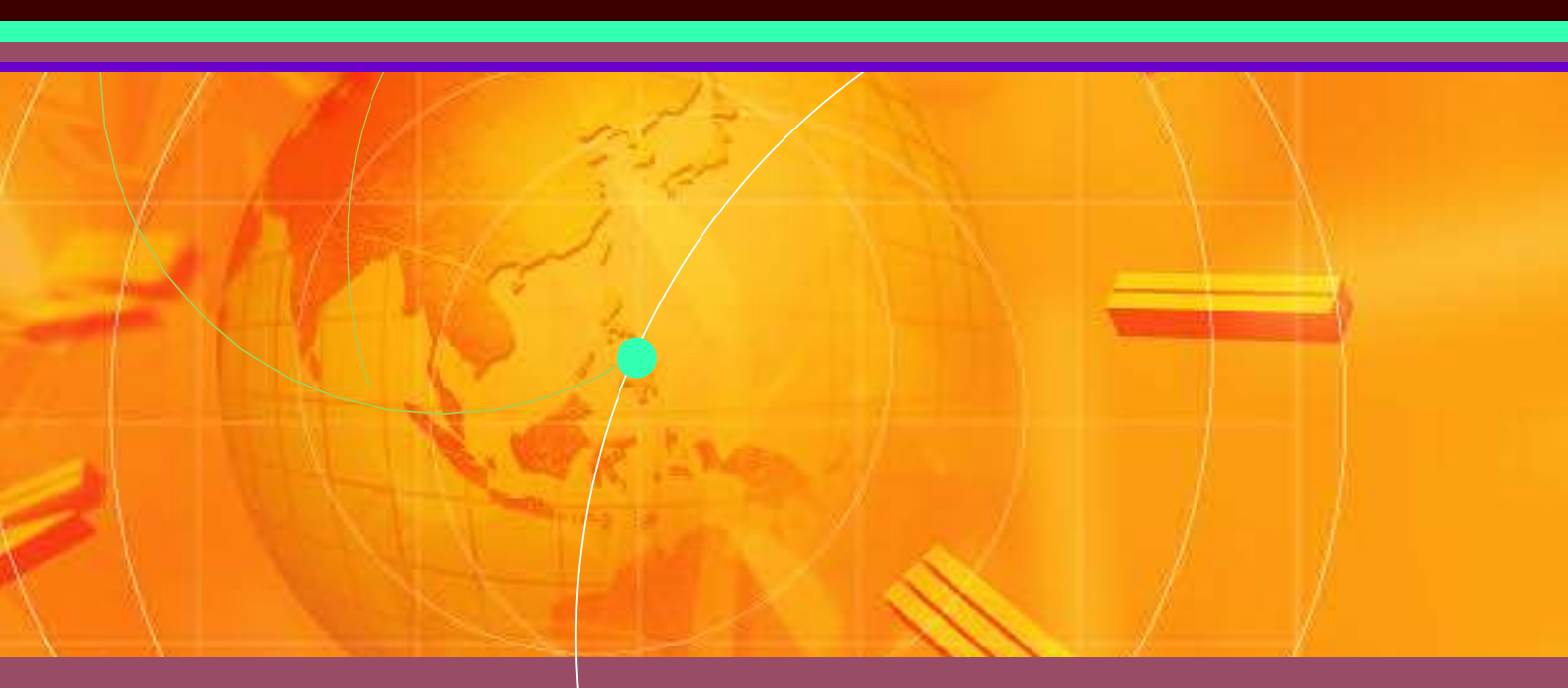
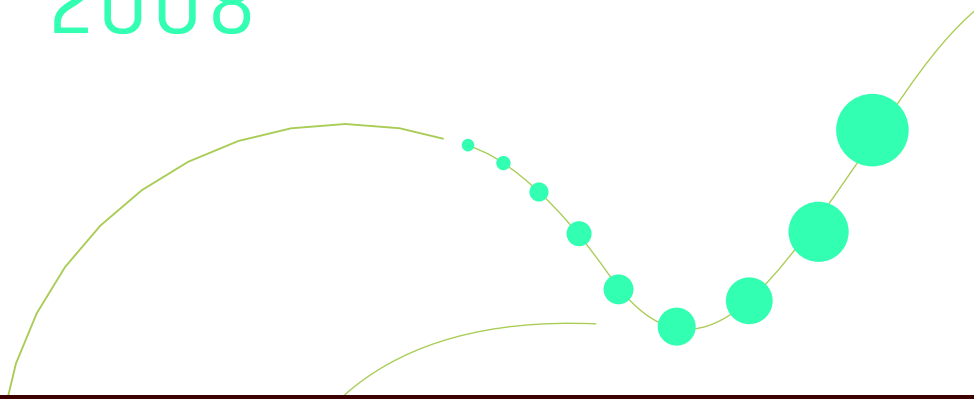


The Future of Cash

2008





. Foreword

Six years after the introduction of the euro, banknotes and coins remain the most widely used payment instrument in the eurozone. Given the continued use of cash in the economy, it is essential for all the stakeholders involved in the cash supply chain to plan for its efficient delivery to merchants and consumers, as well as for the improvement of the productivity of cash processing in order to reduce the societal cost of cash.

This report is aimed at understanding the ongoing forces which are driving change within the cash cycle. It is not our intention to provide all the answers but rather we hope to inspire innovative thinking and new responses to the challenges faced by all stakeholders.

This report was sponsored by SCAN COIN and Innovia. The research was undertaken by Guillaume Lepecq, Director of AGIS Consulting. The views expressed here do not necessarily reflect those of SCAN COIN or Innovia.

A number of interviews were undertaken to support this research. The Cash Processing Conference held in April 2007 in Frankfurt was a further valuable source of information.

We would like to take this opportunity to thank all those who have agreed to share their expertise for the purpose of this research and particularly Yngve Svensson, Managing Director of Scan Coin and Michael Blesovsky Head of Innovia Security.

Guillaume Lepecq
April 1 2008



“

Alice came to a fork in the road.

“Which road do I take?” she asked.

“Where do you want to go?”
responded the Cheshire cat.

“I don’t know,” Alice answered.

“Then,” said the cat, *“it doesn’t matter.”*

Lewis Carroll, Alice in Wonderland

”

. About us

SCAN COIN

www.scancoin.com

SCAN COIN is one of today's leading suppliers of cash processing solutions. A continuous search for new and better solutions is propelling the company forward towards a successful future. The expertise of SCAN COIN as a full-service partner has evolved to serve five main business segments – banking, retail, CIT/cash centres, public transport and gaming & amusement. Experience gained from one segment is often applied in innovative crossover solutions to drive improvements in other segments. Today, SCAN COIN is an international group with direct operations in 14 countries.

A network of distribution partners helps us cover some further 100 countries. The company offers a comprehensive range of hardware and software solutions for coin and note handling.



www.innoviafilms.com

Innovia Films, a specialist polymer film maker, manufactures the Clarity range of security films. Within this range is Clarity-C, a unique BOPP formulation which is provided to Securrency International, a company in which Innovia and the Reserve Bank of Australia are joint venture partners, who use it as the basis of the development of Guardian®, the innovative polymer substrate for banknotes. Clarity-C is perfectly balanced and robust to meet the requirements of high security printing, high-speed processing and use in ATM's. Guardian® was first adopted in Australia in 1988 for their bicentennial commemorative \$10 banknote, since then it has been adopted for the whole Australian note series, and for the whole note series in 4 other countries, New Zealand, Brunei, Vietnam and Romania. Additionally, 21 other countries have issued polymer notes and global interest in this technology is growing.



www.agis-consulting.com

AGIS Consulting is an independent strategy consulting firm, specialised in retail payments, including cash, cards and other payment instruments. AGIS was founded in 2001 in Paris and has since developed a worldwide network of partners.

The European retail payments market is facing tremendous change, under the combined pressures of the evolving regulatory market and European integration, technological innovation and socio-economic factors. AGIS aims at providing its clients with out-of-the-box thinking, in order to anticipate the changes in the market and develop customized value-added solutions.

Clients range from financial institutions, to payment service providers, to soft and hardware vendors.



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. Executive summary

Since the euro was introduced just over six years ago on 1 January 2002, it has grown by 175% to reach €677 billion at the end of 2007 and surpass the dollar as the premier currency. In terms of GDP, it has increased from 4 to 8% between 2002 and 2007. Cash remains the most widely used payment instrument and represents 8 out of 10 transactions in the eurozone.

In spite of this bright outlook, there are signs that the use of cash as a retail payment instrument has declined in most countries. Alternative instruments and particularly the payment card have been successful in displacing cash. This decline has been compensated by an increase in transaction volumes.

