

Staff Memo

Payment habits at point of sale

Different methods of calculating use of cards and cash in Norway

By Olaf Gresvik and Harald Haare

Abstract

We use different empirical methods for estimating the use of cash in Norway. One method gives an estimate of the maximum value of cash use at point of sale. A second estimates the minimum use of cash in the society as calculated from new information uncovered by a recent reorganisation of the cash distribution system in Norway. In a third approach, answers from a general public survey provide insight in by which instrument payments are made. The fourth method looks at which purposes the cash stock is held for. The four approaches give broadly the same results: cash use is very low in Norway compared to other Nordic and European countries, and it has been falling for many years. Cash settles about 23 per cent of transactions at point of sale, representing 14-38 per cent of the value.

Payment habits at point of sale.....	1
Abstract	2
1. Introduction	4
1.1 Methods.....	4
1.2 Cash use in Norway and in other countries.....	6
1.3. Outline.....	7
2. Payments at point of sale and a cost analysis.....	8
2.1. Resources spent on handling payments: the 2007 cost survey.....	8
2.2. Cash is a payment instrument of diminishing importance	8
3. Cash and card use at point of sale in Norway	10
3.1. The relationship between GDP and banknotes and coins in circulation	10
3.2. The maximum value of cash used at point of sale	12
3.3. The minimum value of cash used in the society	16
3.4. The use of cards and cash calculated from our general public survey.....	19
Residents, non-residents and domestic statistics.....	21
2007 and 1993 compared	22
3.5. The use of cards and cash calculated from the merchant survey	24
3.6. Use of cards and cash based on information from other Norwegian surveys	25
The BBS data	25
The Internet banking survey by Sparebankforeningen	27
3.7. Logical results?	28
4. Stock of cash – relation to cash usage.....	30
Is cash an efficient payment instrument?.....	35
5. Comparing cash usage in the Nordic countries.....	38
5.1. Nordic studies.....	38
Norway	38
Sweden	38
Denmark.....	39
Finland.....	39
5.2. Comparing the studies.....	39
6. Conclusions	43
Acknowledgements	44
Definitions of some terms	47
Tables	48
Appendix	54
A 3.4.....	54
Altering survey data	54
Median value and average value	55
Residents, non-residents, and residents travelling	56
A 3.5.....	57

1. Introduction

Statistics for use at point of sale for some payment instruments (cards, cheques) is readily available. This is not the case for cash. We only have hard data on the stock of cash, not on payments made using cash. In this paper we use the available data and employ different methods to estimate the use of cash and other instruments at point of sale in Norway. We compare the results to estimates from other countries on a method-per-method basis.

Four empirical methods form the basis of the analysis in this memo. The four methods are supplemented with other information, completing the picture for Norway. Estimates of cash use have been made in other countries using one or two of these methods, but we are not aware of papers using all of them. This is thus a first attempt to use the methods in a combined analysis. .

The main result is that cash use is low in Norway, both compared to previous years and to other countries. Cash is used in 23 per cent of payments at point of sale, representing 14-38 per cent of the value.

1.1 Methods

First, we calculate the maximum value of cash use at point of sale in Norway, using a method developed by Humphrey et al (2004) and Snellman et al (2001). Estimating value of consumption at point of sale is done by subtracting elements in household consumption commonly paid for using Giros (bill payments). From this estimated value at point of sale, transactions made by card and cheques are subtracted, resulting in a residual value which is the maximum value of cash use at point of sale.

Second, we calculate the minimum value of cash use in the society. This estimation has not been done before, as far as we know. Statistics on cash deposits made at Norges Bank and at private depots owned by Cash in Transit – companies have become available as a result of the recent restructuring of cash handling in Norway. We argue that these cash deposits represent the minimum value of use of cash in the society. This value is larger than the minimum use of cash at point of sale, which we cannot calculate based on the available data.

Thirdly, the use of cash at point of sale by households is calculated, based on results from a survey performed by Norges Bank in 2007. Questions in the survey included how many payments were done over a period of a week, which instrument were used for making payments, which amount of cash the respondent held for payment purposes etc. Similar surveys have been done in a number of countries. Our inspiration came from surveys performed in the Netherlands (2002), Belgium (2003), Austria (2005), UK (1997-2007) and Norges Banks own survey from 1993.

Fourth, it can be argued that the size of the cash stock will depend on the use of cash for registered payment purposes. It will naturally also depend on savings, hoarding and unregistered payments. We estimate the share of the cash stock which is held for each purpose. The analysis covers the cash stock held in institutions and businesses and the cash stock held for making cash payments at point of sale. Using this approach, we show that only a fraction of the cash stock can be assigned to these purposes. The method was developed by Humphrey et al (2000) and repeated by Gresvik and Kaloudis (2001), Guiborg and Segendorf (2007), Carlsen and Rishøj (2006), and Paunonen and Jyrkönen (2002).

The results from the different methods are only partly comparable. "Use of cash" is a vague term. The methods give different results as they show different "use of cash" concepts: at point of sale, in society etc. Use of cash in the society is by definition a larger value than use of cash at point of sale. The maximum use of cash at point of sale is comparable to the use of cash by households (at point of sale). The minimum use of cash in the society includes more activities than the use of cash at point of sale. The cash stock calculation depends on an estimate for use of cash for payments, and it tells us that the use of cash at point of sale is not all the cash used in the society. It does not tell us how much cash is held for hoarding or savings. However, we use other information in this memo to help us understand some elements that the four methods leave unexplained. We find that all the methods and the additional information are telling essentially the same story: in 2007, cash use was low and falling in Norway (compared to previous years and to other countries). Cash is increasingly replaced by payment cards use at point of sale.

1.2 Cash use in Norway and in other countries

Norway has a relatively high estimated maximum share of cash use compared to its neighbours, but it has been falling lately. The most recent year with available data across four Nordic countries was 2000. For Sweden Guiborg and Segendorf (2007) calculated a cash share of 58 per cent for 2000, in Denmark Carlsen and Rishøj (2006) derived a share of 50 per cent for the same year. The euro cash changeover in Finland provided a unique data set on cash, and Paunonen and Jyrkönen (2002) calculated the cash share to be 54 per cent in 2000. At the same time the Norwegian cash share was 63 per cent of the value at point of sale. These calculations are done for a number of years in the four countries, and the Norwegian cash share is higher than the other countries in all but the last years. In 2007, cash was used for at most 38.3 per cent of the value at point of sale in Norway in 2007, or NOK 227.75 billion.

The estimated minimum use of cash for the Norwegian society was NOK 208.01 billions in 2007, that is: 35 per cent of consumption at point of sale, or 12.1 per cent of mainland GDP. Notice that this estimate covers a wider spectre of cash use than points of sale. We have found no calculations done for other countries or earlier years based on similar data.

Results from a survey performed by Norges Bank indicate that the use of cash by the general public is very low in Norway. Only 14 per cent of the value and 23 per cent of transactions were paid in cash at point of sale in 2007¹. Calculations from the Netherlands by Brits and Winder (2005) show cash use to be 55.6 per cent of value and 85.4 per cent of transactions at point of sale in the Netherlands in 2002. Banque Nationale Belgique (2005) estimate cash use to be 62.7 of value and 81.3 per cent of transactions at point of sale in Belgium in 2003. Stix and Wagner (2006) estimate use of cash to be 70.2 per cent of value and 86.1 per cent of transactions at point of sale in Austria in 2005. Even in the UK, use of cash seems to be higher than in Norway; APACS² estimated cash use to be used for 23 per cent of consumers spending in 2007³.

¹ Several surveys support this estimate, see chapter 3 for details.

² APACS is the UK trade association for payments and for those institutions that deliver payment services to customers. See also <http://www.apacs.org.uk>

³ Note that the APACS surveys “consumer spending” covers bill payments as well, and thus underestimate the use of cash at point of sale

The stock of cash is used for point of sale transactions, savings and other purposes. We compare the stock of cash to what we calculate to be the need for cash based on registered activities in the Norwegian society. We are only able to assign the use of 36-41 per cent of the cash stock to registered purposes. Similar calculations have been done in Sweden, Denmark and Finland. The three countries can all assign a comparable or larger part of the cash stock to registered purposes, which indicate that Norwegians possibly are eager cash hoarders or spend proportionally more cash on unregistered purposes than their Nordic neighbours.

1.3. Outline

Chapter 2 briefly presents our ongoing research project on the use of payment instruments in Norway. In Chapter 3, we go through different estimates of cash and card use at point of sale in Norway. In Chapter 4, we evaluate elements of the cash stock, explaining stock based on use at point of sale, and show how this is related to the calculations in chapter 3. Calculations for other Nordic countries reported in Chapter 5 indicate that developments in Norway are not unique. We sum up and conclude in Chapter 6, while the Appendix offers some more detail on the analysis.

2. Payments at point of sale and a cost analysis

Pricing of payment services have accelerated the pace of the shift from paper-based to electronic services in Norway (Bolt, W., D. Humphrey and R. Uittenbogaard (2008)). Availability of payment terminals and pricing of cash withdrawals are important factors in this process. Pricing of cheques and cards have probably had an important effect on the use of cash since 1980. This paper does not analyse the effects of pricing or the relation to payment services production costs. These matters will be discussed in a forthcoming paper from Norges Bank.

2.1. Resources spent on handling payments: the 2007 cost survey

Norges Bank is currently working on a broad analysis of costs in the payment system, based on three separate surveys:

- A survey on merchants' costs at point of sale⁴
- A survey on consumers' payment habits
- A survey on banks' costs related to payment operations

We use some data from the first two surveys in this paper for calculations of payment habits at point of sale. The conclusions will be used as a basis for the analysis in a second Staff Memo, which primarily will focus on costs. The cost analysis will cover information on the cost of producing payment services used by the public, including costs related to handling cash and producing card and giro services.

2.2. Cash is a payment instrument of diminishing importance

It is a common perception that using cash in most cases is more expensive and less efficient than using payment cards at point of sale. On the other hand, cash offers immediate settlement and anonymity when paying, features payment cards cannot offer. Handling payments by cash and cards (and using other instruments) is costly to payment service providers, customers and merchants. It is therefore useful to make an estimate of payment costs to the society. This

⁴ Point of sale is where merchants and consumers meet; where payer and payee make a trade which needs to be settled using a means of payment. The marketplace may be physical or virtual (including the Internet – at least transactions where the service or good is immediately delivered against payment).

requires knowledge of the number and value of transactions. These estimates are calculated in the present paper.

When the monetary exchange economy was established, cash was the primary means of payment⁵ for all kinds of transactions: person-to-person, person-to-business, and business-to-business. Cash has been used for settling debts, making immediate payments, for storing value etc. When the settling parties were unable to meet, cash had drawbacks as a means of settlement. It is bulky, there is a risk of theft and forgery and transportation can take a considerable amount of time.

The invention of other payment instruments made some transactions easier to conduct.

When making deposits, cash is converted into bank money – savings or transaction deposits. Deposits can be accessed by making a withdrawal, converting the deposit to cash, or deposits can be spent by giving the bank an instruction to transfer the money to another person. These instructions are made by using payment instruments like cheques, giros (credit transfers, direct debits) or by using payment cards⁶.

⁵ Cash is both a payment instrument and a means of payment.

⁶ There are a number of other payment instruments in use as well, but these are the most important ones in Norway.

3. Cash and card use at point of sale in Norway

The use of cash and cards at point of sale can be calculated using several data sources and different methods. In some of the calculations below, developments since 1980 are shown. Our main sources of data are domestic statistics from Norges Bank's *Annual Report on Payment Systems*, Statistics Norway (SSB⁷) and two surveys conducted by Norges Bank in 2007. In addition, we use some information from surveys conducted by BBS⁸ and Sparebankforeningen⁹.

Our main finding in Chapter 3 is that cash is no longer the dominant payment instrument at point of sale. Cards are now the most important payment instrument. However, the decline of cash usage is rather slow, as its unique qualities (anonymity, immediate settlement) make it hard to replace.

In Chapter 3, our analysis starts off with a wide scope, narrowing throughout the sections. In section 3.1., we show the development of the M0 (cash) to GDP ratio, a rough indication of the popularity of cash. In section 3.2., we show how to calculate an estimate of the maximum cash use at point of sale. In section 3.3., we make a rough estimate of the minimum cash use in society. In sections 3.4., 3.5., and 3.6., we look at estimates based on surveys – which should be the “correct” use of cash and other instruments at point of sale. In section 3.7., we show how the different analyses are interrelated, and try to sum up our best guess of what happens at point of sale.

3.1. The relationship between GDP and banknotes and coins in circulation

An indication of how popular cash is as a payment instrument is found by calculating the ratio of the value of cash in circulation to GDP¹⁰ (M0/GDP). In 2007, banknotes and coins in

⁷ SSB = Statistisk Sentralbyrå (Statistics Norway)

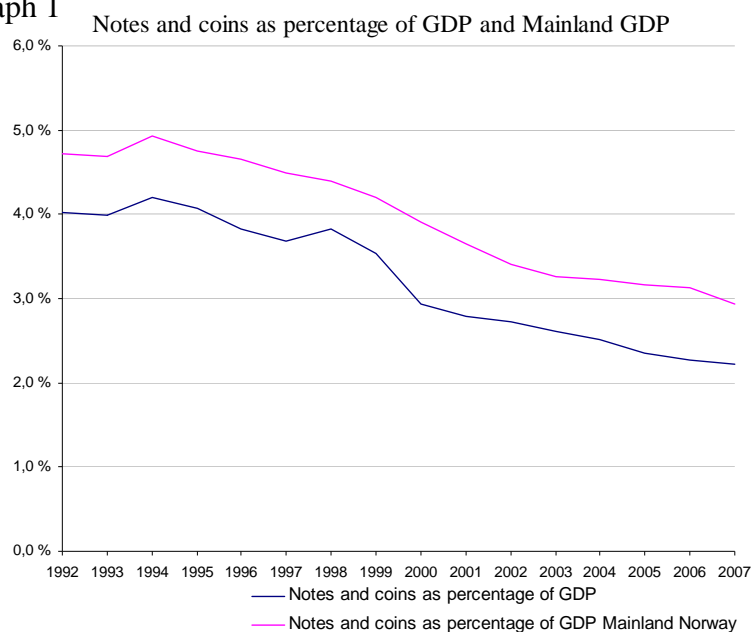
⁸ BBS (Banking and Business Solutions) is a supplier of electronic ID services as well as payment and information solutions to shops, restaurants etc.

⁹ Sparebankforeningen = The Norwegian Savings Banks Association

¹⁰ In Norway, GDP is quoted both as “GDP” and “mainland GDP”, where mainland Norway consists of all domestic production activity excluding exploration of crude oil and natural gas, service activities relating to oil and gas, transport via pipelines and ocean transport. The idea behind this is that the offshore activity is not

circulation accounted for 2.9 per cent of mainland GDP and 2.2 per cent of GDP (see graph 1), a steady fall from the level 15 years ago.

