in connection with illegal activities than in connection with legal activities.

Nevertheless, it is difficult to be more precise about the percentage of cash holdings connected with the illegal segment of the economy without concrete data on the velocity of circulation in the black economy or the scope of cash holdings for 'legal' storing of wealth.

5 Summary

Norges Bank has a statutory responsibility for satisfying society's demand for cash. Demand is determined by the various activities described above. The special features of cash (immediate, anonymous settlement and untraceable transactions) ensure that cash remains an effective means of payment in connection with many kinds of transactions. Since cash is difficult to monitor, we are dependent on more indirect methods as discussed in this article to discover how cash is used.

Cash holdings have more than doubled from 1980 to 2000. Between 37 and 47 per cent of cash holdings may be ascribed to specific purposes in 2000, for example households', companies', banks' and credit institutions' cash holdings for payment transactions. The portion that can be explained by transaction-motivated demand for cash has declined throughout the period but diminished more rapidly after 1996. The unexplained portion (which has increased the entire period) is used partly for legal, but unregistered transactions such as storing wealth and private transactions and partly in connection with illegal activities such as undeclared work and criminal activity.

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