Growth in cash has been driven by three key factors:

- **Hoarding:** only a small share of cash is actually used in day-to-day payments. Following the euro changeover, stocks were replenished.
- **International use:** the euro has become the second global currency after the dollar. It is being increasingly used by non-residents.
- **Low-value transactions:** cash remains the most efficient and convenient tool for small payments.

New payment instruments have been proliferating and are challenging cash. The competition is particularly intense in the low-value segment, as payment providers are focusing on achieving economies of scale and increasing transaction volumes. So far, changing payment behaviour has proven a slow process as users have been showing stickiness towards cash. Meanwhile, cash is not being challenged as a store of value.

The proliferation of payment instruments and mechanisms has raised the issue of efficiency. The cost of cash has been successfully reduced thanks to the industrialisation of wholesale cash-handling and the automation of the distribution of cash.

There are however two levers to further improve the efficiency of cash. The first is the implementation of supply-chain management policies. This requires further integration of the various actors of the cash cycle and organising processes throughout a value chain encompassing multiple companies. The second lever is the shortening of the cash cycle. This is being addressed by the recycling framework.

Cash is also challenged by new forms of money, issued by private entities. Frequent flyer points, virtual currencies, loyalty points, lunch vouchers, social currencies etc... are competing against central bank money. Could they play a more important role in the future? Could currencies be eliminated altogether by developing a set of financial services covering risk management, asset portfolio and liquidity needs, including payment instruments.

Technology, the regulatory framework and competitive pressure are all pushing for radical change in the payments market. However, due to strong consumer inertia change will take place gradually. In the medium-term, cash will continue to play an important role. It is however far more difficult to assess the long-term direction of cash. The emergence of the cashless society has been debated for over 30 years now and yet cash is still growing.

The success of cash has been based on three specific attributes:

- **Universality:** it is accessible to all, irrespective of age, level of education, wealth... It is very broadly accepted.
- **Trust:** cash is considered as state money and serves as a foundation for the entire monetary system.
- **Anonymity:** cash provides security (e.g. against identity theft) and privacy.

A significant displacement of cash would require a payment instrument with these values. One option would be to develop anonymous electronic cash. While feasible from a technical standpoint, it remains to be seen whether public authorities would follow this route.

2

Cash in the economy

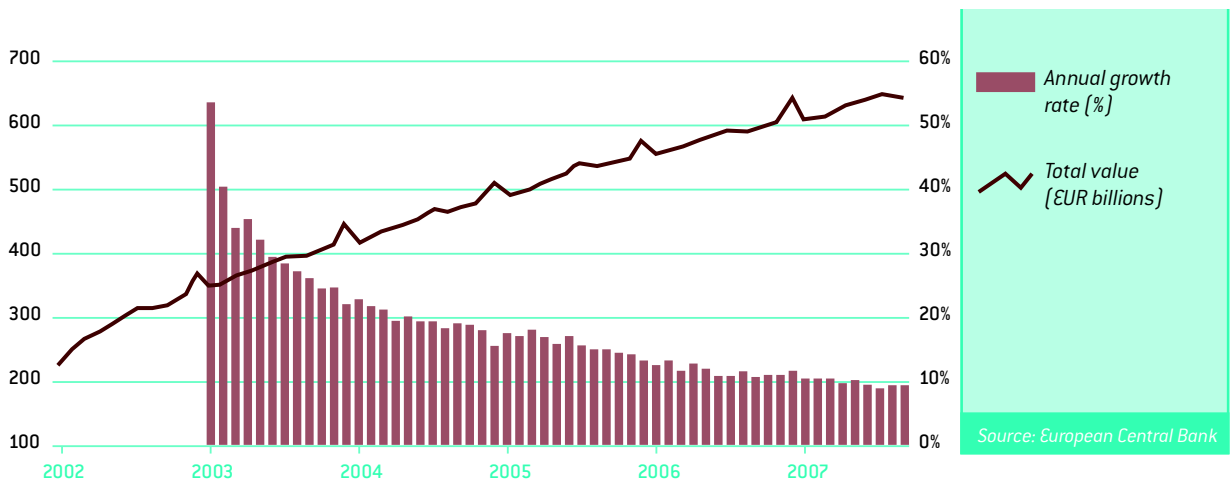
2.1 > Growth in cash

How much cash are you currently holding if any? In the age of ubiquitous networks, internet banking and mobile communications, cash appears obsolete, having been around for several thousand years. Beyond the anecdotal view, let us analyse a few metrics to measure the role and importance of cash in modern economies.

At the end of 2007, the value of euro banknotes in circulation reached €677 billion. This is three times the value of euros introduced in 2002,

representing an average annual growth rate of 20%. Although growth has been declining, it is still close to 8% in 2007, far in excess of nominal GDP growth. At the exchange rate as of the writing of this paper, this figure exceeds the 820 billion US dollars in circulation. It is also interesting to note that this growth has coincided with the emergence of the euro as a global currency, much to the detriment of the dollar. According to Jeffrey Frankel¹, the euro could surpass the dollar as the premier international currency within the next ten years.

FIGURE 1. EURO BANKNOTES IN CIRCULATION



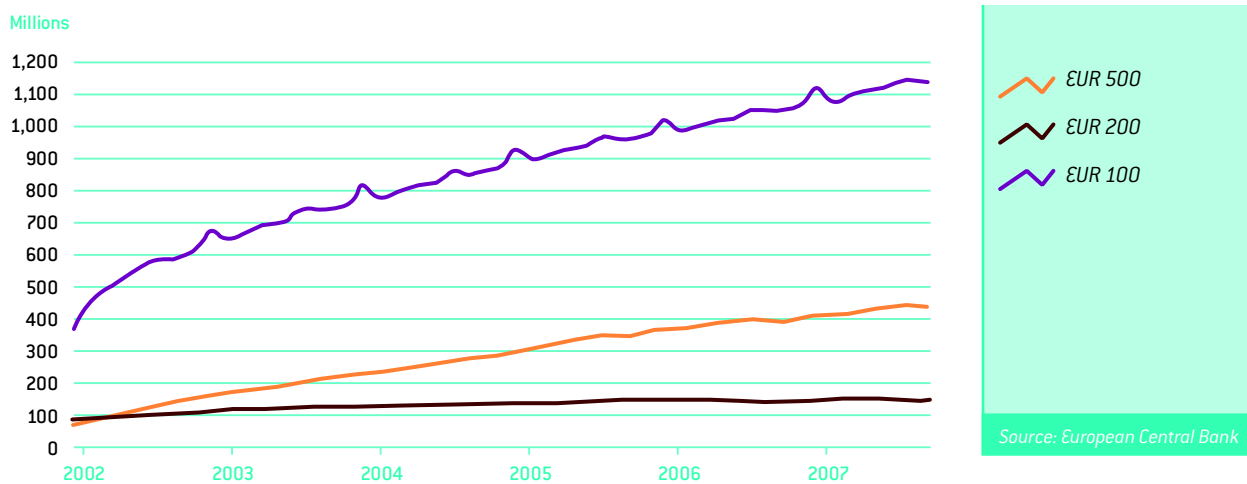
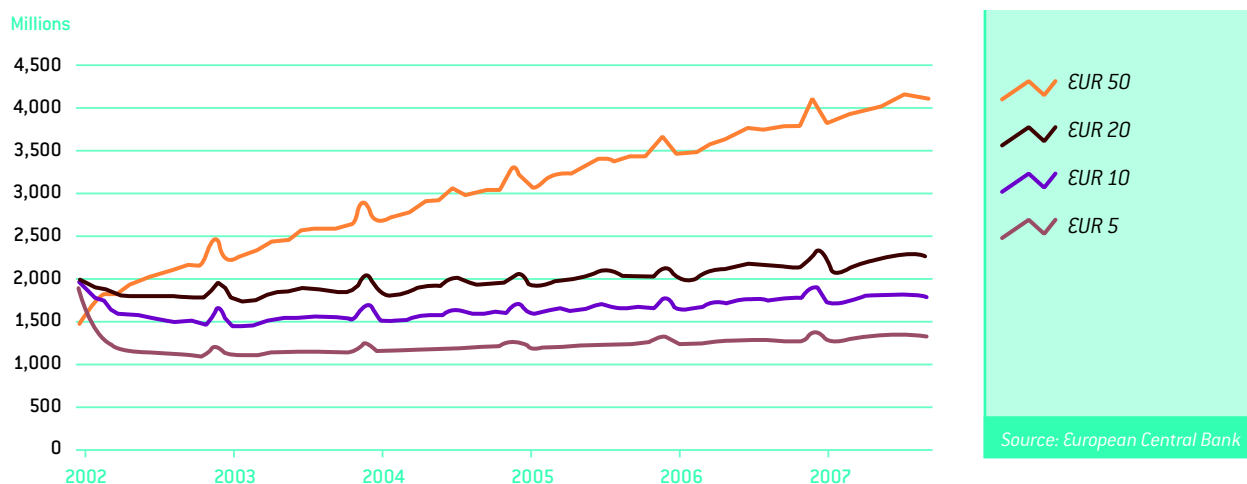
¹ The euro could surpass the dollar within ten years, Jeffrey Frankel, March 2008

The euro is not the only currency experiencing rapid growth. Between 2000 – 2007, the US dollar grew by 42% in value; the British pound by 50%; the Japanese yen by 45% and the Chinese renminbi by 60%.