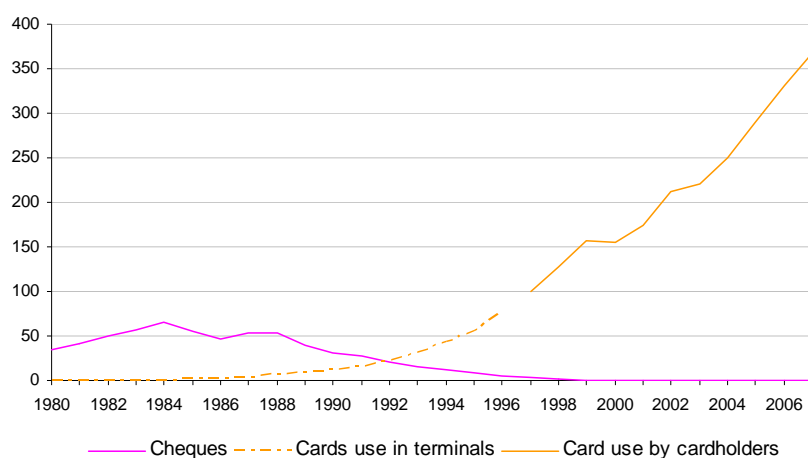
Graph 1



This is a low level compared with other countries, but is similar to the level in other Nordic countries (see Chapter 5). A low and falling level indicates that cash use in society is falling. Cash is replaced by other means of payment, namely transaction deposits and loans, which are most often accessed by payment instruments such as payment cards and giros (credit transfers and direct debits). Graph 2 show the rapid increase in cards use in Norway, and how cheques once was an important point of sale instrument. Statistics in graph 2 is readily available, and since Norwegians prefer debit cards to credit cards, most of the value spent by cards is drawn on deposits. The same was true for cheques, as the cheque otherwise would bounce.

strongly interrelated to the mainland economy. As a consequence, we make an assumption in this paper that use of cash in the offshore economy is negligible.

Graph 2 Use of payment instruments and stock of cash in Norway.
Value in NOK billions



Transaction deposits as a percentage of GDP is increasing, and in 2007 this ratio was 29.8 per cent (39.6 per cent of mainland GDP). See also Table 1.

3.2. The maximum value of cash used at point of sale

Humphrey et al (2000), (2004), estimated the use of cash in retail transactions subject to VAT by two different approaches which gave similar results¹¹. Gresvik and Kaloudis (2001) used one of the two approaches, based on revised data. Here, we use the same approach again, based on revised, updated and new data series¹². The limitation to the method is explained later in this section.

The maximum value of use of cash at point of sale in Norway in 2007 is by this method NOK 227.75 billion or 38.3 per cent of sales value at point of sale. Payments by cards at point of sale represent NOK 367.5 billion, or 61.7 per cent of sales value at point of sale. Use of cheques was negligible in 2007. We show developments since 1980, and in 1984 cheques represented 45.8 per cent of sales value at point of sale. Table 2 shows details.

¹¹ An econometric model and direct calculation of cash use based on statistics from national accounts.

¹² Our numeric results deviate somewhat from the prior analysis due to new information and revisions in the data series.

The maximum value of cash used at point of sale can be calculated as a residual, based on a framework using data from public sources. This estimation is then supplemented with more information later in the memo. The elements in the calculation are:

	Household consumption
-	Consumption paid by giro (bills)
=	<u>Value of consumption at point of sale</u>
-	Value of card payments at point of sale
-	Value of cheque payments at point of sale ¹³
=	<u>Maximum value of payments at point of sale using cash (the residual value)</u>

Household consumption is the sum of residents' and non-residents'¹⁴ consumption.

Consumption can be paid by giro (credit transfer and direct debits), cheque, payment card and cash. Giros are mostly used for large-value payments and for payments where buyer and seller do not meet, and also in some industries like healthcare etc. Consumption paid by giro must be separated in order to isolate the portion of household consumption called 'consumption at point of sale'. Consumption at point of sale is the part of household consumption that is paid for by payment cards, cheques or cash.

The following goods and services¹⁵ are normally paid for by giro (bills) as they typically are sold periodically, purchased from a company that does not have branches or outlets, or are regarded as expensive and require financing:

- House rent
- Motor vehicles for personal use¹⁶
- Insurance
- Electricity and heating
- Postal and telecom services
- Banking, finance and insurance services
- Costs connected with education (study fees etc.)

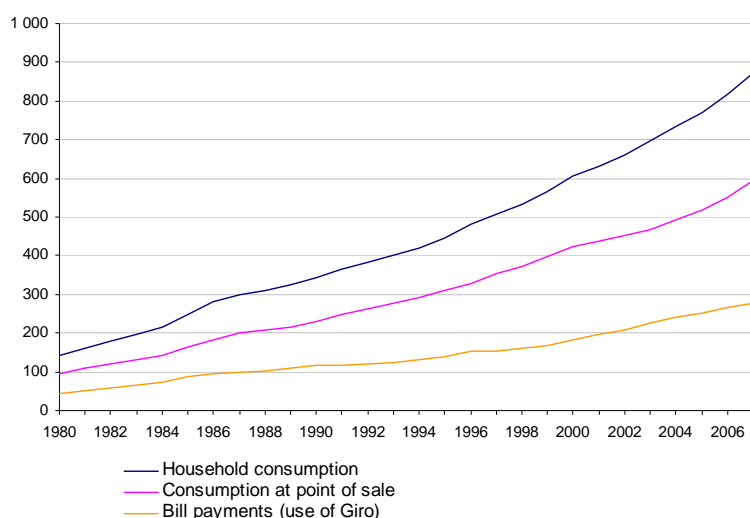
¹³ Note that value of cheques only includes cheques considered to be used at point of sale. Interbank payments, bill payments and business-to-business payments are excluded.

¹⁴ That is: people living in Norway and foreign visitors. Norwegians travelling abroad are not included.

¹⁵ Elements in "Consumption" as reported by SSB

¹⁶ Second-hand sales of cars etc. are not included.

Graph 3 Household consumption by consumption at point of sale and bill payments (use of Giro). NOK billion.



We consider the sum of these goods and services to be an estimate of bills (giro) payments / consumption paid by giro/bills.

From the value of consumption at point of sale, we can directly subtract the value of cards and cheques (see Table 2). Statistics for cards and cheques are of good quality and show use of these instruments at point of sale¹⁷. We assume that cards and cheques are not used for other payments in the society.

Note that we cannot eliminate “other means of payments” in this subtraction. It is very likely that part of the value in the residual (cash and other...) is paid using giros, e-money and possibly other means of transferring money from account to account. We have no statistics that are suitable for making any assumptions regarding the size of this. The residual from the calculation will be treated as a maximum value for what can be paid for by cash at point of sale.

The national accounts show that household consumption in Norway totalled NOK 872.4¹⁸ billion in 2007. Calculated value of consumption at point of sale was NOK 595.25 billion. The value of payments at point of sale using cash (and other means of payments) in 2007 was

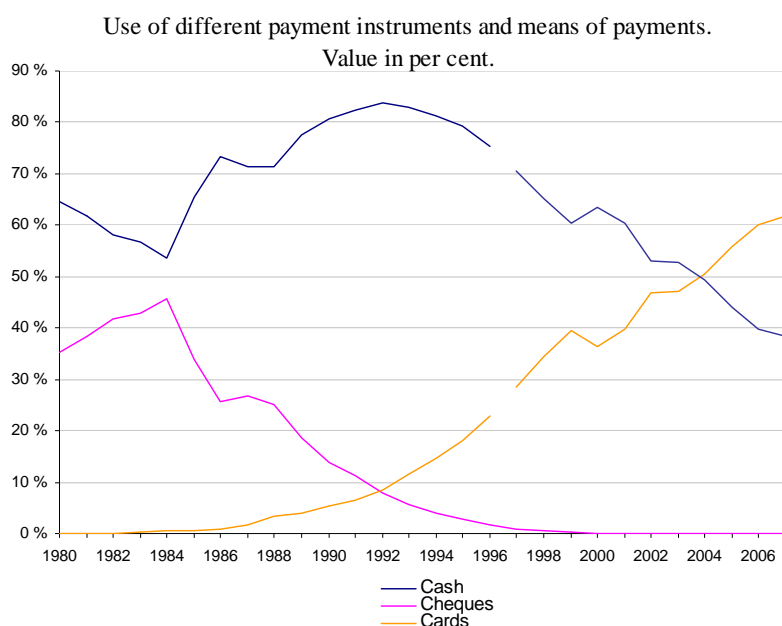
¹⁷ We have subtracted the relevant value of bill payments by cheque.

¹⁸ Household consumption including foreigners' consumption in Norway, excluding Norwegians' consumption abroad and other means of payments (e-money, and possibly giro payments as well)

NOK 227.75 billion or 38.3 per cent of value at point of sale¹⁹. This value of payments gives a cash turnover ratio of the cash stock (NOK 51.5 billion) of 4.42 times a year.

Cash usage fell until cheques peaked in 1984. Cash usage hit at a temporary low level of 53.7 per cent of value at point of sale. At that time banks charged use of cheques, and their popularity as an instrument fell (see also Bolt, W., D. Humphrey and R. Uittenbogaard (2008)). In the late 1980s and early 1990s, no instrument (payment cards) was ready to cover the ground lost by cheques, so cash usage increased until it peaked in 1992 at 83.7 per cent. Since then, cards have had increasing popularity, and in 2005 the maximum value of cash payments was less than the value of card payments in Norway. Statistics are shown in Table 2.

Graph 4



There are two major limitations to the calculations in this section.

- The value of household consumption is too low. There is an illegal / criminal / grey / unregistered economy not covered by national accounts. Unregistered sales of goods and services will often be paid in cash as settlement using cash is untraceable and the

¹⁹ This is based on data from domestic statistics on use of cheques and cards from Norges Bank's *Annual Report on Payment Systems*, supplemented by data on use of cheques provided by FNH (Norwegian Financial Services Association) and Sparebankforeningen

parties remain anonymous to each other. The underestimation of household consumption thus has a direct effect on our maximum value of cash calculation²⁰.

- Cash can be used at several stages in the value chain. Point of sale is the end of a value chain, where goods and services are finally consumed. However, goods and services can be paid for several times before being consumed – an apple is, for example, sold by the producer to the wholesaler, which sells it to the shop, which sells it to the consumer. In theory, cash can be used at every stage of the chain. If this is so, the value of cash used in the society will be larger than the value of cash used at point of sale. Our calculations only focus on point of sale, and it is thus possible that the use of cash in the society is larger than our estimate. That said; we do not believe the difference to be very large. Business-to-business transactions are normally settled using deposits through the giro system. This is reflected in the use of giros: Norges Bank's statistics show the value settled using the giro system to be NOK 10 428.8 billion, or more than six times mainland GDP. We do not believe that cash is an important instrument for B2B transactions.

3.3. The minimum value of cash used in the society

Banks in Norway deposit cash at Norges Bank and in several private cash depots. When a Norwegian krone is deposited, it has reached the end of one full circle of the circulation.²¹ It started as an issued note/coin from Norges Bank, was picked up by a bank, withdrawn by a customer, spent in a store, deposited by the store to a bank, and then deposited by the bank to a private cash depot or Norges Bank (see Illustration 1). Most likely, the krone has been used for payments at some stage, making “loops” in the bigger cash circle. One straightforward circulation without loops represents the minimum value²² cash can generate in a year in the society.

²⁰ To speculate a bit on this: If the grey economy is 10 per cent of mainland GDP (NOK 1714.6 billion * 0.1), the cash residual most likely will be close to that much larger amount, which would give a cash use at point of sale of 227.75+171.46 = NOK 399.21 billion.

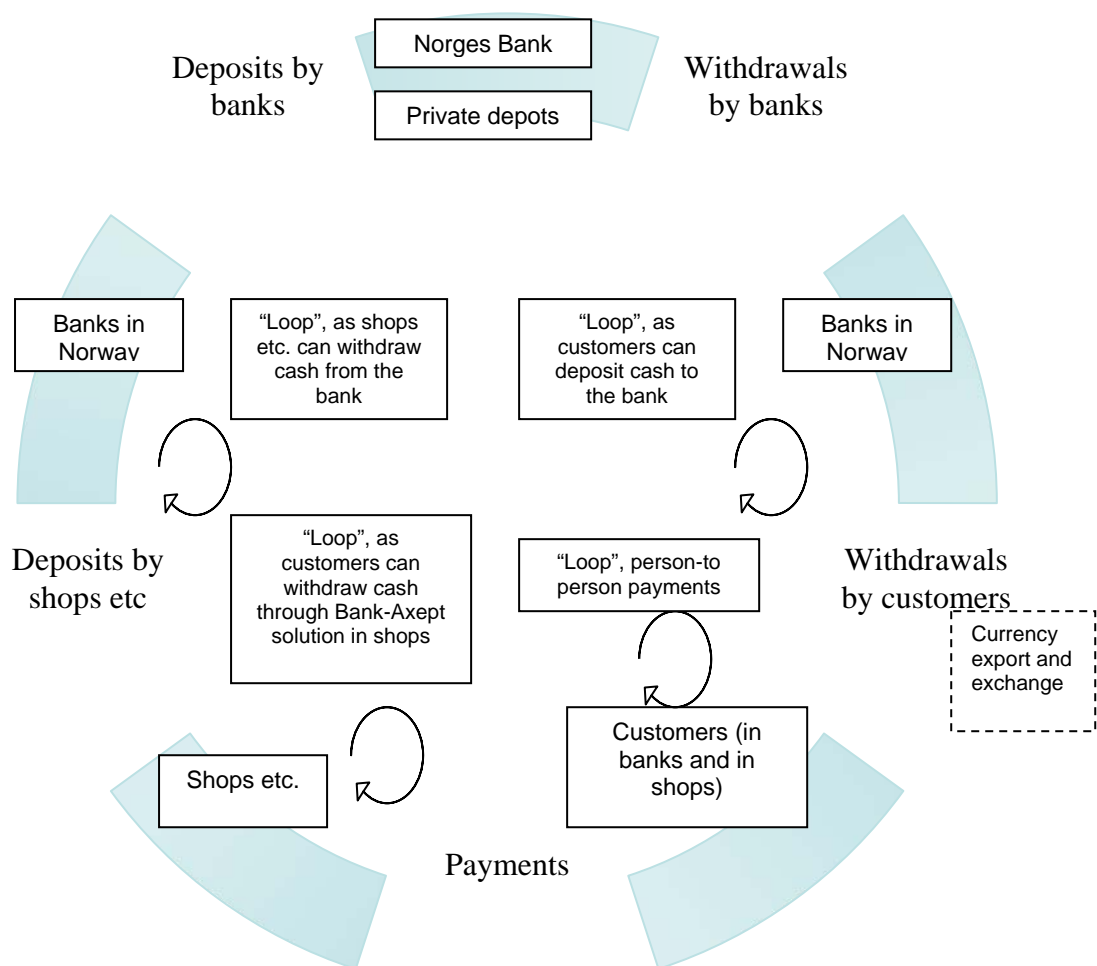
²¹ The circulation description is simplified.