Demand is strongest for the higher denominations (€500, €100 and €50) as illustrated by the breakdown of euro banknotes

in circulation by denomination (FIGURE 2). These denominations are probably partly hoarded even though the line between the store of value function of cash and the transactional function is difficult to determine. Indeed, the presence of seasonal peaks for the €100 note indicate they are also used in transactions.

FIGURE 2. GROWTH OF EURO BANKNOTES BY DENOMINATION

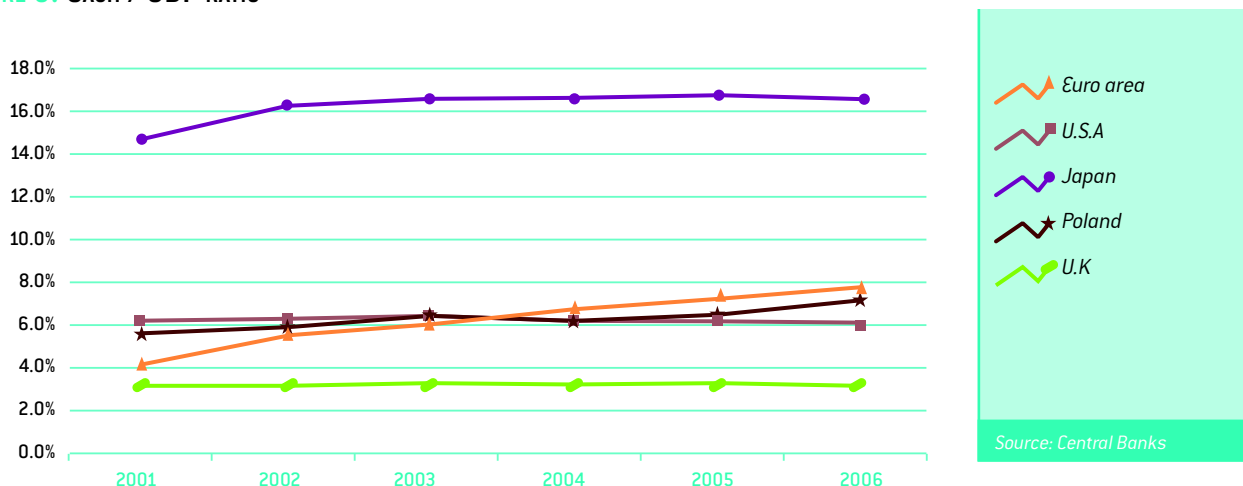


Cash in the economy

Another measure of cash demand is the cash outstanding to GDP ratio. This figure has been steadily declining in modern economies since the second half of the twentieth century and while it reached its lowest point in the nineties, it has since then been stable or increasing slightly. This raises the question of whether there is a minimum level of cash required in a modern

economy. One in four adults in the European Union only carry cash as a payment instrument. The decline corresponds with the emergence of alternative payment instruments and especially the card which, to a certain extent, has successfully displaced cash during that period. Meanwhile growth in non-cash payments has been slowing in the eurozone since 2003.

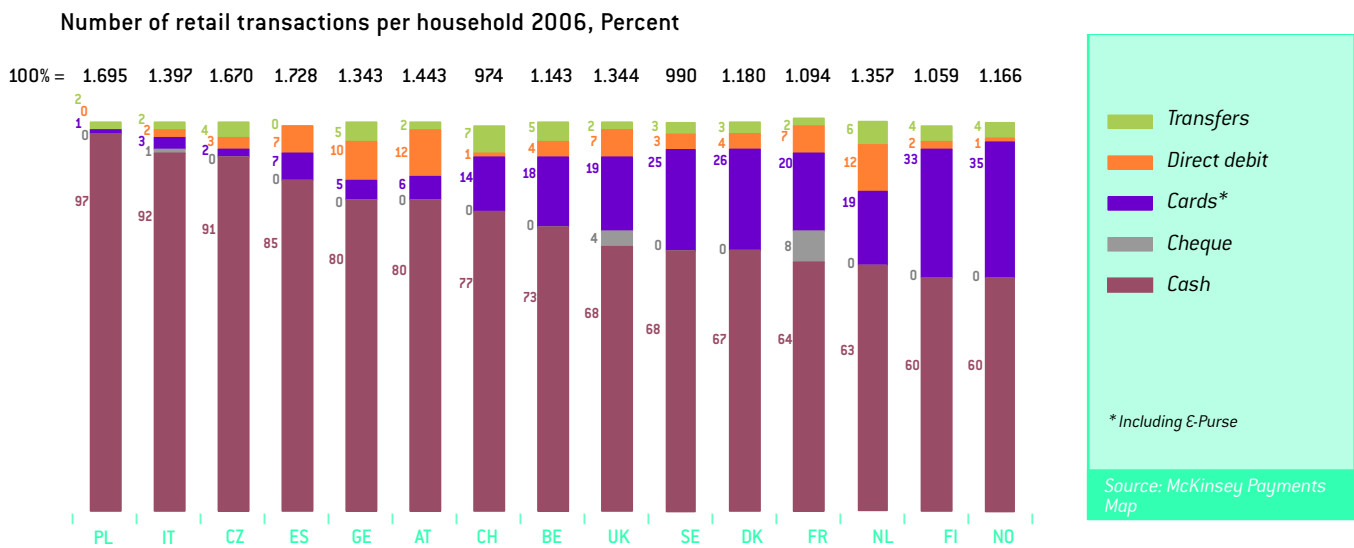
FIGURE 3. CASH / GDP RATIO



Cash share in transactions is dominant. Cash is by far the most frequently used payment instrument. According to the European Payments Council, on average 7 to 8 out of 10 transactions are made in cash. It is considered as the benchmark payment transaction, i.e. the instrument which is used by default. Meanwhile, there are significant variations within Europe, with two groups of countries emerging, as

shown in **FIGURE 4**. The first group (Poland, Italy, Czech Republic, Spain, Germany and Austria) are countries with less than 20% of non-cash transactions per year. In the second group (Switzerland, Sweden, Belgium, Denmark, the United Kingdom, Norway, the Netherlands and France) non-cash instruments exceed 20% of transactions and have displaced cash quite successfully.

FIGURE 4. SHARE OF CASH IN RETAIL TRANSACTIONS



2.2 > How do we explain the growing weight of cash in modern economies?

On average, each European consumer holds €2,000 in cash. It is unlikely that most people hold such amounts and considering the increasing efficiency of banks and retailers alike in the processing of cash, it is equally unlikely that they hold high levels of cash. So where is the cash? We estimate that approximately three quarters of the cash in circulation is actually in the hands of the public, i.e. €1,500 per capita.

In the case of the euro, it is likely that following the currency exchange in 2002, stocks of hoarded currency in the legacy domestic currencies were reconstituted in euros. This explains the solid demand for cash in the years immediately following 2002.

The economic environment characterised by low interest rates and an appreciating currency most likely contributed to strengthening this trend. The importance of hoarding is further evidenced by stronger growth of high-denomination banknotes. Yet, beyond this observation, the real question is why people continue to hoard cash. According to Helmut Stix², cash held for daily transaction purposes accounts for a small share of total cash in circulation. In the case of Austria, this share is estimated to be around 10%. At a time of sophisticated financial markets, why do people prefer to hold on to such high-levels of non-interest-earning assets? It certainly raises questions about the access to, confidence in and transparency of financial markets.

² The Impact of ATM Transactions and Cashless Payments on Cash Demand, Helmut Stix, Monetary Policy & the Economy Q1/04



2 . Cash in the economy

Prior to the introduction of the euro, the deutschmark was the only eurozone currency which had significant use outside of its borders. The euro is now the second global currency after the USD and has been experiencing increasing international use. The European Central Bank estimates that, in value terms, between 10% and 20% of the euro banknotes in circulation are held by non-euro area residents who continue to generate demand for euro banknotes, mainly as a store of value or as a parallel currency (e.g. Kosovo, Montenegro). This estimate does appear somewhat conservative when compared to the 60% of US currency held outside the country (US Department of Treasury, 2003).