²² This is based on the assumption that it is unlikely that a bank will return money to the central bank or a private cash depot before it has circulated at least once.

This is unfortunately not the minimum value of payments made by cash at point of sale, which would be what we would like to calculate. The difference between the minimum use in society and minimum use of cash at point of sale is probably a larger value than what is the case for the maximum use of cash (we assumed the difference to be marginal or close to zero in the maximum calculation). The maximum use of cash at point of sale and the minimum use of cash in the society do not represent a 1:1 comparison, but it is the best comparison we can make based on available statistics.

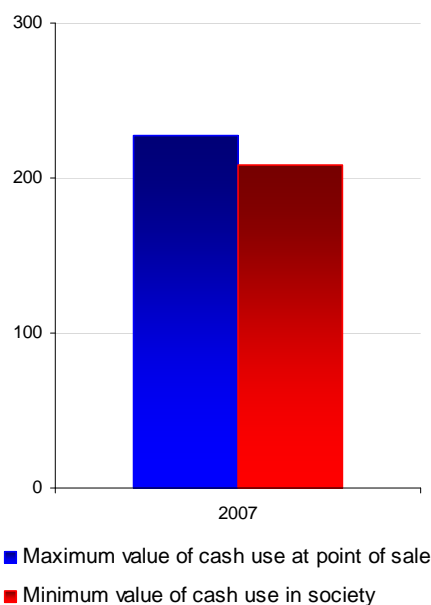
Illustration 1

Cash circle in Norway



In 2007, the registered value of deposits made to Norges Bank and private depots was NOK 208.01 billion, which is our estimate of the minimum value of cash used in the Norwegian society. The average stock of cash in 2007 was NOK 51.5 billion, which means that every krone in the stock of cash was spent a minimum of 4.04 times a year.

Graph 5 Cash: value
at point of sale and in society.
In billions of NOK.



Unfortunately, there are some problems with this calculation:

- Notes and coins are Norwegian currency, and can be exchanged in a bank into other currencies. This is a purely financial transaction, and does not tell anything about activities at point of sale. We have no statistics that show us the relation between currency exchange and deposits at Norges Bank / Nokas / Loomis²³.
- Cash is used both for legal and illegal payments. Illegal payments are normally not “point of sale” as our calculations are based on statistics from the legal economy. There are also legal payments that are not registered. Our calculated cash value is therefore less than the total payments in the society (point of sale-like), and the deposits shown above apply to the whole economy. It includes more than the minimum value of cash use at point of sale.
- The notes/coins can make “loops” between customers and stores at several points in the circle. The value generated by using cash can be considerably larger. When cash circulates in the loops within the circle, the value generated by notes and coins in circulation will be larger than the minimum value mentioned above. However, if a note goes straight through the circle without making loops, the minimum value it generated at point of sale can theoretically be read directly from the deposit statistics.

²³ Nokas and Loomis transport and sort cash on banks’ and merchants’ behalf.

The system for distributing cash has been thoroughly restructured in Norway in later years. Compared to the mid-1990s and earlier years, CIT operations (CIT = cash in transit) are now handled by CIT companies, and less often in bank branches²⁴. Due to this restructuring, there are no statistics available prior to 2007 which are directly comparable to the NOK 208.01 billion mentioned above. Before the restructuring, cash deposits were made by the banks to Norges Bank's branches and main office, and the banks themselves handled parts of the deposits.

When comparing the minimum value spent in cash in the society with the maximum value spent in cash at point of sale as calculated in Section 3.2, and plotting this in graph 5, we illustrate a range for cash spent at point of sale in Norway for 2007. This range is narrow, and the minimum value is quite high compared to the maximum value. As explained above, this is no surprise. In this graph, we compare a value for the whole society with a "part-of-the-society" value, and we know that the point-of-sale value is lower than the society value.

One reason for this narrow range might be that illegal activities generate quite a lot of cash usage, as described in Gresvik and Kaloudis (2001). This is not reflected in our maximum-value calculation in section 3.2. and our survey results in section 3.4. for the whole economy (legal, illegal, criminal and grey economy). It is difficult to make estimates for the illegal activities. This limits our analysis on this point.

3.4. The use of cards and cash calculated from our general public survey

Cards and cash use can be examined by mapping the general public's habits. In September 2007, Norges Bank²⁵ conducted a survey based on a representative selection of inhabitants in Norway over 15 years old. The survey included questions regarding their payment habits. The survey was of the omnibus type, i.e. respondents were asked every evening in a week to describe their payments the previous day – how many payments they made, with cash or card,

²⁴ See Eklund, Veggum and Solberg (2005) for further explanations.

²⁵ The survey was constructed and analysed by the authors of this memo, while NORSTAT, a market analysis agency made the phone interviews on our behalf.

what kind of card etc. 1201 persons answered all 9 questions, while 2608 answered all but one question. The sample was considered representative for the whole population²⁶.

The survey was inspired by a similar survey conducted by Norges Bank in 1993, and by surveys conducted in the Netherlands and Belgium as described in Banque Nationale de Belgique (2005) and Brits and Winder (2005).

The main results show that at point of sale in 2007, the value of use of cards and cash by residents + non-residents was NOK 379.3 billion and NOK 62.4 billion, or 86 per cent and 14 per cent based on the average value of respondents' payments (see Table 3). The survey estimates a total value at point of sale of NOK 441.7 billion. According to these figures, the cash stock of NOK 51.5 billion had a turnover of 1.21 in 2007.

The calculation of an estimate of the domestic level of number of transactions for Norway is as follows:

Number of transactions on the domestic level is multiplied by the average value of transactions²⁷, and:

Number of transactions on the domestic level =

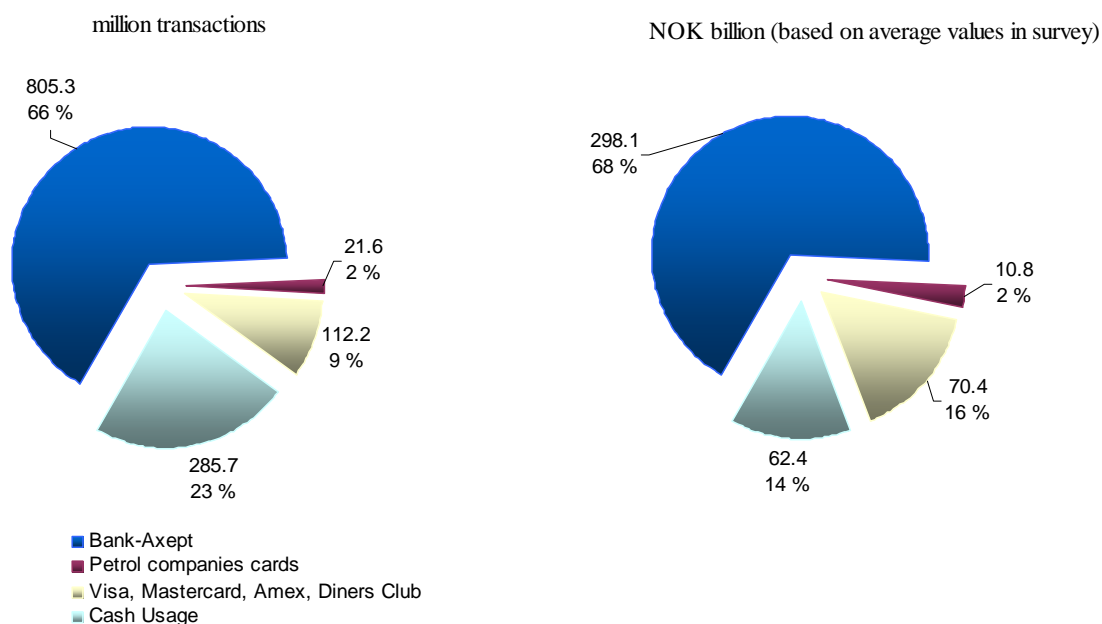
$$\frac{\text{Number of Payments in survey}}{\text{Number of respondents in the survey}} \times 365 \times \text{citizens in Norway older than 15 years}$$

²⁶ We did not ask how businesses spent their deposits and cash. The survey only focused on private individuals' use of cash and deposits.

²⁷ Average value in the 2007 survey, and estimated average value in the 1993 survey

Diagram 1

Payments by cash and cards at point of sale in Norway 2007



The number of transactions totals 1 224.8 million transactions (see Table 3). Cash accounts for 23 per cent of the transactions and relatively more low-value payments are made by cash than by cards.

The calculations indicate that cash a large stock of cash is necessary to uphold a rather low point of sale value (low turnover). On the other hand, for individuals, cash might be a very effective or possibly the only relevant payment instrument in certain situations, as discussed in section 3.6. The low turnover does not necessarily indicate inefficiency.

Residents, non-residents and domestic statistics

When using survey data, we found it necessary to make an adjustment in the data set to compensate for what we believe was confusion among respondents about which brand they normally use when making card payments. We believe respondents underestimate their use of Bank-Axcept. An explanation to the adjustment of data is shown in the Appendix.

In the survey, the data average value is dominated by a few high-value purchases. This gives a rather high average value. We therefore show calculations using the median value, which is less affected by the large-value transactions, to indicate what the common transaction values. The median cannot be calculated from the domestic data set.

Survey data are collected from residents only. The 1993 survey and the 2007 survey are thus directly comparable based on the respondents' universe. When calculating use of cards and cash at point of sale in Norway in 2007, statistics on non-residents' card (and cash) use is also included (as explained in the Appendix)²⁸.

2007 and 1993 compared

Norges Bank conducted a similar survey in 1993²⁹ on payment habits. Results are comparable with the 2007-survey, and changes have been remarkable.

Cash was the dominant means of payment at point of sale in Norway in 1993. It accounted for 84 per cent of transactions and 75 per cent of value at point of sale. Cheques were used in 3 per cent of the transactions and accounted for 5 per cent of the value. Cards were used for 13 per cent of the transactions; representing 20 per cent of the value at point of sale (see Table 5). The international brands were much more important in 1993 than in 2007, both in terms of the number of transactions and by value. Typically, payment cards carrying an international brand have been used for payments of larger value than domestic brands, which explains why cards accounted for a rather large portion of value in 1993, despite the low number of transactions.

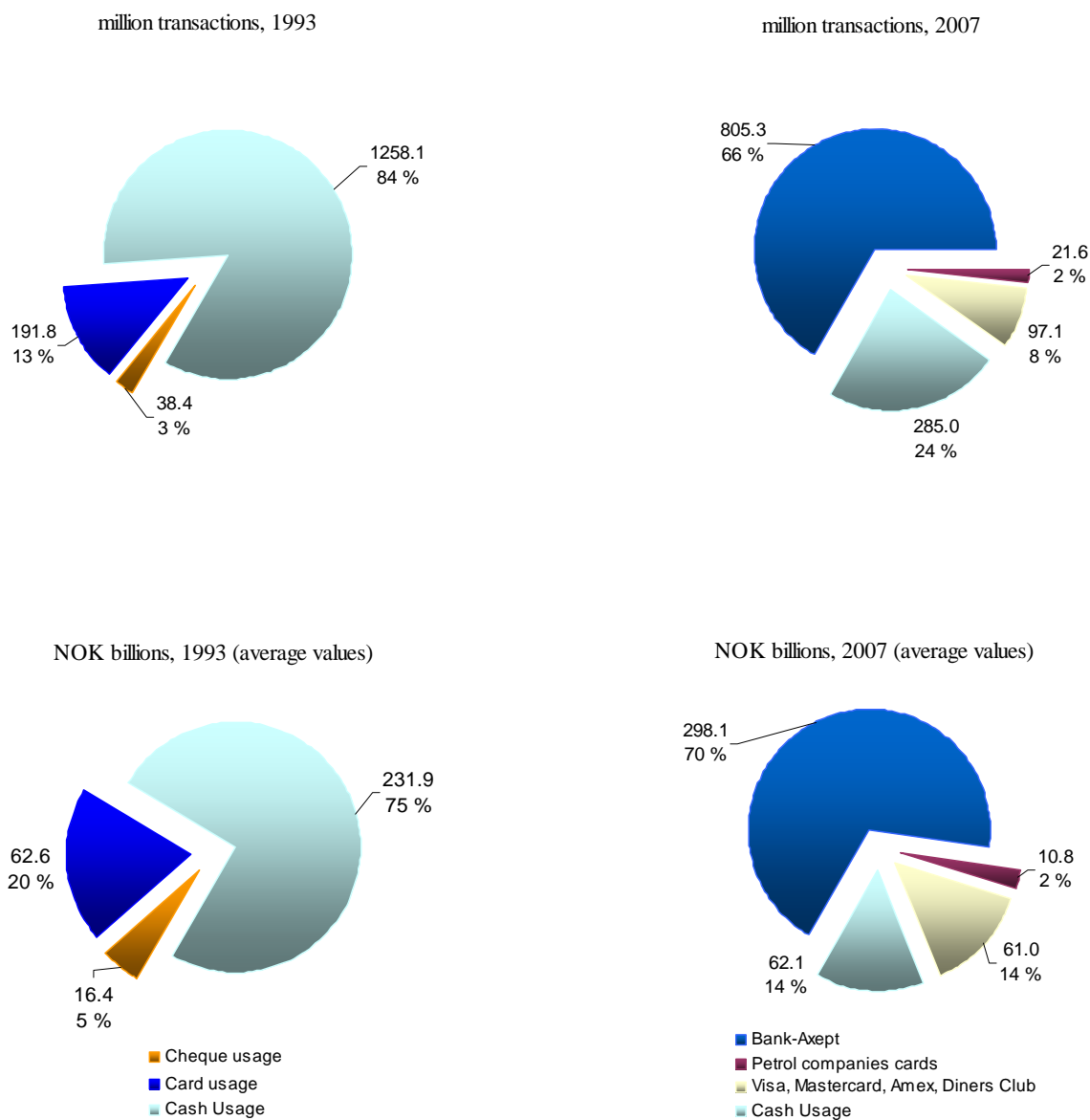
Calculations for 2007 (residents only) are shown in Table 4. Calculations for 1993 are shown in table 5. Diagram 2 show results from 1993 and 2007.

²⁸ Data on card use by residents abroad is not relevant for our calculations.

²⁹ Interviews by phone, giving 1400 answers, were performed by the market analysis firm Opinion on Norges Bank's behalf.

Diagram 2

Payments by cash and cards by residents at point of sale in Norway



The survey card data on card use match domestic statistics very well for 2007. This is elaborated in Appendix. The 1993 survey match is a bit harder to estimate, as domestic data was less detailed in 1993. However, the data from Norges Bank's *Annual Report on Payment Systems* indicate a rather good match on the 1993 survey as well.

3.5. The use of cards and cash calculated from the merchant survey

In 2007-2008, Norges Bank conducted a survey among merchants on costs of handling payments. One question focused on how many payments the business received in the course of one month, the value, and how payments were made; cash or card. These answers could have provided a good basis for estimating payments at point of sale.