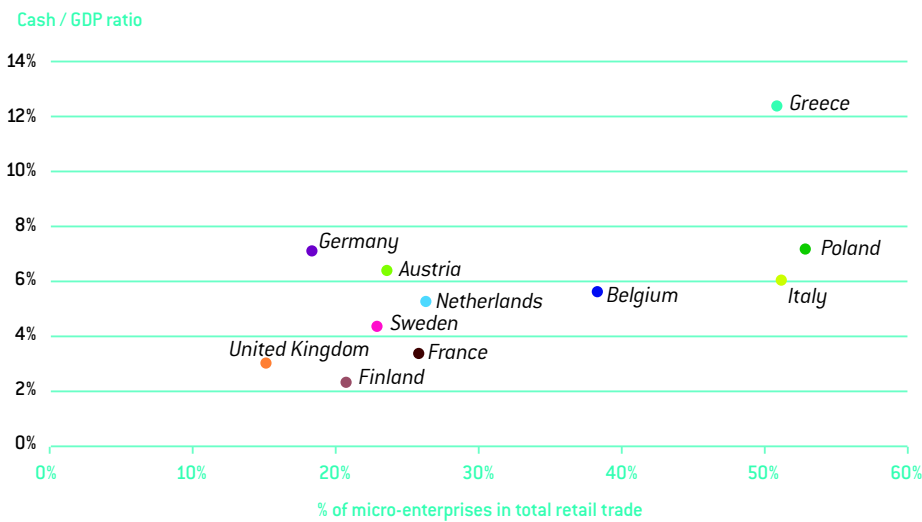
The international use of currencies is spurred by globalisation and the increase in migrant populations. The OECD estimates that over 75 million immigrants are living in OECD countries. Currency transfers from migrants to their native countries are estimated at €140 billion. This exceeds public assistance from rich nations to emerging countries. This has an impact on major international currencies but also on the currencies of the migrants' countries of origin. In Ireland, the Polish zloty is the second largest foreign currency after the British pound. A pizza chain in the United States, which caters mainly to Mexican immigrants, has chosen to accept pesos³ to attract customers. In the absence of a

harmonised European payments market, cash is widely used for cross-border transactions. Currency held overseas represents a form of interest-free borrowing and earns seigniorage for the eurozone countries. This amount can be estimated by multiplying the amount held by non-residents by short-term interest rates, i.e. in the region of €3-4 billion per year of savings for eurozone taxpayers.

The structure of the retail sector is another key factor explaining cash demand. Accepting transactions for a merchant requires significant investments: a point-of-sale terminal, a connection to the network, staff training etc... which can only be recovered through a high volume of transactions. Small merchants are often reluctant to invest in these terminals. **FIGURE 5** illustrates the relationship between merchant size and cash usage; as a proxy for merchant distribution, we have used the share of companies employing less than 10 staff in the total retail turnover. For the cash/GDP ratios, we have used 1999 figures to avoid the distortions related to the euro changeover. Hence, countries where the retail market is concentrated in the hands of a few large merchants will see lower cash demand. Countries where small stores represent a higher share of retail trade tend to have a higher cash/GDP ratio. In Germany, 30% of food sales are made at discounters, where cash represents 80 to 90% of transactions.

³ Pizzeria Patrón, Dallas, U.S.A

FIGURE 5. MICRO-ENTERPRISES TURNOVER OF TOTAL RETAIL TRADE & NON-CASH PAYMENTS



Source: European Central Bank, Eurostat

Cash is often associated with illegal activities. One study⁴ estimates that 63% of cash outstanding in Norway is linked to illegal activities. Most of these are related to sales and income tax evasion. It is worth noting however that cash is only a medium in these transactions and not the cause. Temptations to redeem cash would only lead to a shift towards other payment instruments – e.g. foreign currencies, gold or pre-paid cards... These instruments are far more difficult to trace as they are not linked to a bank account. For law enforcement officials, these newer cards, many of which can be reloaded online or at check-out counters, are an ideal tool for credit-card thieves, drug rings, and even terrorist cells. "It is a great concern to the DEA and the FBI because of the terrorist

financing angle," says Don Semesky, Head of the Office for Financial Operations at the US Drug Enforcement Administration.

This is prompting governments to take measures against the use of cash. Know Your Customer policies are being reinforced globally to prevent identity theft, money laundering and terrorist financing. In France, cash transactions over €3,000 are prohibited. In Korea, there is a 2% rebate on the sales tax when payments are carried out by card. The Singapore Government took more radical actions in 2002 when attempting to turn the country into a cashless society by introducing the Singapore Electronic Legal Tender concept (SELT). This has had little impact on cash in circulation which has grown by 28% between 2002 and 2006.

⁴ *The future of cash: legal falling use and implications for government policy*, Humphrey, Kaloudis and Øwre



2 . Cash in the economy

Also, the anonymity of cash is relative. Cash is not as easy to conceal and transport as one might think. A briefcase full of €500 notes holds €5 million. Banknotes can be tracked through their serial numbers. Customs and police authorities have trained dogs to sniff out the ink incorporated in the banknotes. More recently,

anti-theft devices - such as cash boxes, safes, ATMs... - incorporate a unique marker which contaminates criminals who break into the system. The unique forensic code provides the police service with an irrefutable link back to the scene of the crime.

2.3 > Cash usage is changing

Cash used to be the dominant and in many cases the only available payment instrument. The development of a wide array of alternatives has limited this role. Consumers now have the choice to pay with a cheque, a payment card, and increasingly a pre-paid card, a mobile phone or a finger using biometric identification. However, in spite of rapid innovation in the payments area, choice is not always widely available. There are numerous situations where choice is limited e.g. small shops which do not accept cards, remote areas which do not have access to an appropriate communications network or vending machines which only accept cash or cards.

This choice of payment instruments raises the issue of the efficiency of cash versus other payment instruments. The Dutch and Belgian central banks have undertaken separate detailed analyses⁵ to identify and quantify the costs of payment instruments used at the point of sale. Both conclude that cash is cheaper for low-value transactions. In the case of electronic payments, costs are essentially infrastructural, and hence fixed, with low marginal costs per transaction

whereas for cash the mix is balanced and the cost of a transaction increases with the value of the purchase. The break-even transaction amount below which cash is more economical than debit cards is €10.24 in Belgium and €11.36 in the Netherlands. Key findings of these studies are summarised in **FIGURE 6**. The British Retail Consortium (BRC) surveyed its members on the cost of collecting payments⁶. This survey shows that cash measured in transaction volumes is still the dominant method of payment used by customers whilst being the most cost-effective.

Another consequence has been the specialisation of the different instruments. This specialisation is based on several criteria, as demonstrated by Bounie and Abel⁷. Transaction size has a clear impact and cash is preferred for low-value transactions (under €15). The type of store where the purchase is made is another determinant; cash is more likely to be used in small stores whereas cards are more frequently used at larger retailers. Some categories – and typically the travel and entertainment industry (restaurants, bars, cafés, transport...) rely heavily on cash.

⁵ *Payments are No Free Lunch*, Hans Brits and Carlo Winder, DNB Occasional Studies, Vol. 3/Nr. 2, 2005.

⁶ *Costs, Advantages and Disadvantages of Different Payment Instruments*, Banque Nationale de Belgique, December 2005.

⁷ *2006 Cost of Collection Survey*, British Retail Consortium (BRC)

⁷ *Cash, Check or Bank Card? The Effects of Transaction Characteristics on the Use of Payment Instruments*, David Bounie and Abel François, March 2006.

The type of interaction is another discriminating criteria; cash is predominantly used in face-to-face transactions. Remote channels – internet, phone and mail-order – on the other hand

privilege non-cash transactions. Finally, socio-demographic characteristics also explain cash usage e.g. women and people with less education are typically strong cash users.

FIGURE 6. BREAKDOWN OF TRANSACTION COSTS PER PAYMENT INSTRUMENT IN BELGIUM AND THE NETHERLANDS

	CASH	DEBIT CARDS	CREDIT CARDS	E-PURSE	TOTAL
Belgium					
> Cost as % of GDP	0.58	0.11	0.04	0.02	0.74
> Average cost of transaction	€0.53	€0.55	€2.62	€0.55	€0.56
> Transactions (in millions)	2,970	539	37	107	3,653
> Transactions as % of total	81.3	14.7	1.0	3.0	100
> Fixed/variable costs as % of overall costs	49 / 51	61 / 39	75 / 25	83 / 17	–
Netherlands					
> Cost as % of GDP	0.48	0.11	0.04	0.02	0.65
> Average cost of transaction	€0.30	€0.486	€3.587	€0.931	€0.35
> Transactions in millions	7,066	1,069	46	87	8,268
> Transactions as % of total	85.5	12.9	0.6	1.1	100
> Fixed/variable costs % of overall costs	41.4 / 58.6	59.6 / 40.4	96.2 / 3.8	69.6 / 30.3	–

There are signs of a decline in cash usage in the retail sector. Overall, cash represents one fifth of consumer spending in value in France and the United Kingdom. However, for low-value transactions, for certain categories of retailers - small stores, markets, travel and entertainment...- and for certain consumer segments cash usage is predominant. In the United Kingdom, 91% of all payments under £10 were made by cash⁸.

In Germany, cash represents 82,1% of the turnover of discounters. The evolution of these segments will have a strong impact on future cash usage. The British Retail Consortium survey indicates that the total number of transactions processed increased by 12% whereas the average transaction value (ATV) across all payment types has decreased from £24.76 in 2005 to £23.46 in 2006.

⁸ APACS

3

Evolution of the cash cycle

3.1 > Evolving central bank models

The organisation of the cash supply chain is largely determined by the role and footprint of the central bank. Differences are observed from one country to another, for reasons such as the commercial banking systems, the legal framework, the payment behaviour of the

general public, the cash-in-transit infrastructure and geographical and security considerations. Each central bank has its own specificities and no two models are identical. However, three fundamental models emerge, as summarised in **FIGURE 7**.

FIGURE 7. DIFFERENT CENTRAL BANK MODELS

DELEGATED	SHARED	CENTRALIZED
The central bank sets the rules and monitors the process but stays out of cash cycle.	The central bank processes part of the cash.	The central bank controls the full cash cycle and processes the majority of the cash.
<ul style="list-style-type: none"> > United Kingdom > Netherlands > Austria > Denmark > Sweden > Ireland 	<ul style="list-style-type: none"> > Spain > Portugal > Belgium > USA 	<ul style="list-style-type: none"> > France > Germany > Poland > Italy

These organisational models are not engraved in stone and are constantly evolving in order to adapt to changing market conditions and reduce costs. There is an ongoing pendulum effect between central bank processing and private sector processing. Monetary authorities are constantly looking for the optimal balance between in and out-sourcing, between cost-efficiency and ensuring a smooth supply of cash to the market. For example, the Netherlands have moved to a delegated system; France and

Germany have streamlined their branch network while Poland is currently reviewing options.

Irrespective of the level of central bank involvement in the cash cycle, infrastructure and network consolidation has been observed. This movement has been driven on the one hand by the necessity to adapt to new economic conditions such as population shifts, changes in payments behaviour, banking infrastructure and on the other hand, by technology investments in high-speed sorters and processing equipment

and through improving information systems. The central banks of Belgium, Finland, Luxembourg and the Netherlands have developed a common IT platform which harmonises communication formats for commercial cash handlers.

Streamlining the central bank network has been evident in Germany where the Bundesbank has reduced the number of branches from 202 to 47 between 1991 and 2007.

FIGURE 7.2. EVOLUTION OF THE DEUTSCHE BUNDESBANK BRANCH NETWORK



The historical top-down vision of the currency supply chain - with a central bank at the top of the pyramid - has progressively evolved into that of a payment scheme. The role of the central bank is above all a role of governance: it sets the rules and supervises their implementation by the actors in the supply chain. The latter are becoming increasingly specialised in this market with for instance on one hand, the emergence of cash-positive or cash-negative banks and on the other hand, the evolution of Cash-In-Transit from transport to global solutions.

If a “one-size-fits-all” model for cash supply in the euro area is not desirable, the Governing Council of the European Central Bank adopted in February 2007 a roadmap to achieve greater convergence in National Central Bank cash services in the medium term. The main features are summarised in **FIGURE 8**. The European Payments Council supports this view and is calling for the harmonisation of operational conditions across the eurozone and the dismantling of legal barriers that limit an open market for cash.

FIGURE 8. CONVERGENCE OF CENTRAL BANK SERVICES

ITEM	IMPLEMENTATION
> Remote access to NCB cash services across national borders	June 2007
> Coin lodgements are accepted from professional clients at all NCBs	December 2007
> Harmonised approach to Electronic Data Exchange	
> Dropping of banknote facing and orientation requirements for lodgements	January 2011
> Opening hours	
> Common packaging standards for banknotes	

. Evolution of the cash cycle

3

3.2 > Automation of cash distribution

The first ATM was installed in North London in 1967. Over the forty years since then, more than 1.65 million machines have been installed worldwide. The expansion of ATM networks by banks has enhanced the convenience of cash and reduced potential interest rate losses by increasing accessibility to cash closer to the point of sale. This has considerably reduced the cost of cash.

By expanding their ATM networks banks have successfully migrated the distribution of cash withdrawals from the bank teller to the ATM. This has had a mixed impact on cash in circulation. On the one hand, ATMs reduce the need to hold banknotes as they are readily available. On the other hand, banks need to replenish their ATMs with currency and in times of low inflation, the opportunity cost of holding excess cash is probably lower than the cost of refilling the machines more frequently. The net

result should be a reduction in average cash balances held and thus a negative effect on cash in circulation.

Between 2000 and 2006, the ATM network in the eurozone grew by 30% to reach 265,000 units installed. During the same period, the value of cash withdrawals grew by 66% to reach €877 billion. ATM numbers and cash withdrawals have grown in all countries with the exception of Finland. Finland has followed the example of Norway, where the number of ATMs has been declining since 2003, although this has not led to a decline in cash in circulation which grew by 7% in 2006. This has resulted in a sharp increase in "cash-back", a service offered by retailers whereby an extra amount of money is added to the total purchase price of a payment card transaction and the customer receives the extra amount in cash along with their goods. Almost 50% of cash is sourced by cash-back in Norway.

FIGURE 9. NUMBERS OF ATMs - TOP TIER COUNTRIES

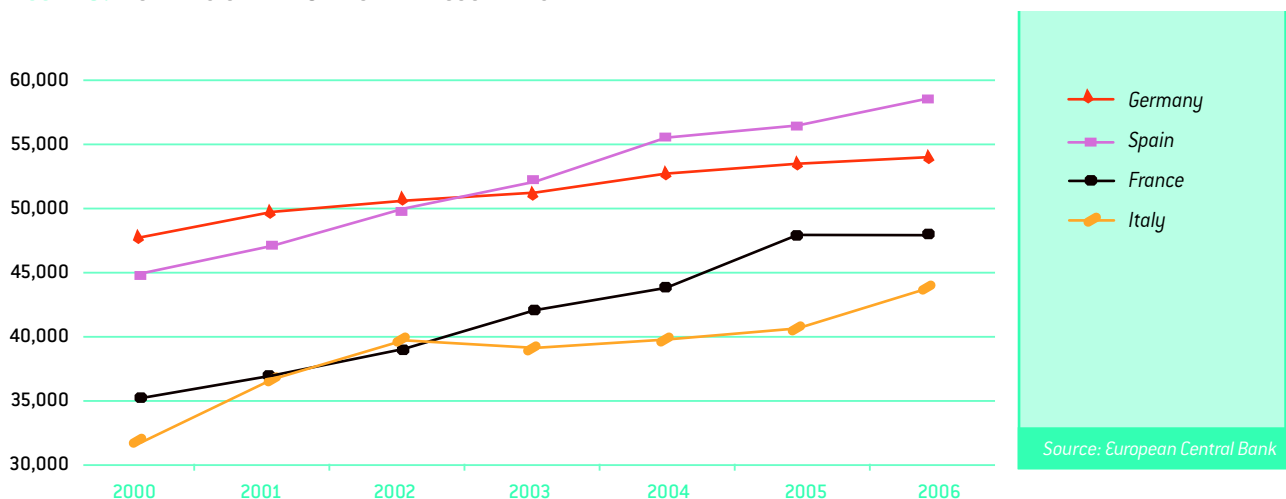
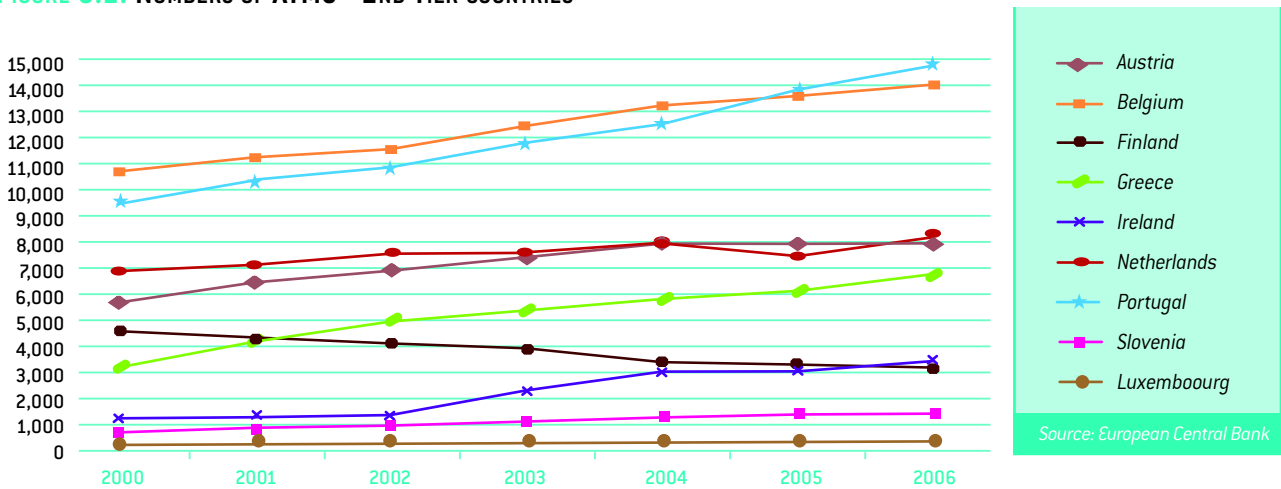


FIGURE 9.2. NUMBERS OF ATMs - 2ND TIER COUNTRIES



Growth in the ATM network is mainly due to off-site ATMs which now represent one third of the network, even if strong variations exist from one country to another. Retail locations are home to around half of the off-site ATMs. Shopping centres and supermarkets are the most popular off-site locations, followed by bars and petrol stations.