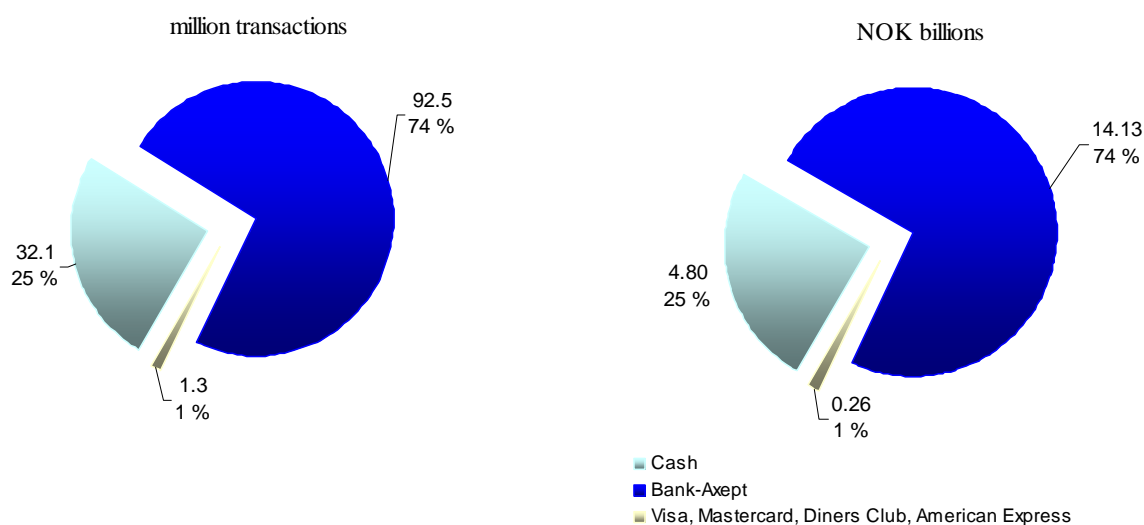
Unfortunately, the response rate to this survey was very low. We eventually received only 147 responses, covering 696 businesses (of 3000 letters sent). Responses to some of the 14 questions were of poor quality³⁰. A few questions were answered properly, though, and can be used as indications when combined with other information. The responses from merchants are skewed, weighted too heavily on grocery chain stores compared to businesses in Norway on the whole. This skewness leads us to believe that transaction data will be skewed towards small-value payments, and perhaps towards an overweight of Bank-Axcept payments compared to other card brands as some grocery chains do not accept all card brands. In addition, a Norwegians usually do not use credit cards or delayed debit cards when buying food.

The survey did not ask questions related to business' own use of cash and deposits. Table 9 reveals that merchants report that cards dominate over cash at point of sale. Our ex ante expectations based on the skewness of the material seem to be confirmed Payments are generally of rather low average value, and heavily weighted towards Bank-Axcept payments. Even if the response rate was low, the result should be taken into consideration when evaluating the survey in section 3.3. They indicate that the responses given in the survey described in section 3.3. are reasonably accurate.

³⁰ See the Appendix for a further description of the survey.

Diagram 3

Payments by cash and cards at point of sale in Norway 2007



3.6. Use of cards and cash based on information from other Norwegian surveys

BBS and Sparebankforeningen have conducted surveys that include questions on customers' and merchants' preferences for cash and card use in 2007. Our results find support in these surveys.

The BBS data

BBS has conducted two surveys, one covering their own customers' (merchants) contentment and one covering card holders' card usage.

All merchants in the first survey have a BBS card terminal which accepts Bank-Axcept cards. Such terminals can accept other brands as well (Visa, MasterCard etc). Many merchants accept several brands. A number of other companies besides BBS also offer terminals to merchants. The survey is not representative for the country as a whole as it only covers BBS' customers / merchants. We still believe it gives a good indication, as 900 merchants answered the computer-assisted telephone interview on customer contentment.

72 per cent of the merchants in the survey preferred their customers to use payment cards, an increase from 52 per cent in 1996. Merchants preferring cash has decreased from 19 per cent

to only 5 per cent. The indifferent merchants grew fewer, from 28 per cent to 20 per cent in the period.

80 per cent of the merchants preferred cards when the amount to be paid was low. 11 per cent of the merchants did not prefer their customers to pay by cards at all.

The sales value paid by cards at point of sale was 61 per cent in 2007, an increase from 50 per cent five years earlier. Businesses with a high or relatively high card share initially are gaining an even higher share and the businesses which initially had a high cash share continue to have a low card share. The highest card usage is found in the clothing business. Here 75 per cent of sales are paid by cards. The lowest share was found in restaurants, where only 42 per cent of the sales were paid by cards. In most businesses, the card share ranged from 60 to 70 per cent.

In the grocery business, 97 per cent of the shops offered cash-back through the national Bank-Axcept debit card system. In other businesses, the percentage of shops offering cash-back arrangements was in the interval 43 to 77 per cent. In these shops, cash-back arrangements have increased substantially. In the clothing business, for instance, these arrangements have increased from 42 per cent in 2005 to 55 per cent in 2007.

The second survey from BBS was a general survey on use of payment cards. 650 persons were interviewed by phone. Of these, nearly 600 had more than one card.

Cards were the preferred way of paying for 74 per cent, while 23 per cent preferred cash. Today, every fourth card holder uses his cards more than ten times a week.

The BBS survey reveals only small changes in the use of cash-back (through Bank-Axcept terminals) and ATMs. 74 per cent of card holders make use of the cash-back solution at least once a week³¹. 76 per cent of withdrawals by cash-back were less than NOK 600, while more than 60 per cent of the withdrawals from ATMs exceeded NOK 600.

³¹ It is perhaps somewhat surprising that it is the youngest age group, 15-29, that uses the ATMs most frequently. One should think that youngsters and young adults would prefer using cash-back at terminals. A reason for this might be that withdrawing cash from the ATM gives more control over their own economy. As expected, the average value of the withdrawal in this group is rather low.

The lowest amount the respondents felt comfortable paying by card was on average NOK 100 in 2007, a decline since 2000 (NOK 140). A third of those asked said they would not use their card for payments under NOK 50.

The Internet banking survey by Sparebankforeningen

Each year since 2000, the Norwegian Savings Banks Association has conducted a series of surveys primarily targeting the general public's attitudes to Internet banking. A minor part also deals with the use of cards and cash. About 1000 persons over 15 have been interviewed by phone every year³².

The use of cards in grocery stores has risen in the period 2005-2007. In 2007, 77 per cent³³ used cards in payment operations at least every second time. 8 per cent never use cards when paying for groceries. In 2005, 72 per cent used their cards at least every second time.

The survey shows that in 2007, 95 per cent of the population carried cash in their pockets on a daily basis. This indicates that cash is an important payment instrument to most people. This corresponds to the above mentioned share that never uses cards when paying for groceries.

The largest proportion of people paying solely by cash in grocery stores is found in the age group 60+ with rather low income and education levels, but even in this group the number of people using cards has shown a sharp rise lately. In 2008, 18 per cent of this group pay solely by cash, while 25 per cent used only cash three years ago.

People were asked how and how often they withdrew cash; in grocery stores (as cash-back), through ATMs or over the counter in a bank. In 2007, 53 per cent of the customers withdrew cash in shops at least once a week. In 2005, 57 per cent withdrew cash in shops at least once a week, and this trend actually continues in 2008 (48 per cent). ATMs have also become less popular in recent years. In 2005, 49 per cent used ATMs at least once a week. In 2007, 42 per cent made an ATM withdrawal at least once a week, and in 2008 the percentage making a weekly withdrawal had fallen to 38 per cent. Withdrawing cash over the counter in a bank

³² The market analysis company TNS Gallup conduct the survey on behalf of Sparebankforeningen.

³³ The percentage can be decomposed into: 42 per cent always use the card and 20 per cent "normally" use the card while 15per cent use the card ca. every second time they shop.

was least popular. In 2007, only 18 per cent went to the bank at least once a month, a slight decrease compared with 2005.

The percentage of people using cash-back in shops (Bank-Axcept) at least once a month has been rather stable in the period 2005 to 2008: about 75 per cent of the customers uses cash-back that often. The usage of ATMs, measured the same way, decreased in the years 2005 and 2007, while there has been a slight increase in 2008. In 2008, 78 per cent use the ATMs at least once a month.

3.7. Logical results?

A simultaneous look at all data reported give some confidence. The data sets are independent, but tell much the same story: the use of cash is low and it has fallen over time. At point of sale, cash is replaced by transaction deposits and loans accessed by payment cards.

The BBS survey indicated that 95 per cent of the population always carries cash for transaction purposes. The number of transactions at point of sale has been estimated to be 1 224.8 millions in 2007. 285.7 million payments were performed using cash as the payment instrument. As there were 3.7 million Norwegians older than 16 years in 2007, the average is 72 cash payments per person per year, or 1.48 per week (1 to 2 payments per week using cash). Our calculations in the next chapter show a cash replenishment frequency of 50.7 times a year per person, or slightly less than one withdrawal a week. There are approximately 128 000 businesses in Norway likely to be point of sale locations (see Appendix section 3.5.). Not all have payment terminals, domestic data show that there are 107 000 payment terminals³⁴ in Norway, but as some businesses can have several outlets, there are quite a number of outlets without terminals. Sales are settled using cash or some form of credit at these outlets. Since there are a couple of situations every week where an individual can expect to depend on cash to settle a transaction, it is rational to withdraw cash from time to time and hold a certain amount of cash at all times for transaction purposes. Most people withdraw cash once a week for their one or two weekly cash transactions.

³⁴ The actual number is somewhat higher, as there are 107 000 that can read Bank-Axcept cards and other cards, while there are terminals in operation that cannot read Bank-Axcept cards, but can read other cards (Visa etc). We do not have statistics for these terminals, but we know they are, among other places, used in parking houses, air/bus/train ticket automats, taxis and in some (tourist) shops. We do not believe that these terminals are so widespread that they alter the argument.

The general public surveys reveal that in 1993, 75 per cent of value was paid using cash. In 2007, the corresponding figure was 14 per cent. Using the calculation in section 3.2., the maximum value paid in cash at point of sale was 83.7 per cent in 1993 and 38.3 per cent in 2007, we observe that the trend is largely the same in the two surveys and in the maximum-value calculation. The maximum value is a few percentage points above the more likely survey-based value, as should be expected

The M0/GDP calculation, the maximum-value calculation and the surveys all tell the same story: fewer cash payments for a lower total value in Norway³⁵.

What might be a disturbing notion is that there seems to be quite a lot going on in the society that uses cash for unregistered purposes, some of it possibly illegal or criminal. The calculations in section 3.3 show us that the minimum cash value in society seems to be very high compared to calculations in sections 3.2 and 3.4. At the same time, calculations in Chapter 4 show us that only a part of the cash stock is held for registered transaction purposes. As Gresvik and Kaloudis (2001) discussed, the need for cash can be rather large in the grey / illegal economy. The anonymity offered when using notes and coins will always be attractive for some, so that it is no surprise that the demand for cash can be larger than what we can calculate using public statistics. At the same time, one should remember that a lot of unregistered activity is completely legal, and if cash use continues to fall, card use will cover some of the unregistered activity as well.

³⁵ Which also (luckily) confirms our subjective observations.

4. Stock of cash – relation to cash usage

It is useful to take a look at the size of the cash stock and at why residents hold cash. The stock of cash can be divided into two parts: cash stock explained by use of cash for registered purposes and cash stock not explained by registered purposes.

Calculations indicate that only a rather low percentage of the cash stock can be explained by facts related to public statistics. In 2007, only 36 per cent of the cash stock of NOK 51.5 billion could be explained by registered purposes, i.e. NOK 33.2 billion is held for purposes we cannot explain (see Table 10).

Gresvik and Kaloudis used two different calculations when trying to assign the stock of cash to different purposes. Additional information is now available from Norges Bank's survey from 2007³⁶, making a choice between the two methods possible. One of the questions in the survey was: *“Can you tell me what amount of cash you hold for payment transactions? (that is, money for everyday use – cash in the wallet or its like. The question is not about money stored for wealth or savings.)”* The responses averaged NOK 2 628. The median was NOK 400. The median value is by coincidence identical to what was considered a reasonable “contingency holding” in the first calculation by Gresvik and Kaloudis. The average value is very close to what was considered the upper boundary for household's cash reserve in Gresvik and Kaloudis' second calculation (NOK 3 000 which is the amount that may be held before it is subject to wealth tax, that is, an unreported cash holding). We find the second calculation to be most relevant, since the average value from the survey was relatively close to the original assumptions, and we make the calculations for the years 1980 – 2007 based on the survey value of NOK 2 628 as the household's cash reserve. However, it is interesting to illustrate the differences between the methods, so both are shown.

The total stock of cash in Norway averaged NOK 51.5 billion in 2007. The stock of cash has been increasing since 2003 and has never been higher in nominal terms. However, the reader should keep in mind the M0/GDP ratio, as described in section 3.1, which indicates diminishing importance of cash usage in the society. Only a part of total stock is used for transaction purposes. Based on data from Statistics Norway (SSB), we find that the stock of

³⁶ See section 3.4. for details.

cash held in the public sector, the financial sector and private sector companies totalled only NOK 10 billion in 2007.

Our challenge is thus to try to explain how the main part of the cash stock, NOK 41.5 billion of notes and coins in circulation, is used. The residual is comprised of three elements:

- Legal person-to-person payments (Person to person)
- Storing of wealth
- Tax evasion and criminal activity

Tax authorities supplied us with data on reported stock of cash (above NOK 3 000) in taxpayers' returns for the years 1996-1999. We assume that the reported share of cash stock for all previous years is the same as for 1996 and that the reported share of cash stock for the years 1999 to 2007 is the same as for 1998.

We assume that 0.7 per cent of the cash stock is held by foreigners (based on an estimate made by SSB).

Calculation 1 (contingency holdings, holdings for giro payments and holdings for household consumption)

The value of consumption paid in cash at point of sale (section 3.2.) is used as the basis for calculating the cash stock that is necessary to enable the public to pay for this consumption. To calculate this stock we must first calculate the public's cash replenishment frequency, i.e. how often on average individuals acquire cash (withdraw cash). Using statistics on the number of withdrawals over the counter (OTC), by ATM and "cash-back" (using the Bank-Axcept system in shop terminals), we find 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 72 in 2004 before falling to 51 in 2007³⁷. On average, every individual renewed his cash holdings once a week in 2007. We see that access to an increased number of withdrawal locations (ATMs and payment terminals) and pricing of withdrawals has changed

³⁷ The number of withdrawals from Bank-Axcept terminals is unfortunately burdened with some uncertainty for the years prior to 2005, which has possibly led to overstating the number of withdrawals. In addition, OTC withdrawals are estimates for 2006 and 2007. This can perhaps explain parts of the somewhat puzzling pattern which indicated that in 2006 and 2007 the number of withdrawals fell considerably.

the pattern of withdrawals. The frequency of cash replenishment has increased since 1980 while the amount of each withdrawal has decreased somewhat.

The value of cash stock adequate to cover household POS consumption is found by dividing the value of consumption paid in cash at point of sale derived in section 3.2. 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.

We assume that an individual had to carry NOK 400 (the median value) as idle cash in his/her wallet for precautionary reasons in 2007 (so as not to run out of cash). In 1992, cash-back was introduced. Prior to that, we assume the amount was somewhat higher, NOK 500 in 2007-terms³⁸. Thus, we multiply NOK 500, adjusted for inflation for the period 1980-1992, and NOK 400, adjusted for inflation for the period 1993-2007, by the number of inhabitants 15 years and older.

We assume that 0.7 per cent of the cash stock is held by foreigners (based on an estimate made by SSB).

Cash is also used to pay giro payments at the counter, although this is less common than it used to be. The cash holdings required to complete these giro transactions may be calculated on the basis of the payments throughout the year. By using the cash replenishment frequency in connection with giro payments in the same way that we calculated cash holdings for

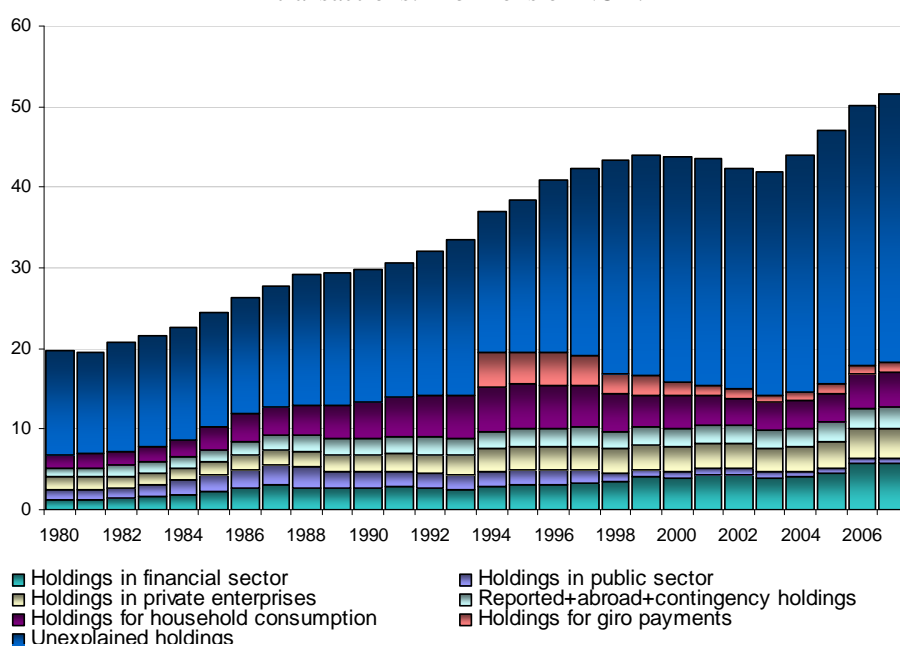
³⁸ We adjust these values for inflation (2007=100 in the index), so the amount was higher in nominal terms.

consumption, we determine the holdings that are adequate to pay the giros that are paid in cash at the counter. Unfortunately, there are no statistics for giros paid in cash before 1994 and we have not made an estimate for the previous years.

Adding the numbers in calculation 1, we find that they sum up to NOK 8.3 billion on top of the NOK 10 billion from SSB. This still leaves NOK 33.2 billion “unexplained”, or 64 per cent of the cash stock in 2007 (see Graph 6). This percentage has varied over the years, but not very much if we ignore the giro payments element: it has been within the interval of 50 to 67 per cent since 1980. If we include the giro payments element, it has increased since 1994, with a slight reduction the last two years.

Graph 6

Cash holdings by sector and for different types of transactions. In billions of NOK.

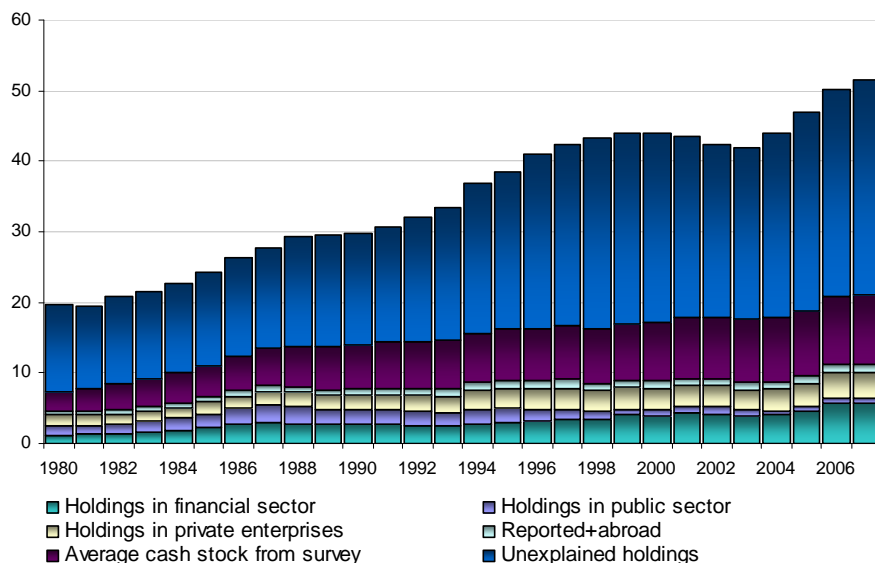


Calculation 2 (contingency holdings, holdings for household consumption and giro payments are replaced with a cash stock that is used for all three)

As explained above, the survey provided us with new information of what the stock held by households for payment purposes is in 2007, NOK 2 628. If we assume this to be sufficient holdings for all purposes, this greatly simplifies *calculation 1* above, as it replaces the three elements with one. NOK 2 628 multiplied by Norwegians older than 15 years and inflation adjusted give the result shown in Graph 7.

As the graph show, the explained part of the cash stock increases significantly to 41 per cent in 2007. The unexplained part of the cash stock is NOK 30.5 billion, or 59 per cent, according to this calculation.

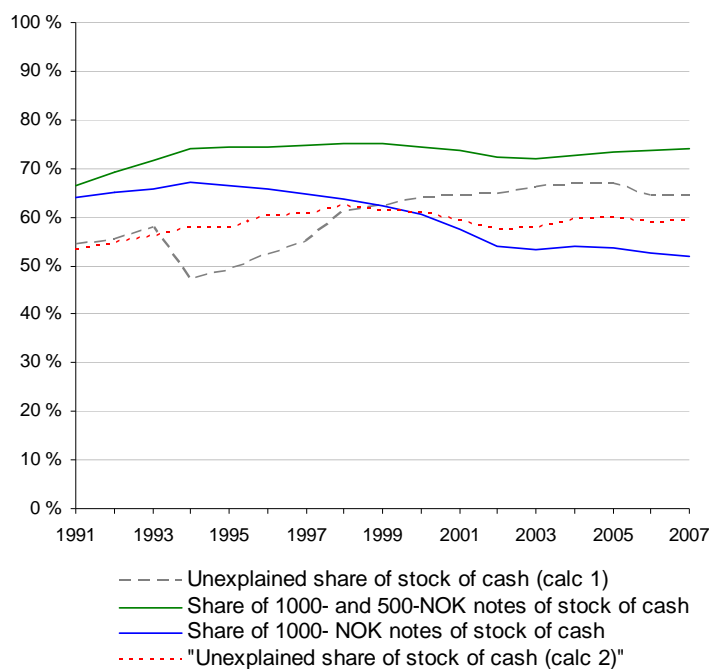
Graph 7 Cash holdings by sector and for different types of transactions. In billions of NOK.



Large value notes and their use

Anecdotal evidence suggests that large-value notes have been popular for storing value (savings) and for illegal transactions. If we plot the percentage of 1000-krone notes in the cash stock against the unexplained residual, we find that they are comparable (see Graph 8).

Graph 8 Unexplained share of cash stock in relation to share of large-value notes.



Over the years, the share of 1000-kroner notes in the cash stock has fallen, most significantly in 1999 and 2001, when a substantial number of 1000-kroner notes from series IV and V became invalid as part of Norges Bank's note issuance policy. As we can see, the unexplained element has increased, so although the level is in the same range, this is not the full explanation. Also, a line including the share of the sum of 1000-kroner and 500-kroner notes is added. These two "large-value notes" combined have a value that matches the unexplained element of the above calculation.

Is cash an efficient payment instrument?

In our calculations, we found the cash turnover ratio, i.e. how many times the cash stock had to be used for cash payments during a year according to our estimated values. We saw that the cash stock of NOK 51.5 billion was used 4.42 times a year (section 3.2.), 4.04 times a year (section 3.3.), or 1.21 times a year (section 3.4.).

According to our calculations, most people use cash once or twice a week, most people withdraw cash once a week, and the total number of cash transactions at point of sale is much

lower than the number of card transactions at point of sale. We found it hard to estimate total cash use in society, as point of sale activity is only part of cash use in society.

The alternative to cash payment is using deposits. Deposits can be used for payments at point of sale by using instruments like cards and cheques to access the deposits. Deposits can also be used when payer and payee do not meet, for example to pay bills. In Norway, most such payments are initiated through the giro system. However, it is also possible to transfer funds within a bank or to use other instruments like SWIFT instructions. Deposits are most often held as transaction deposits and in saving accounts. If we assume that transaction deposits are held for transaction purposes only (not saving, as interest on such accounts is normally very low), we have a “deposits stock”, comparable to the cash stock. Average annual transaction deposits in Norway in 2007 were NOK 678.8 billion.

Those deposits were mainly used for bill payments and point of sale payments. In 2007, these payments totalled NOK 10 428.8 billion in giro payments, NOK 367.5 billion in card payments, and NOK 12.9 billion to cover cheques, according to Norges Bank’s *Annual Report on Payment Systems*³⁹. The giro payments can be split into business giros and private giros. Business giros account for the bulk of the value, 8 767.6 billion⁴⁰.

If we assume that businesses do not use transaction deposits to pay their bills⁴¹, transaction deposits are used by private persons to make payments amounting to $(10\,428.8 + 367.5 - 8767.6 - 12.9) = \text{NOK } 2015.8$ billion. Assuming that transaction deposits amount to 678.8 billion, the deposit turnover ratio is then 2.96, which is quite comparable to the cash turnover ratios calculated in this memo.

Does this indicate that cash is an inefficient means of payment? Even if we ignore the alternative use of cash, i.e. wealth storage, so that the only reason for holding cash is to make payments, this calculation does not indicate that cash is inefficient. And since most people find no alternative to cash in quite a few transactions during a year, and many people find it

³⁹ Card payments are calculated as in Table 11 in the Appendix. Cheques were estimated to be 0 at point of sale, so we assume these cheque payments are all bill payments.

⁴⁰ Business giro by Internet (online) banking and business terminals. There may be more business giros, but our statistics do not provide details about this.

⁴¹ Clearly an extreme assumption, of course, for illustration purposes only. Businesses can draw on credit lines in banks.

practical to store wealth as cash, there seems to be a good case for keeping cash in circulation for many years to come.

A temporary conclusion would be: on the basis of turnover ratio, cash is probably not less efficient than deposits for payments at point of sale. On the contrary, cash provides the public with a practical instrument to settle transactions immediately, and it is a complementary instrument to payment cards. And in quite a few situations through the year, most people complete transactions where there is no alternative other than cash for settlement.

The above argument only considers part of the problem which should be discussed. Cash handling requires a complete infrastructure and building and maintaining such an infrastructure has costs. These costs may be compared to card and giro infrastructure costs, and which infrastructure is the cheapest, fastest and safest is not obvious to society. In the forthcoming Staff Memo on payment costs, we may have more information since cash and its alternatives will be in focus.

5. Comparing cash usage in the Nordic countries

5.1. Nordic studies

Studies on the usage of cash (and cards) have been carried out in the Nordic countries. Some statistical data from these studies are found in the Appendix. Below is a brief account of the most important findings.

Norway

Humphrey, Kaloudis and Øwre (2000) estimated the use of cash payments as a share of sales value at point of sale. A sharp decline in cash payments was found. The decline was explained by a rise in card usage. The cash usage at POS in the future was predicted to fall, although at a slower rate than in the past. The authors looked at the use of cash for unregistered activities and hoarding purposes and defined this as the total value of cash outstanding less the value of cash used by consumers, banks, stores and public authorities in legal activities at POS and bill payments through giros. A revision of the study based on data of better quality was made by Gresvik and Kaloudis in 2001. These studies form the basis for the calculations made here.

Sweden

Andersson and Guiborg (2001) studied at cash usage in the Swedish economy through 1991-1999. In 2007, Guiborg and Segendorf (2007) looked at “The Use of Cash and the Size of the Shadow Economy in Sweden”.

The Swedish studies are based on similar assumptions and use the method developed by Humphrey et al. Simplifications were made due to differences data accessible. To calculate the amount of cash needed for the general public the Swedish survey used the value of cash withdrawals from ATMs alone, while the Norwegian study also included other types of cash withdrawals. The replenishment rate is likely to be lower in the Swedish study. The calculation does not include cash use in person-to-person transactions.

Denmark

Carlsen and Riishøj (2006) applied a methodology roughly identical with the one used in Norway and Sweden. They also used an alternative method for estimating the value of cash payments. Cash payments were defined as: value of cash payments on a yearly basis = private consumption – direct debits (“Betalingsservice”) – the value of card payments + cash back – cheque payments – the value of giro and joint payment cards. (“fællesindbetalingskort”). Both methods show a clear decline in the use of cash, although the results of the two methods differ slightly. The authors give a possible explanation: the estimate for the retail payments by giro may be underestimated before 1999 and overestimated after 1999.

Finland

Paunonen and Jyrkönen (2002) studied the years from 1995 to 2000 in Finland and used the same methodology the other papers mentioned above.

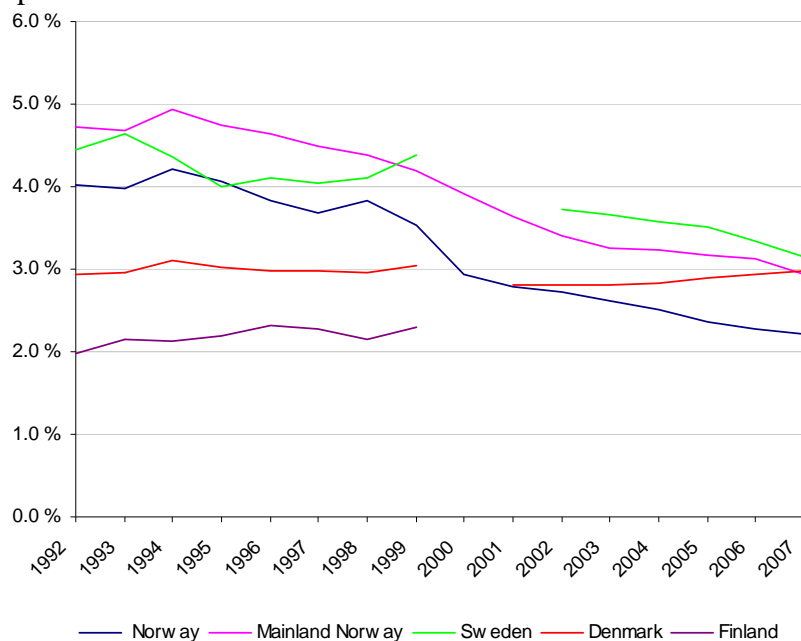
In the changeover to euro, new information on cash held for hoarding purposes, held abroad, lost, destroyed or collected was obtained. The value of the FIM in circulation before the changeover was about EUR 606 million higher than the value of cash in circulation at the end of April 2000. This might have been money used for hoarding etc. However, the authors comment on several factors that may affect the demand for cash, and the result must therefore be interpreted with caution.