The distribution of cash has been largely

automated due to the ATM network; the collection of cash remains essentially a manual process carried out at branch counters or from night safes. The European Payments Council considers that the inflow of cash is twice as costly as the outflow (€21 billion versus €11 billion). Hence, there are significant potential cost savings to be achieved through the automation of the collection of cash.

3.3 > Recycling

In January 2005, the European Central Bank adopted a common framework on the recycling of euro banknotes. It enables banks and professional cash handlers to recirculate notes on the condition that they have been checked for authenticity and fitness, using machines and processes which have been controlled by the Central Bank. This framework

follows the Terms of Reference for the use of Cash Recycling Machines (CRMs) adopted in May 2002.

National Central Banks (NCBs) are responsible for implementing the framework within their national boundaries. A two year transitional period, ending on 1 January 2007, provided for the adaptation of existing machines.

. Evolution of the cash cycle

In December 2006, the transition period was extended to expire by the end of 2009 in France and by the end of 2010 in Greece, Spain, Ireland, Italy and Portugal. Depending on the central banks, the framework is implemented through legislation, as in France or through contractual arrangements such as in Belgium, the Netherlands or Austria.

The guiding principle of the framework is that banknotes which are re-issued to the public must be checked for authenticity and fitness by tested machines or trained staff. Only fit banknotes can be recycled with unfit banknotes to be returned to NCBs. There is an exception for remote branches which can continue manual fitness checking within a limit of 5% of the overall volume of banknotes recycled.

Banknotes which are checked for authenticity by trained staff can be re-issued over the counter after being checked for fitness. Counterfeits and suspect notes are to be handed over to national authorities. Machines used for recycling purposes are to be tested by a NCB before their putting into operation (initial verification test). Successfully tested machines are published on the ECB website (www.ecb.eu). NCBs may carry out inspections at credit institutions' premises and will collect statistical information from banks and professional cash handlers.

For the Eurosystem, the rationale of the European Recycling Framework is to achieve a level playing field in the eurozone and to contribute to the quality and genuineness of the banknotes in circulation. Before the framework, the situation varied from country to country; some countries would source their

banknotes exclusively from the central bank while others would recirculate without following any particular rules.

For banks, the framework should contribute to reducing the cost of cash in several ways:

- Automating the incoming flows of banknotes.
- Reducing the number of transports
- Reducing the risks

It also improves customer service as clients have the option to deposit cash at a recycling ATM rather than at the teller.

However, as with any change, these savings will not take place overnight and banks will need to invest in new equipment and adjust their processes. These investments will likely take place in line with the replacement cycle of existing equipment. In the short run there could well be increased costs due to the fact that banks need to stop "uncontrolled" recycling. Recycling will likely act as a catalyst towards existing trends as it will reduce the role of the Central Banks in the cash cycle, increase the automation of processing and increase the workload for the private sector.

Recycling could take place in one of the following areas as illustrated in [FIGURE 10](#):

- **Cash centre:** this form of industrial recycling would only marginally increase the cost of processing on condition that the centre is equipped with the adequate sorters. One issue however, is that optimising the process requires the cash centre be able to process together currency originating from different banks. This is not currently allowed in all countries.

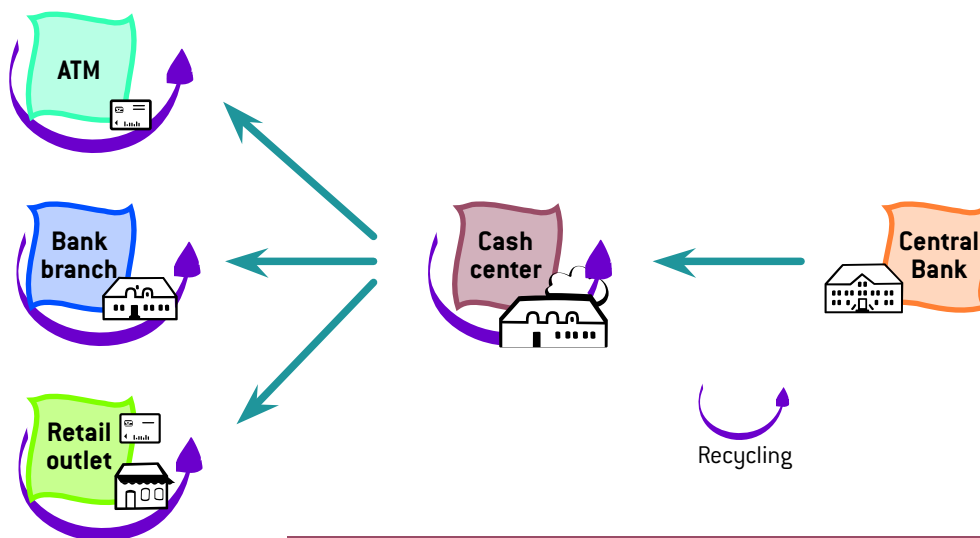
- **Bank branch:** some banks have decided to recycle offline in their branches. This is a way for banks to re-insource cash handling and reverses the trend of taking cash out of the branch. It also reduces the dependency of the bank on CITs.
- **ATM:** recycling ATMs offer a fully automated solution. However, this solution does require a balance between the in-and out-flows, both in value and per denomination.

There have also been issues in relation to the robustness of the technology.

- **Retail ATMs:** ATMs located in stores and shopping malls can be replenished with cash from the tills on the condition that it has been checked in compliance with the framework. This leads to higher costs for retailers and it appears that they are showing little interest. On the contrary, this could foster cash-back.

FIGURE 10. RECYCLING OPTIONS

Optimising the cash cycle: recycling alternatives



RECYCLING IS EXPECTED TO HAVE AN IMPACT IN THE FOLLOWING AREAS:

- > Cash centres will need to deploy the adequate equipment and ensure its maintenance.
- > Savings are anticipated in terms of transport and insurance.
- > From a societal point of view, recycling should reduce cost of cash by avoiding the duplication of tasks.
- > For the banking sector, recycling will represent an additional workload.
- > In the short term, additional investments will be required.
- > For the banking industry, this could modify the competitive landscape.

. Evolution of the cash cycle

It would be premature to assess the implementation of the recycling framework. There are signs however that the market is moving. In Germany, three quarters of the banks have signed contracts with the Bundesbank. At the time of this writing, it is estimated that 10 to 30% of the banknotes are recycled without complying with the framework. Approximately 5,000 Cash Recycling Machines have been

installed. Banks encountered reliability problems initially but the situation seems to be stabilising. In France, 35 banks have signed recycling contracts with the Banque de France as well as 5 Cash-in-Transit companies. Around 2,200 branches were recycling at the end of 2007. According to Retail Banking Research, by 2014 approximately a quarter of the installed ATMs will recycle.

BRANCH RECYCLING

- > Savings in cash logistics
- > Optimisation of internal cash stock
- > Minimize transport costs
- > More flexibility in servicing ATMs
- > Investment in small desktop sorters is enough to enable branch recirculation
- > Savings primarily for small bank branches

CASH CENTRE RECYCLING

- > Personnel costs are higher in a branch
- > Use of synergies and volumes
- > Balancing of cash positive and cash negative customers, if possible
- > Higher security
- > Branches do not need to invest in new technology
- > Branches do not need to introduce new processes

CASH RECYCLING MACHINES

- > Fully automated process
- > Security
- > Added convenience for customers:
 - Avoids queuing at the teller
 - Extended opening hours
 - Immediate credit
- > High investments
- > Suitable for high volumes
- > Need for balanced in- and out-flows

RETAIL RECYCLING

- > Increases cash handling costs
- > Complicates cash handling process
- > Unbalanced in and outflows
- > Cash-back option?

3.4 > Outsourcing

Cash processing is an industrial process far removed from traditional banking activities and culture. The internal organisation of cash handling within banks is often obsolete and inefficient, inherited from old bank organisations and further complicated by mergers, acquisitions and restructuring. This has led the majority of banks to opt for the outsourcing of wholesale cash processing.

Banks pursue several objectives when they choose to externalise their cash processing:

- Cut costs by streamlining processing structures and implementing higher throughput sorters.
- Achieve economies of scale thanks to larger and more efficient cash centres.
- Reduce investments required by an increasingly capital-intensive industry.
- Reduce the risks associated with cash.
- Optimise the supply chain management.
- Focus on the core business.

There are on the other hand inherent difficulties associated with outsourcing. First and foremost is the loss of control and the reliance on external providers. In some cases, banks no longer have the know-how in relation to cash handling. This is particularly sensitive in case of a contingency and in the context of business continuity planning. Another key inhibitor is the social impact and the fear of change.

Cash processing has evolved from a labour-intensive activity focused on the transportation of cash to a capital-intensive industry offering end-to-end solutions. Transport no longer constitutes the value added in the business but continues to structure the organisation; typically the CIT's footprint remains a key factor of selection by banks and retailers.

The industry is generally divided into the following activities: transport, processing and ATM servicing. CITs are attempting to move away from this product-centric organisation to a customised insourcing model. An interesting business case is provided by the evolution of package delivery firms which now offer holistic supply chain management.

The structure of the CIT industry is very different from one country to another. In France and the United Kingdom, two players dominate the market. In Germany, 85 CITs are registered; the majority are limited to one branch. The consolidation process has been initiated and the 5 largest players now have 80% market share. The industry however is still very much price driven. In Poland, it is estimated that there are 2,700 enterprises which are involved in the transportation of cash. The top five CITs have a combined market share of around 20%. Processing remains essentially a manual process.

The trend towards externalisation of cash logistics now seems irreversible in Europe. Under the pressure of technological innovation and stricter regulation, cash logistics are becoming increasingly sophisticated and capital intensive. In spite of this long-term strategy, some banks may consider re-insourcing parts of the cash cycle due to insufficient competition in some regions or on the contrary because the industry is too fragmented in other regions. However, this requires that banks and CITs achieve a higher level of integration and progress from a supplier-customer relationship. This requires long-term agreements between the partners in order to make the technology investments that would contribute to drive down cost.

4

. Future of Cash

Cash is growing but what is the long-term direction of cash? Some stakeholders have an interest in seeing it disappear: they offer alternative payment instruments and are pushing for the substitution of cash. Is this in the interest of the market?

4.1 > The functions of cash

“Money is a matter of functions four, a medium, a measure, a standard, a store.”

Cash is a form of money. Economists generally consider that money is defined by the three following characteristics:

- Medium of Exchange.
- Unit of account.
- Store of value.

The **medium of exchange** function means that money is used as an intermediary for trade. Historically, it was an improvement of a barter system, which was confronted with the “double coincidence of wants problem”, i.e. for two parties to agree on a transaction they need to simultaneously want to exchange their respective goods. This innovation made possible the emergence of large trading economies, since individuals do not have to wait to find someone whose wants coincide with their own. The broad acceptance of cash is an indicator that it is an efficient medium of exchange.

A **unit of account** is a standard unit of measurement of the value of goods, services, and other transactions. It enables economic agents to keep financial records in a common language facilitating the comparisons of prices and value. Cash plays a significant role as a unit of account as children learn the value of things by associating them with the respective notes

and coins even before they can count. Cash remains an important budget control instrument as consumers can instantaneously measure how they spend their income.

To act as a **store of value** money must hold some or all of its value over time. This allows the accumulation of wealth in the form of “liquid” assets. Cash is issued by the central bank and its conservation demonstrates a high level of confidence in the stability of the value of the currency. Some economists argue that the store of value function is in contradiction with the medium of exchange as one requires money to be hoarded while the other requires it to circulate.

Cash is challenged as a payment instrument not as a store of value. Cash is subject to ever-increasing competition from electronic forms of payments. While cards were originally designed to withdraw cash, they have evolved as a substitute for cash. Until recent years, electronic payments failed to penetrate the low-value transaction market – the limit being around the €15 mark. However, the electronic payments industry is clearly targeting these transactions and is relying on innovation to improve their position. Contactless cards, NFC (near-field communication), mobile payments, pre-paid cards are being rolled out across the globe and are expected to substitute cash transactions.

Also, in a networked economy the cost of electronic transactions is expected to decline.

Cash is also challenged by new kinds of currencies, ranging from frequent flyer miles, to coupons, to internet currencies such as Linden dollars, the currency of the virtual world Second Life. In January 2005, *The Economist* wrote "Calculations by *The Economist* suggest

that the total stock of unredeemed frequent-flyer miles is now worth more than all the dollar bills in circulation around the globe". Alan Greenspan, former Chairman of the Federal Reserve, foresaw "new private currency markets in the 21st century".

However, these payment innovations do not challenge cash in its store of value functions.

4.2 > The attributes of cash

The success of cash is based on specific attributes:

- Universality
- Anonymity
- Trust

Universality is based on the availability and broad acceptance of cash. Cash is available to all, including children and persons without an identity. According to a UNICEF report "An estimated 50 million babies born in the year 2000 – about 40 percent of all births – were never legally registered and started life without an official identity or nationality. With no document to prove how old they are – or even who they are – they are likely to join the millions facing discrimination and the lack of access to basic services such as health and education". One could add electronic payments to these services.

Banknotes and coins are also designed to facilitate their use by the blind. As for its acceptance, cash does not require access to an infrastructure or membership to a network.

The settlement is also immediate, final and does not include hidden costs. Cash is portable - at least for daily use - and does not require a PIN code or a signature. Cash is available for a broad range of transactions including person-to-person payments.

The universality of cash is being restricted. As a result of money-laundering regulations, it is becoming increasingly difficult to pay with large sums of money. Also, with the rapid development of the internet, where the use of physical cash is limited by nature, the relative importance of cash in transactions is declining.

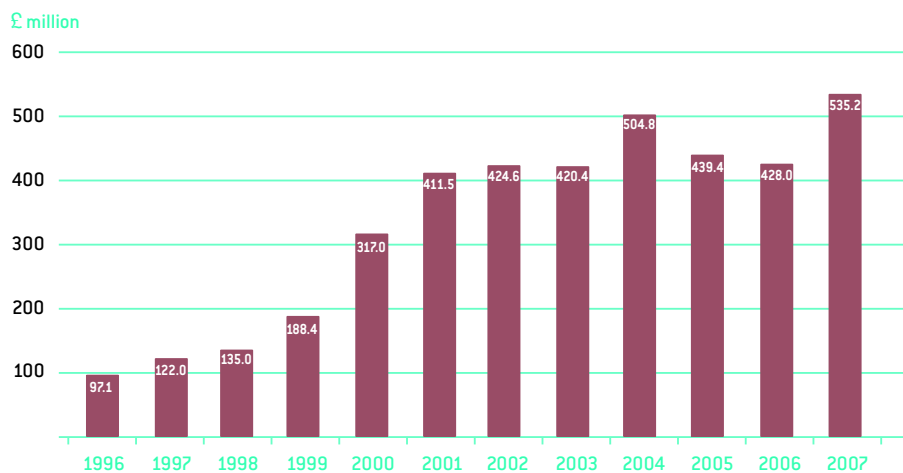
The second specific feature is **anonymity**. Cash does not require the disclosure of personal information. This is the subject of endless debate between those who favour full traceability of transactions and the advocates of privacy. The former claim that anonymity favours crime and tax evasion, while the latter argue that the tracking of transactions is an intrusion into one's privacy. It is not the purpose of this report to take sides.

. Future of Cash

However, we do recognise that the use of cash offers protection against some of the risks currently associated with electronic payments, ranging from card fraud, to phishing scams, to identity theft. In the United Kingdom alone card fraud amounted to £535 million in 2007, a 25% increase over the previous year. Identity theft, i.e.

the illegal use of another person's identity, is most commonly used to obtain loans and/or credit cards from a financial institution. In 2005, over 9 million adults in the US were victims, representing a total cost estimated at over USD 50 billion according to Javelin Strategy and Research.

FIGURE 11. PLASTIC CARD FRAUD LOSSES ON UK-ISSUED CARDS 1996-2007



Source: APACS

The importance of anonymity becomes more and more relevant as both governments and corporations are increasingly tempted to use the availability of the huge amount of information associated with electronic transactions, for both security and marketing reasons. Government agencies are tempted to access the data in the framework in the fight against crime and terrorism; this was illustrated by the Swift case in 2006. SWIFT is a Belgium-based company with offices in the United States and which operates a worldwide messaging system used to transmit, inter alia, bank transaction

information. For security of data reasons SWIFT operates two identical "mirror" servers, one located in the European Union and the other in the United States. All financial messaging data are held on each server for a period of 124 days. The United States Department of Treasury issued subpoenas requiring SWIFT to provide access to message information held in the USA and SWIFT complied, although in contradiction to Belgian and European data protection regulations. The matter became public as a result of press coverage in late June 2006.