5.2. Comparing the studies

The Norwegian M0/GDP ratio has fallen since 1992. The cash use was high in the early 1990ies probably due to the phasing out of cheques for point of sale purchases. In the early 1990s, Norwegian banks developed a common debit card system, Bank-Axcept, and cash was substituted by cards very rapidly. Developments in the other countries are more alike, but the M0/GDP ratios in Sweden, Denmark and Finland are rather different.

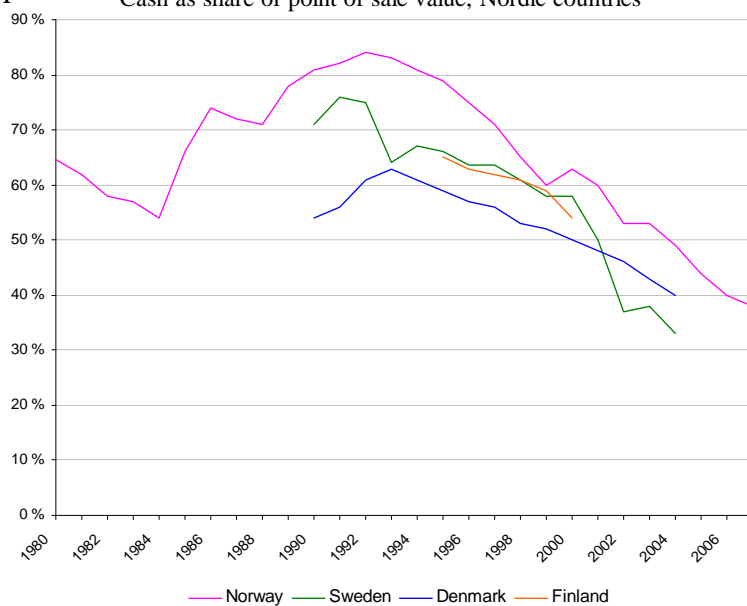
Graph 9 shows the relation between cash in circulation and GDP in the Nordic countries.

Graph 9 Notes and coins as percentage of GDP in the Nordic countries



The share of cash used at point of sale has decreased in all the Nordic countries in the last 15 years (Graph 10).

Graph 10 Cash as share of point of sale value, Nordic countries



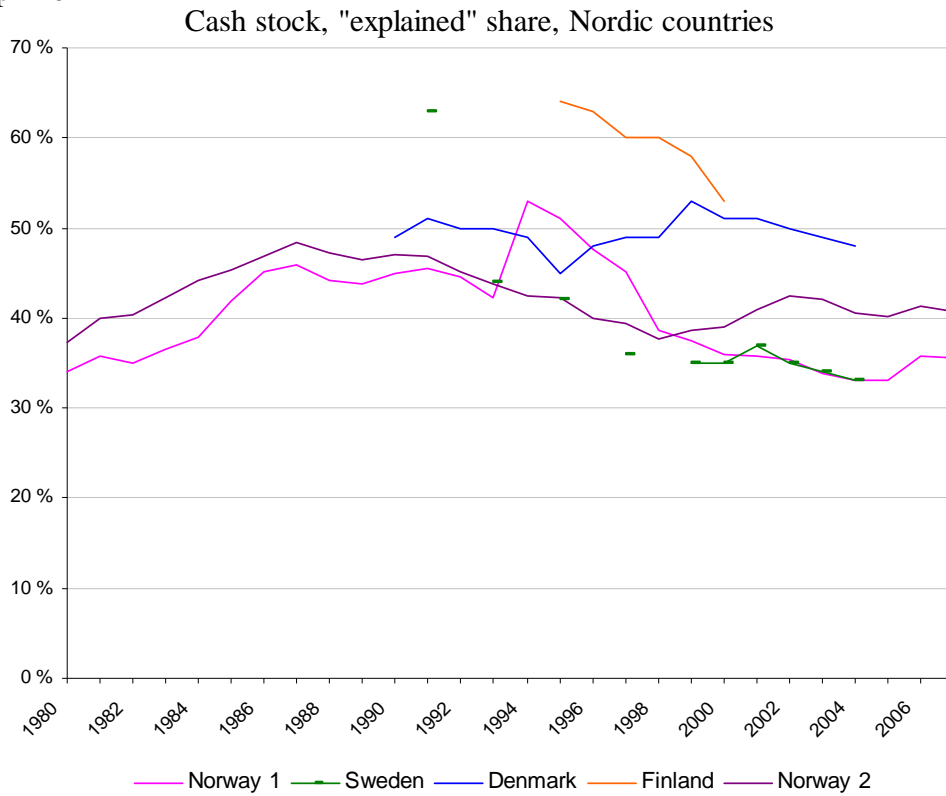
In the early 1990s, the share of cash payments at point of sale was more than 80 per cent in Norway compared with 54 per cent in Denmark (1991) (see Table 12). By the end of the 1990s, the share had fallen to 60 per cent in Norway, 58 per cent in Finland and Sweden and 52 per cent in Denmark. In 2004, the share in Denmark was 40 per cent. In this memo, we show that the share in Norway is about 38 per cent using the same methodology as in studies across the Nordic countries, while survey results indicate that 14 per cent might be a more correct estimate.

Bergman et al (2008) discuss the social costs of card and cash payments. They calculate these costs to be 0.4 per cent in Sweden. They conclude that cash payments tend to be more expensive than card payments, and that the results of their study indicate that cash-use should be reduced. The authors recommend a balanced use of withdrawal fees for cash and transaction fees on cards to obtain a more effective payment system in Sweden. The chart illustrates that implementing this type of strategy has an effect: the Norwegian banking industry has been using fees in ATMs and fees on card use for twenty years, combined with a user-friendly card system where all cards can be used in all ATMs and payment terminals all over the country.

The number of days between each cash replenishment by consumers has been declining in all countries over the years. In the early 1990s, the number of days was calculated to approximately 12 in Norway and Sweden and 8 in Denmark. In the late 1990s, the number of days was 5 in Norway and Denmark, 8 in Sweden and approximately 7 in Finland. Since then, the number of day has not changed much. The study conducted by The Norwegian Saving Banks Association shows that since 2005 customers have not replenished cash by means of cash back or in ATMs quite as often as they did some years ago. It seems clear that customers' demand for cash has fallen.

The share of the total cash in circulation which can be explained (see Table 13) has fallen in most Nordic countries, while in Denmark the share has been relatively stable since 1990. In Norway and Sweden, the unexplained share was the same in 2004. Finnish data show a falling trend for those few years during which the calculations were made.

Graph 10



6. Conclusions

Cash has largely been replaced by cards at point of sale in Norway. However, cash still plays a significant role.

The main findings in this paper are that payments at point of sale in Norway are likely to be approximately NOK 442 billion (section 3.4), and at most NOK 595 billion (section 3.2) in 2007. Payments at point of sale are mainly completed using cards or cash. The value paid by means of other instruments in use at point of sale is considered negligible. Cash is used at point of sale for 14-38 per cent of value, while the remaining 62- 86 per cent of value is paid using payment cards. The value per transaction is lower for cash than for cards, so in terms of the number of transactions, cash has a relatively bigger share. Our estimate is 23 per cent.

Calculations based on Norwegian statistics dating as far back as 1980 show that the ratio of the cash stock to GDP has fallen over the years (section 3.1.), and it has fallen considerably faster than in other Nordic countries (Chapter 5.). Also, the maximum value of cash use calculated in section 3.2. has diminished rapidly and faster than in other Nordic countries (Chapter 5.). In the early 1990s, cash was the dominant payment instrument at point of sale, even more so in Norway than in other countries. This was a result of the rapid disappearance of cheques due to pricing. The introduction of a common interface (Bank-Axcept) combined with the pricing strategy followed by the banks encouraged Norwegians to move towards electronic-based point of sale payments, where they accessed their transaction deposits by electronic means. Norwegians embraced payment cards faster than consumers in most other countries. This has led to a rapid displacement of cash and has resulted in low cash use compared to other countries.

However, there are elements that cannot be explained by the available statistical data. We know that the unregistered (grey) economy uses cash for its purposes, and calculations in section 3.2 and Chapter 4 show that considerable values are most likely spent at “unregistered points of sale”. Unfortunately, statistics are insufficient to allow us to be very detailed on this.

Cash is still a popular payment instrument, and the main part of the population still finds it convenient to use cash in many situations. Most people make payments by cash every week

(section 3.7). There is no reason to believe that cash as a means of payment will be terminated in the near future. It is likely, however, that the trend will continue – cash will be used less.

This paper describes different ways of calculating cash use and card use at point of sale. The different methods all point in the same direction: that cash is used for approximately every fourth transaction, for about a sixth of the value, and that most people pay by cash a couple of times per week and make cash withdrawals about once a week. Cash is used for both registered and unregistered (legal and illegal) purposes, while cards are used only in the registered economy. Most people and merchants find cards more efficient than cash in most situations.

Acknowledgements

We wish to thank Leif Veggum, Gunnvald Grønvik, Sigbjørn Atle Berg and Ragnhild Solberg at Norges Bank for helpful comments.

References

- Andersson, M. and G. Guiborg, “*Kontantanvändningen i den svenska ekonomien*” (Cash usage in the Swedish economy), Penning- och valutapolitik No. 4 2001, Sveriges Riksbank
- Banking and Business Solutions (BBS), *A survey on customer satisfaction* (data published in this memo with special permission from BBS), Oslo 2007
- Banking and Business Solutions (BBS), *A survey on behaviour and attitudes towards card usage* (data published in this memo with special permission from BBS), Oslo 2007
- Banque Nationale de Belgique, “*Costs, advantages and drawbacks of the various means of payment*”, 2005
- Bergman, M., G. Guiborg and B. Segendorff, “*Kort- och kontantbetalningar – ett samhällsekonomiskt perspektiv*” (Cards and cash in a social cost perspective), Penning och valutapolitik No. 2 2008, Sveriges Riksbank
- BIS, “*A glossary of terms used in payments and settlement systems*”, Basle March 2003
- Bolt, W., D. Humphrey and R. Uittenbogaard, “*Transaction Pricing and the Adoption of Electronic Payments: A Cross-Country Comparison*”, International Journal of Central Banking, Vol. 4, No. 1, March 2008
- Brits, H. and Carlo Winder, “*Payments are no free lunch*”, DNB Occasional Studies, Vol. 3 No. 2. 2005, De Nederlandsche Bank.
- Carlsen, M. and J. Dinesen Riishøj, “*Brug af kontanter i Danmark*” (Cash usage in Denmark) Working Paper Series No. 41 – 2006, Danmarks Nationalbank
- Eklund, T., L. Veggum and R. L. Solberg “*Norges Bank’s role in cash distribution*”, Economic Bulletin No. 4 2005, Norges Bank
- Gresvik, O. and A. Kaloudis “*Increased cash holdings – reduced use of cash: A Paradox?*”, Economic Bulletin No. 4 2001, Norges Bank
- Guibourg, G. and B. Segendorff, “*The use of Cash and the Size of the Shadow Economy in Sweden*”, Working Paper series No. 204 2007, Sveriges Riksbank
- Humphrey, D., A. Kaloudis and G. Øwre, “*Forecasting Cash Use in Legal and Illegal Activities*”, Working Paper series No 14 2000, Norges Bank
- Humphrey, D., A. Kaloudis and G. Øwre, “*The future of cash: falling legal use and implications for government policy*”, Journal of International Financial Markets, Institutions and Money 14 (3): 221-233, 2004
- Koivuniemi, E. and Kari Kemppainen, “*On Costs of Payment Methods: A survey of Recent Studies*”, Working paper No. 6/2007, Suomen Pankki.

DRAFT: not to be distributed without permission by the authors

Paunonen, H. and H. Jyrkönen, “*Cash usage in Finland – How much can be explained?*”, Discussion Paper No 10 2002, Suomen Pankki

Snellman, J., J. Vesala and D. Humphrey, “*Substitution of Noncash Payment Instruments for Cash in Europe*”, Discussion papers No 1 2000, Suomen Pankki

Snellman, J., J. Vesala and D. Humphrey, “*Substitution of Noncash Payment Instruments for Cash in Europe*”, Journal of Financial Services Research 19 (2001), 131-145.

Sparebankforeningen (The Norwegian Savings Banks Association), *A survey on internet banking, Oslo 2008* (data published in this memo with special permission from Sparebankforeningen)

Stix, H. and K. Wagner, “How are payments made in Austria?” Monetary policy and the economy Q2 / 06, Oesterreichische Nationalbank

Definitions⁴² of some terms

Automated teller machine (ATM):

This is an electromechanical device that permits authorised users, typically using machine-readable plastic cards, to withdraw cash from their accounts and/or access other services, such as balance inquiries, transfer of funds or acceptance of deposits. ATMs may be operated either online with real-time access to an authorisation database or offline. (BIS)

Credit card:

A card indicating that the holder has been granted a line of credit. It enables the holder to make purchases and/or withdraw cash up to a prearranged ceiling. The credit granted can be settled in full by the end of a specified period or can be settled in part, with the balance taken as extended credit. Interest is charged on the amount of any extended credit and the holder is sometimes charged an annual fee. (BIS)

Debit card:

A card enabling the holder to have his purchases directly charged to funds on his account at a deposit-taking institution (may sometimes be combined with another function, e.g. that of a cash card or cheque guarantee card). (BIS)

Means of payment:

Cash, deposits and credit

Payment:

The payer's transfer of a monetary claim on a party acceptable to the payee. Typically, claims take the form of banknotes or deposit balances held at a financial institution or at a central bank. (BIS)

Payment instrument:

Any instrument enabling the holder/user to transfer funds/payment means. (BIS)

Point of sale:

Where payments are made with cash, cards or other means

⁴² Most of the definitions are from the BIS Glossary on payments and settlements.

Tables

Table 1

Year	Notes and coins*	Transaction deposits	GDP Norway	Mainland GDP	Notes and coin as percentage of GDP		Transaction deposits as percentage of GDP	
	NOK bn				Norway	Mainland	Norway	Mainland
					Norway	Norway	Norway	Norway
1992	32.0	154.7	797.3	679.5	4.0 %	4.7 %	19.4 %	22.8 %
1993	33.4	149.6	838.3	712.3	4.0 %	4.7 %	17.8 %	21.0 %
1994	37.0	163.5	878.8	749.6	4.2 %	4.9 %	18.6 %	21.8 %
1995	38.4	175.8	943.4	806.9	4.1 %	4.8 %	18.6 %	21.8 %
1996	39.6	191.5	1033.0	851.6	3.8 %	4.6 %	18.5 %	22.5 %
1997	41.2	214.4	1119.2	919.0	3.7 %	4.5 %	19.2 %	23.3 %
1998	43.6	234.4	1140.4	992.6	3.8 %	4.4 %	20.6 %	23.6 %
1999	43.8	275.9	1240.4	1045.3	3.5 %	4.2 %	22.2 %	26.4 %
2000	43.6	322.3	1481.2	1113.9	2.9 %	3.9 %	21.8 %	28.9 %
2001	42.9	331.3	1536.9	1179.6	2.8 %	3.6 %	21.6 %	28.1 %
2002	41.8	351.9	1532.3	1224.6	2.7 %	3.4 %	23.0 %	28.7 %
2003	41.6	371.1	1593.8	1274.8	2.6 %	3.3 %	23.3 %	29.1 %
2004	43.7	406.6	1743.0	1355.3	2.5 %	3.2 %	23.3 %	30.0 %
2005	45.9	465.8	1945.7	1451.1	2.4 %	3.2 %	23.9 %	32.1 %
2006	49.2	568.4	2161.7	1575.8	2.3 %	3.1 %	26.3 %	36.1 %
2007	50.4	678.8	2276.8	1714.6	2.2 %	2.9 %	29.8 %	39.6 %

* Annual average based on monthly observations. Notes and Coins total, issued by Norges Bank

Table 2

Year	Household consumption*	Consumption at point of sale**	Bill payments	Value of payments at point of sale using:			Value of payments at point of sale, as a percentage, using:		
	NOK bn			Payment cards***	Cheque****	Cash (and others)	Payment cards	Cheque	Cash (and others)
				NOK bn	NOK bn	NOK bn			
1980	140.74	96.68	44.06	0.00	34.14	62.54	0.0 %	35.3 %	64.7 %
1981	159.73	108.94	50.79	0.00	41.67	67.27	0.0 %	38.2 %	61.8 %
1982	178.63	119.32	59.31	0.16	49.81	69.35	0.1 %	41.7 %	58.1 %
1983	197.00	130.65	66.36	0.35	56.17	74.13	0.3 %	43.0 %	56.7 %
1984	215.41	142.87	72.54	0.65	65.44	76.78	0.5 %	45.8 %	53.7 %
1985	249.67	163.57	86.09	0.88	55.55	107.14	0.5 %	34.0 %	65.5 %
1986	280.23	183.90	96.33	1.57	47.25	135.08	0.9 %	25.7 %	73.5 %
1987	299.85	200.85	99.00	3.13	54.09	143.64	1.6 %	26.9 %	71.5 %
1988	311.60	209.59	102.01	7.36	52.77	149.46	3.5 %	25.2 %	71.3 %
1989	324.29	216.43	107.86	8.45	40.29	167.70	3.9 %	18.6 %	77.5 %
1990	343.19	228.19	115.00	12.17	31.74	184.28	5.3 %	13.9 %	80.8 %
1991	365.87	249.33	116.54	16.10	28.01	205.22	6.5 %	11.2 %	82.3 %
1992	382.62	263.86	118.77	22.40	20.65	220.80	8.5 %	7.8 %	83.7 %
1993	402.42	277.02	125.40	31.70	15.63	229.70	11.4 %	5.6 %	82.9 %
1994	420.75	290.86	129.89	43.00	11.21	236.64	14.8 %	3.9 %	81.4 %
1995	446.60	309.36	137.24	55.90	8.31	245.15	18.1 %	2.7 %	79.2 %
1996	480.86	329.16	151.70	75.40	5.42	248.35	22.9 %	1.6 %	75.4 %
1997	507.40	352.64	154.76	100.20	3.27	249.17	28.4 %	0.9 %	70.7 %
1998	533.56	373.13	160.42	128.20	1.77	243.16	34.4 %	0.5 %	65.2 %
1999	564.79	396.76	168.03	157.00	0.76	239.00	39.6 %	0.2 %	60.2 %
2000	605.12	422.79	182.33	154.40	0.20	268.18	36.5 %	0.0 %	63.4 %
2001	632.19	436.46	195.73	173.30	0.07	263.09	39.7 %	0.0 %	60.3 %
2002	660.11	451.29	208.82	211.70	0.02	239.57	46.9 %	0.0 %	53.1 %
2003	695.57	468.90	226.67	221.20	0.01	247.69	47.2 %	0.0 %	52.8 %
2004	734.08	492.70	241.38	249.50	0.00	243.20	50.6 %	0.0 %	49.4 %
2005	768.61	518.07	250.54	289.70	0.00	228.37	55.9 %	0.0 %	44.1 %
2006	816.46	551.22	265.23	331.60	0.00	219.62	60.2 %	0.0 %	39.8 %
2007	872.40	595.25	277.15	367.50	0.00	227.75	61.7 %	0.0 %	38.3 %

* Source: SSB. Includes foreigners' consumption in Norway, excludes Norwegians consumption abroad

** Consumption less house rent, electricity and heating, purchase of motor vehicles, postal and telecommunication services, education expenses, insurance, financial and judicial services

*** Total use of payment cards held by Norwegians and foreigners visiting Norway. Numbers in Italics are based on use of EFTPOS terminals, and also estimated based on number of terminals for the years 1980-1990. Source: Norges Bank

**** Use of personal cheques only. Business cheques are excluded since they often were used to pay bills and interbank payments. Source: Norges Bank, FNH, Sparebankforeningen

Table 3

2007	Transactions						Value				
	Norway, total (calculated)		Domestic data	Survey data (adjusted)*			Norway, total (calculated)		Domestic data	Survey data (adjusted), using average values*	
	million transactions	per cent	million transactions	million transactions	per cent	NOK bn	per cent	NOK bn	NOK bn	per cent	
<i>Base: Residents + non-residents</i>											
Bank-Axcept	805.3	66 %	805.3	756.7	67 %	298.1	68 %	298.1	336.4	71 %	
Petrol companies cards	21.6	2 %	21.6	16.1	1 %	10.8	2 %	10.8	6.9	1 %	
Visa, Mastercard, Amex, Diners Club	112.2	9 %	112.2	87.7	8 %	70.4	16 %	70.4	63.5	13 %	
Card usage, total	939.1	77 %	939.1	860.5	77 %	379.3	86 %	379.3	406.9	86 %	
Cash usage	285.7	23 %		261.8	23 %	62.4	14 %		66.9	14 %	
Point of sale, total	1224.8	100 %		1122.3	100 %	441.7	100 %		473.7	100 %	

*Note that number of transactions and values for Visa, Mastercard, American Express and Diners Club have been proportionally increased for survey data to reflect the same relationship as for the domestic data set.

Table 4

2007	Transactions						Value				
	Norway, total (calculated)		Domestic data	Survey data (adjusted)			Norway, total (calculated)		Domestic data	Survey data (adjusted), using average values	
	million transactions	per cent	million transactions	million transactions	per cent	NOK bn	per cent	NOK bn	NOK bn	per cent	
<i>Base: Residents</i>											
Bank-Axcept	805.3	67 %	805.3	756.7	68 %	298.1	69 %	298.1	336.4	72 %	
Petrol companies cards	21.6	2 %	21.6	16.1	1 %	10.8	2 %	10.8	6.9	1 %	
Visa, Mastercard, Amex, Diners Club	97.1	8 %	97.1	75.9	7 %	61.0	14 %	61.0	55.1	12 %	
Card usage, total	924.0	76 %	924.0	848.7	76 %	370.0	86 %	370.0	398.4	86 %	
Cash usage	285.0	24 %		261.8	24 %	62.1	14 %		66.9	14 %	
Point of sale, total	1209.0	100 %		1110.5	100 %	432.1	100 %		465.3	100 %	

Note: the observant reader notices that total card use is NOK 370 bn, while in section 3.2 this is said to be only 367.5. The reason for this is that here, petrol cards are included while "other" cards are excluded, while the opposite is the case in section 3.2.

Table 5

1993	Transactions			Value	
	Survey data			Survey data, based on average values	
	million transactions	per cent		NOK bn	per cent
<i>Base: Norwegians in Norway</i>					
All payments, POS and giro	1837.2			474.7	
Giro usage	348.9			163.8	
Cheque usage	38.4	3 %		16.4	5 %
Card usage	191.8	13 %		62.6	20 %
Cash usage	1258.1	85 %		231.9	75 %
Point of sale, total	1488.3	100 %		310.9	100 %

Table 6

Q: How did you pay?

Survey data	Adjusted data			Original data	
	Number of transactions*	per cent		Number of transactions	per cent
	Norwegian domestic debit card solution (BankAxcept)	1457	66.0 %		791
Cards issued by petrol companies (without international card)	31	1.4 %		31	1.4 %
American Express	2	0.1 %		2	0.1 %
Diners Club	10	0.5 %		10	0.5 %
Mastercard / Eurocard	32	1.5 %		32	1.5 %
Visa / Visa Elektron	102	4.6 %		767	34.8 %
Payment cards issued by international card companies	146	6.6 %		811	36.8 %
Other credit cards (Cresco and others)	2	0.1 %		2	0.1 %
Other types of cards	9	0.4 %		7	0.3 %
Cash	504	22.8 %		504	22.8 %
Other instruments**	57	2.6 %		60	2.7 %
Sum	2 206	100.0 %		2 206	100.0 %

*We believe that the respondents confuse the brands Bank-Axcept and Visa, so we alter the answers from the survey to reflect the allocation between the two brands reported in Norges Bank's report on payment systems 2007.

**"Other instruments" consisted of 57 payments using Giro.

Table 7

	Average value		Median value
	Domestic data	Survey data	Survey data
Norwegian domestic debit card solution (BankAxept)	370.19	444.60	300.00
Cards issued by petrol companies (without international card)	500.00	430.50	450.00
American Express	1075.54	475.00	475.00
Diners Club	1382.63	226.00	205.00
Mastercard / Eurocard	846.52	619.30	349.00
Visa / Visa Elektron	452.37	737.30	300.00
Payment cards issued by international card companies	628.97	725.73	300.00
Other credit cards (Cresco and others)	1175.65	156.50	156.50

Table 8

2007	Transactions		Value	
	Survey data	Domestic data	Survey data*	Domestic data
	million transactions	million transactions	NOK bn	NOK bn
<i>Base: Norwegians in Norway</i>				
Use of Bank-Axept	756.7	805.3	336.4	298
Petrol cards	16.1	21.6	6.9	11
Payment cards carrying an international brand	75.9	97.1	55.1	61
American Express	1.0	2.7	0.5	3
Diners Club	5.2	4.2	1.2	6
Mastercard / Eurocard	16.6	29.3	10.3	25
Visa / Visa Elektron	53.0	60.9	39.1	28
Other cards	1.0	6.9	0.2	8

* The average value of all international branded payment card transactions is NOK 725. Visa transactions dominate. When making the adjustment in section 3.3., the number of Visa-transactions is reduced. In this table, adjusted transaction numbers are used, reducing the Visa value (increasing Bank-Axept value), which gives a higher sum for payment cards carrying an international brand than the sum of the individual international card brands.

Table 9

<i>Based on one month in 696 businesses</i>	Transactions		Value	
	millions	per cent	NOK bn	per cent
Cash	32.1	25 %	4.80	25 %
Bank-Axept	92.5	73 %	14.13	74 %
Visa, Mastercard, Diners Club, American Express	1.3	1 %	0.26	1 %
Total	125.9	100 %	19.19	100 %

Table 10

Year	Notes and coins*		Holdings in financial sector		Holdings in private enterprises		Calculation 1		Calculation 1		Calculation 2		Calculation 2		Share of 1000-NOK notes of cash stock**		Share of 1000 and 500-NOK notes of cash stock per cent
	NOK bn	sector	NOK bn	sector	NOK bn	sector	Reported + abroad + contingency holdings	Holdings for household consumption	Holdings for giro payments	Unexplained holdings	Explained share of cash stock (giro) included	Explained share of cash stock (giro)	Average cash stock from survey	Reported + abroad	Unexplained holdings	Explained share of cash stock	
1980	19.8	1.2	1.2	1.2	1.6	1.1	1.1	1.6	1.6	13.1	34%	2.8	0.6	12.4	37%	64%	67%
1981	19.6	1.3	1.3	1.5	1.8	1.2	1.2	1.8	1.8	12.6	36%	3.2	0.6	11.8	40%	65%	69%
1982	20.7	1.3	1.4	1.5	1.8	1.3	1.3	1.8	1.8	13.5	35%	3.6	0.6	12.4	40%	66%	72%
1983	21.5	1.5	1.6	1.4	1.9	1.4	1.4	1.9	1.9	13.7	37%	3.9	0.6	12.4	42%	67%	74%
1984	22.6	1.7	1.9	1.5	2.0	1.5	1.5	2.0	2.0	14.1	38%	4.2	0.7	12.6	44%	67%	74%
1985	24.4	2.0	2.2	1.7	2.8	1.6	1.6	2.8	2.8	14.2	42%	4.5	0.7	13.3	45%	65%	75%
1986	26.3	2.2	2.8	1.8	3.5	1.7	1.7	3.5	3.5	14.4	45%	4.8	0.8	14.0	47%	64%	75%
1987	27.8	2.4	3.1	1.9	3.6	1.8	1.8	3.6	3.6	15.0	46%	5.3	0.8	14.3	48%	62%	75%
1988	29.2	2.5	2.8	1.9	3.7	1.9	1.9	3.7	3.7	16.3	44%	5.7	0.9	15.4	47%	60%	74%
1989	29.4	2.1	2.7	2.0	4.1	2.0	2.0	4.1	4.1	16.5	44%	6.0	0.9	15.7	47%	60%	74%
1990	29.7	2.0	2.8	2.1	4.5	2.1	2.1	4.5	4.5	16.4	45%	6.3	0.9	15.7	47%	66%	74%
1991	30.6	1.9	2.8	2.2	4.9	2.1	2.1	4.9	4.9	16.7	46%	6.5	0.9	16.3	47%	66%	74%
1992	32.0	1.9	2.6	2.3	5.2	2.2	2.2	5.2	5.2	17.8	44%	6.7	0.9	17.6	45%	64%	75%
1993	33.4	1.7	2.6	2.4	5.3	2.0	2.0	5.3	5.3	19.3	42%	6.9	1.0	18.8	44%	62%	75%
1994	36.9	2.0	2.8	2.7	5.6	2.2	2.2	5.6	5.6	17.4	53%	7.1	1.1	21.3	42%	60%	74%
1995	38.4	2.0	3.0	2.8	5.6	2.2	2.2	5.6	5.6	18.8	51%	7.3	1.1	22.2	42%	58%	74%
1996	41.0	1.8	3.1	2.9	5.4	2.3	2.3	5.4	4.1	21.4	48%	7.4	1.2	24.6	40%	54%	72%
1997	42.3	1.5	3.4	3.0	5.2	2.4	2.4	5.2	3.7	23.2	45%	7.6	1.2	25.7	39%	53%	72%
1998	43.3	1.1	3.4	3.0	4.7	2.2	2.2	4.7	2.4	26.5	39%	7.8	1.0	27.0	38%	54%	73%
1999	44.1	0.9	4.0	3.1	3.9	2.2	2.2	3.9	2.4	27.5	38%	8.0	1.0	27.0	39%	52%	74%
2000	43.9	0.8	3.9	3.1	4.0	2.2	2.2	4.0	1.7	28.1	36%	8.3	1.0	26.7	39%	60%	74%
2001	43.5	0.9	4.3	3.1	3.6	2.3	2.3	3.6	1.4	28.0	36%	8.6	1.0	25.7	41%	58%	74%
2002	42.3	1.0	4.2	3.0	3.3	2.3	2.3	3.3	1.1	27.3	35%	8.8	1.0	24.3	42%	54%	72%
2003	41.9	0.7	3.9	2.9	3.4	2.3	2.3	3.4	0.8	27.7	34%	9.0	0.9	24.2	42%	53%	72%
2004	44.1	0.6	4.0	3.1	3.4	2.4	2.4	3.4	1.1	29.5	33%	9.1	1.0	26.2	41%	54%	73%
2005	47.0	0.6	4.5	3.3	3.3	2.5	2.5	3.3	1.2	31.4	33%	9.3	1.1	28.1	40%	54%	73%
2006	50.2	0.7	5.8	3.5	4.2	2.6	2.6	4.2	1.1	32.3	36%	9.6	1.1	29.5	41%	52%	74%
2007	51.5	0.7	5.7	3.6	4.5	2.6	2.6	4.5	1.2	33.2	36%	9.8	1.2	30.5	41%	52%	74%

* Annual average based on monthly figures 1980-1995, quarterly figures 1995-2007

** Note that in 1999 and in 2001 series IV and V of 1000-NOK notes turned invalid reducing the share of 1000-NOK notes substantially

Table 11

Notes and coin as percentage of GDP					
Year	Norway	Mainland Norway	Sweden	Denmark	Finland
	1990	4.0 %	4.7 %	4.5 %	3.0 %
1991	4.0 %	4.7 %	4.5 %	2.9 %	1.8 %
1992	4.0 %	4.7 %	4.4 %	2.9 %	2.0 %
1993	4.0 %	4.7 %	4.6 %	3.0 %	2.2 %
1994	4.2 %	4.9 %	4.4 %	3.1 %	2.1 %
1995	4.1 %	4.8 %	4.0 %	3.0 %	2.2 %
1996	3.8 %	4.6 %	4.1 %	3.0 %	2.3 %
1997	3.7 %	4.5 %	4.0 %	3.0 %	2.3 %
1998	3.8 %	4.4 %	4.1 %	3.0 %	2.1 %
1999	3.5 %	4.2 %	4.4 %	3.0 %	2.3 %
2000	2.9 %	3.9 %			
2001	2.8 %	3.6 %		2.8 %	
2002	2.7 %	3.4 %	3.7 %	2.8 %	
2003	2.6 %	3.3 %	3.7 %	2.8 %	
2004	2.5 %	3.2 %	3.6 %	2.8 %	
2005	2.4 %	3.2 %	3.5 %	2.9 %	
2006	2.3 %	3.1 %	3.3 %	2.9 %	
2007	2.2 %	2.9 %	3.2 %	3.0 %	

Source: ECB, Norges Bank

Table 12

Cash as share of point of sale value				
Year	Norway	Sweden	Denmark	Finland
1980	64.7 %			
1981	62.0 %			
1982	58.0 %			
1983	57.0 %			
1984	54.0 %			
1985	66.0 %			
1986	74.0 %			
1987	72.0 %			
1988	71.0 %			
1989	78.0 %			
1990	81.0 %	71.0 %	54.0 %	
1991	82.0 %	76.0 %	56.0 %	
1992	84.0 %	75.0 %	61.0 %	
1993	83.0 %	64.0 %	63.0 %	
1994	81.0 %	67.0 %	61.0 %	
1995	79.0 %	66.0 %	59.0 %	65.0 %
1996	75.0 %	63.5 %	57.0 %	63.0 %
1997	71.0 %	63.5 %	56.0 %	62.0 %
1998	65.0 %	61.0 %	53.0 %	61.0 %
1999	60.0 %	58.0 %	52.0 %	59.0 %
2000	63.0 %	58.0 %	50.0 %	54.0 %
2001	60.0 %	50.0 %	48.0 %	
2002	53.0 %	37.0 %	46.0 %	
2003	53.0 %	38.0 %	43.0 %	
2004	49.0 %	33.0 %	40.0 %	
2005	44.0 %			
2006	40.0 %			
2007	38.0 %			

Table 13

Year	Cash stock, "explained" share, Nordic countries			
	Norway	Sweden	Denmark	Finland
1980	34 %			
1981	36 %			
1982	35 %			
1983	37 %			
1984	38 %			
1985	42 %			
1986	45 %			
1987	46 %			
1988	44 %			
1989	44 %			
1990	45 %		49 %	
1991	46 %	63 %	51 %	
1992	44 %		50 %	
1993	42 %	44 %	50 %	
1994	53 %		49 %	
1995	51 %	42 %	45 %	64 %
1996	48 %		48 %	63 %
1997	45 %	36 %	49 %	60 %
1998	39 %		49 %	60 %
1999	38 %	35 %	53 %	58 %
2000	36 %	35 %	51 %	53 %
2001	36 %	37 %	51 %	
2002	35 %	35 %	50 %	
2003	34 %	34 %	49 %	
2004	33 %	33 %	48 %	
2005	33 %			
2006	36 %			
2007	36 %			

Appendix

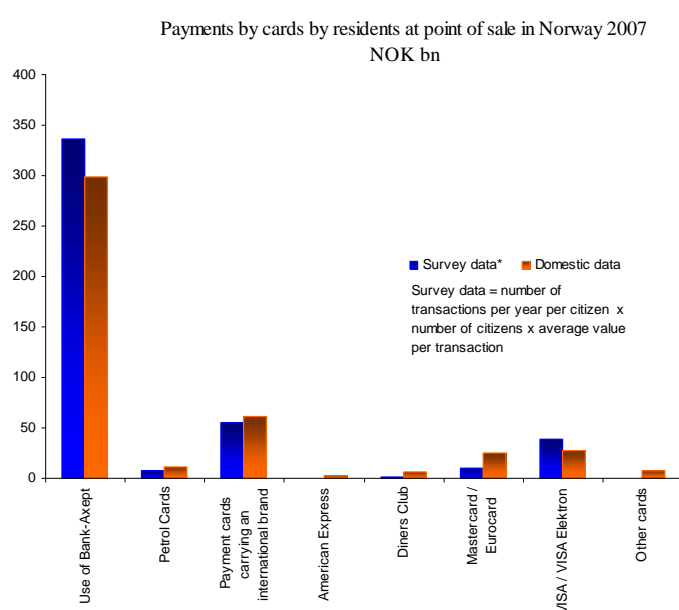
A 3.4

Altering survey data

The data in the survey agree rather well with statistics on card use in Norges Bank's *Annual Report on Payment Systems 2007*. However, we have chosen to make changes in the data set in the survey for a particular relation: the number of VISA transactions in the survey is apparently overestimated by 40 percentage points compared to domestic data⁴³, while the number of transactions based on Bank-Axept cards (the domestic debit card solution) is underestimated by 38 percentage points.

A probable explanation is that most physical plastic cards issued in Norway are combined cards, and the combination Visa / Bank-Axept is by far the most common. The Visa logo is on the front of the card, while the Bank-Axept logo is on the back. When the card is used in a card terminal which accepts Bank-Axept, the Bank-Axept card function is used by default. Visa is a well-known brand, and Bank-Axept is not. In a survey conducted by BBS (the owner of the Bank-Axept brand), only 15 per cent of the respondents recognised the brand to be related to payment cards. Most cardholders thus believe they have a Visa card, while the truth is that they have a Bank-Axept card for payments. We believe this is a just cause for adjusting the data from the survey, and we will use the adjusted data set in our analysis (see Table 8).

Appendix Graph 1



The average value of card payments in the survey differs from the average value of card payments in domestic data. We believe this is due to the low number of observations for some of the brands. In the domestic data set, average value is higher for international brands of payment cards than for the survey

⁴³ Domestic data is from Norges Bank's *Report on Payment Systems 2007* and includes all transactions in Norway.

data set. We believe this is due both to a limited number of observations in the survey and because the respondents did not include businesses. When businesses use international cards, the value of the purchases is typically higher than when private individuals use the same cards. We therefore assume that the survey gives a relatively correct picture of cash use in the society. As an example, we had only two observations based on American Express cards in the survey. The value of these two transactions can hardly be representative for an average payment in Norway for such cards. This is a weakness in the survey data set which is difficult to compensate for and leads us to exercise caution when interpreting the results. There was a relatively high number of Bank-Axcept observations, and the average Bank-Axcept payment is closer to what is found in the domestic statistics.

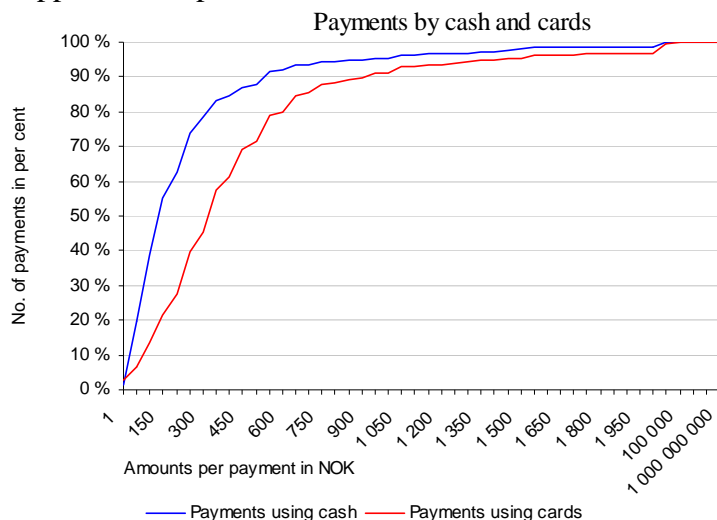
Median value and average value

The survey shows that the median value for payments is lower than the average. This is systematic and valid for all kinds of cards and cash where the survey had enough observations to show a tendency.

What we do know from comparing the survey with the domestic data set is that the survey provides a rather good picture of domestic data regarding card usage. In calculating the cash use, we therefore use the domestic data set for cards and the survey data set for cash. (see Table 9).

The data show that cash is the most popular instrument for low-value transactions. Also the number of cash transactions was relatively low even if they include person-to-person payments as well as payments for goods and services in shops etc.

Appendix Graph 2



Residents, non-residents, and residents travelling

The survey only covers people living permanently in Norway (residents). However, there are two other interesting groups to consider when calculating cash and card use at point of sale: non-residents and residents abroad. Firstly, non-residents use cards and cash at point of sale in Norway when shopping. When comparing the analysis in section 3.3 with sections 3.2, 3.4 and 3.5, non-residents should be included in the calculation. The calculation based on residents and non-residents show the total use of cash and cards at point of sale within Norway. However, comparing results from the survey of 2007 with the 1993 survey, only “residents” should form the basis for comparison.

On the basis of the results from the survey and the domestic data, we calculate use of cash and cards at point of sale in Norway. Tables and graphs show the calculations made for residents and residents +non-residents using average values from the survey.

A 3.5

How we conducted the merchant survey: Plan A, Plan B and Plan C

When asking shops, hotels and restaurants etc. about costs relating to payments from their customers, we encountered obstacles that made us alter our original plan twice. Even though we put a significant amount of effort into this survey, we still feel uncomfortable using some of the results, due to a low response rate and low quality of the responses. Some of the information is quite robust, though, and can be used (with caution) in our analysis. Below, we show a record of our efforts to give an indication of the robustness of the numbers and to share our experiences when we tried to shed light on an issue which is of very little interest to most of the respondents.

Our POS study was inspired by similar studies carried out by the Dutch and Belgian central banks.

When constructing the survey, we had numerous consultations with HSH (The Federation of Norwegian Commercial and Service Enterprises) and NHO Reiseliv (Norwegian Hospitality Association). We assumed that the bulk of the respondents would be organised in one of these organisations. We also conducted a pilot study among some of the members of these organisations, to improve the quality and relevance of the questions. The survey was administered by Norges Bank.

Plan A:

To draw a statistically valid sample, we contacted Statistics Norway. We defined the statistical codes of the different industries that we wanted in our sample. The total population consisted of 128 141 enterprises. Most of these enterprises were very small. The sample drawn consisted of 2 996 enterprises. In order to avoid too many very small enterprises in the sample our drawing procedure was as follows:

The population was divided by industry and size (the number of employees). The likelihood of being drawn was constant within each industry. The likelihood of being drawn increased with the number of employees. The likelihood was twice as large for enterprises with 0 to 3 employees as for enterprises where we had no information on the number of employees (normally one-person entities). The likelihood of being drawn doubled for enterprises with 4

DRAFT: not to be distributed without permission by the authors

to 19 employees compared to enterprises with 0 to 3 employees. The likelihood was again doubled for enterprises with more than 20 employees compared to enterprises with 4 to 19 employees.

The questionnaire was sent to the respondents in late autumn 2007. It was accompanied by a letter from the governor of the central bank which emphasised the importance of this survey to society. We also attached a letter from HSH and NHO urging their members to respond. Enterprises participating would at a later stage receive the results of the survey so that they could compare their own submitted information to the average for all respondents.

The response to the questionnaire was indeed far from good. Even though we reminded the businesses about our questionnaire by letter and phone, the total number of responses was only 122, for 155 businesses, far from being satisfactory for our purposes.

Plan B:

To improve the data, we selected 40 large members from HSH and NHO. Even though our hopes were high for a better response rate this time, we had to work hard for this.

The data from Plan B was added to the data from Plan A. Disappointingly, even the combined Plan A + B consists only of 147 respondents, covering 696 businesses. This is better, but not as good as it should be to make a proper statistically reliable analysis.

Plan C:

Working with the data collected we discovered that the time spent by the customer to pay at the cash register was substantially greater for all payment instruments than in similar surveys from the Netherlands and Belgium. We suspected that the respondents' degree of accuracy on these questions was low. We therefore conducted a special study, collecting detailed information from 8 different businesses on time spent on payment transactions. 559 cash transactions, 401 debit card transactions and 103 credit card transactions were recorded. The results showed that the time used to perform the payment operation were in line with our expectations, and even lower than what was recorded in the surveys in Belgium and the Netherlands.