Payment cards are highly valued by marketing departments. They allow them to track purchasing behaviour, implement loyalty programs and profile their customers. In this context, cash is becoming the last space of liberty.

The third feature is **trust**. Cash is issued by a central bank, whose primary target is to achieve price stability and therefore maintain the purchasing power of the currency. The mission of a central bank also consists in ensuring the integrity of banknotes. Trust in cash also results from the fact that it is the contingency payment solution. When all else fails, cash is always available. In case of natural disasters - e.g. hurricane Katrina in the US in 2005 - concerns about technology breakdowns - e.g. the Y2K changeover - or fear of a financial crisis - e.g. the Northern Rock bankruptcy in the UK in 2008 - there is a “dash for cash” on behalf of consumers. The financial industry is prepared for this and has developed business continuity planning in anticipation for instance of a flu pandemic.

However, trust in cash also provides credibility to electronic payments. Cash is the foundation upon which other payment mechanisms systems were

developed. Historically, the card was designed to facilitate cash withdrawals at ATMs, which still represent a third of card transactions today. This is well understood by payment card schemes which offer emergency cash in the case of lost or stolen cards. Entropia Universe, the fastest growing virtual world, introduced an ATM card system that connects directly with real-world ATMs machines internationally, for easy access to the conversion between virtual and physical currency. This allows Entropia members to conveniently access virtual PED (Project Entropia dollars) and transfer it into “real” cash.

For banks and merchants, cash and non-cash payment instruments compete against one another. They will favour the instrument which generates the higher revenue in once case and/or limit the transaction costs in the other. However, from a consumer perspective both are part of a holistic monetary system, which includes a mix of payment instruments and mechanisms. Each instrument has pros and cons in a specific transaction environment. The consumer will likely adopt a portfolio strategy aimed at diversifying risks by carrying a variety of instruments.

4.3 > Scenarios for the future of cash

In this section, we envisage and summarise three possible scenarios for the evolution of cash in the long term. These scenarios have been developed around five variables which we believe will be the key drivers for change in the payments market:

- **Technology:** the deployment of ubiquitous communication networks will pave the way for innovative electronic payment systems.

- **Regulatory environment** will foster or impede the development of interoperable standards.

- **Security and risk:** the perception of risk will impact consumer choice of payment instruments.

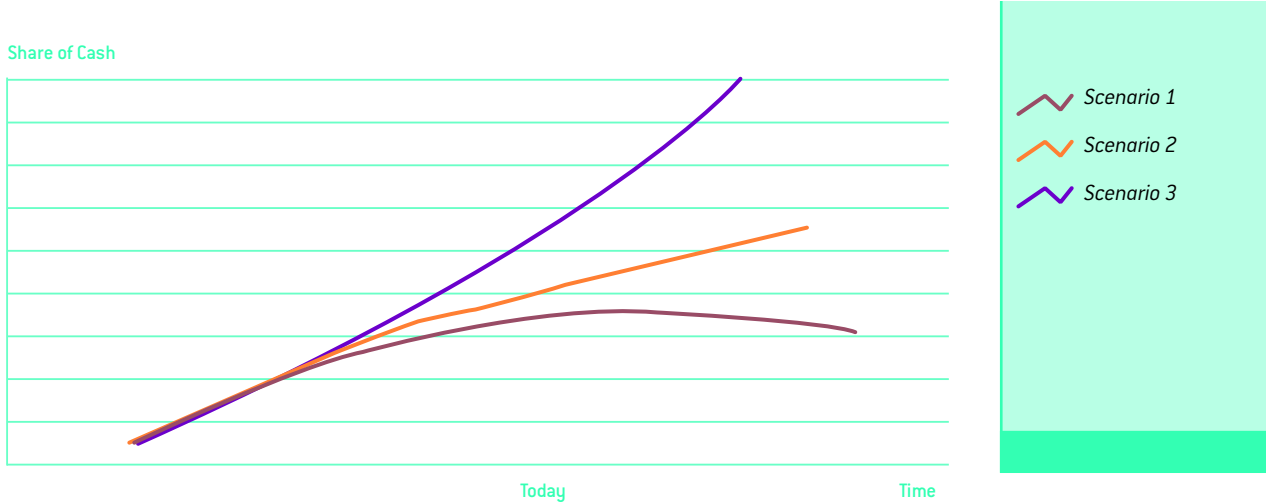
- **New forms of money:** could new forms of money challenge traditional central bank money?

- **Customer behaviour:** how, where and with what will customers pay?

4

. Future of Cash

FIGURE 12. THE LONG-TERM DIRECTION OF CASH



SCENARIO 1: slow decline in cash demand

In our first scenario, we envision a slow decline of the share of cash in transactions. Electronic payments providers aggressively pursue the war on cash and finally manage to penetrate the low-value payments market with contactless and pre-paid cards. Thanks to increasing volumes creating economies of scale, the costs of electronic transactions drop and they become cheaper than cash. Cash transactions will be marginalised to specific segments and merchants will surcharge for payments in cash. As the usage of cash in transaction declines, it also becomes less attractive as a store of value. New forms of money will be developed for those who do not have access to mainstream financial services.

At one point central banks decide they will no longer issue cash.

This migration will happen slowly. Payment behaviour is difficult to change.

Deployment of these technologies is relatively slow because of network externalities, e.g. the value to an individual user of a new payment solution depends on the number of merchants who accept and vice-versa.

SCENARIO 2: cash demand remains stable

In our second scenario, cash demand remains stable. Electronic transactions continue to grow but the providers focus on developing value-added services ranging from loyalty, to insurance,

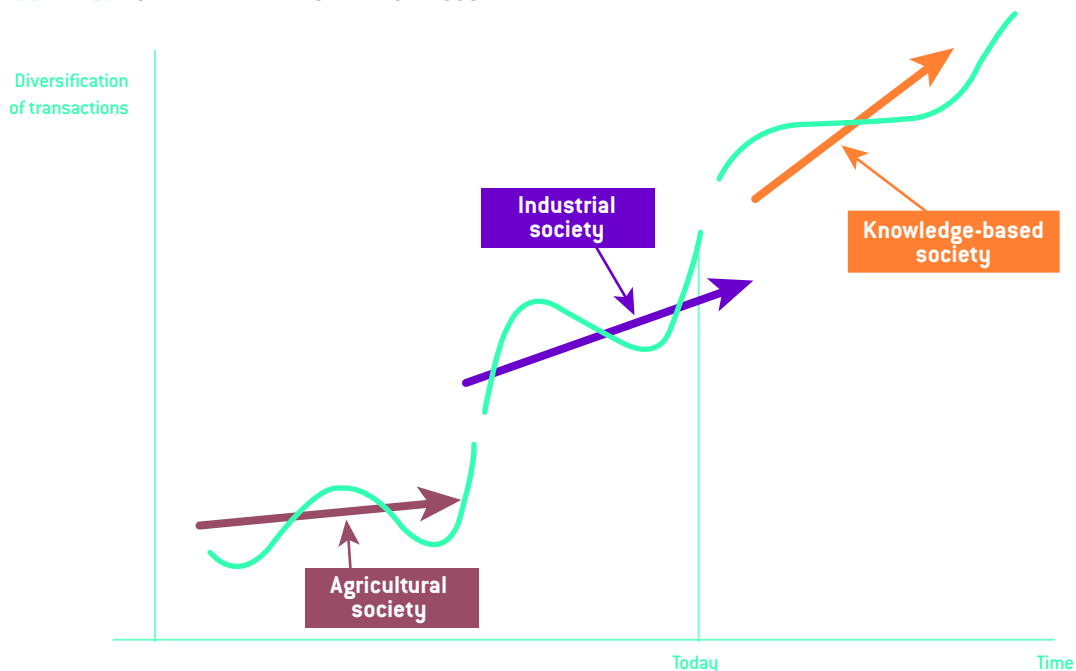
to identity. Customers are increasingly concerned about online fraud and security. The productivity of cash processing has been radically improved as banks and merchants increase automation and shorten the supply chain with recycling. Cash remains a cost-efficient payment instrument for commodity-type transactions. Cash also offers protection against risks associated with electronic payments. Governments will take action to ensure that they will not lose control of the money supply and will impose stringent regulations on privately issued currencies.

SCENARIO 3: cash demand grows

The third scenario assumes a sharp increase in transaction volumes. The transformation of our economies into learning-intensive societies will

lead to new transaction spaces. A familiar example of this evolution is the ability to create and distribute music in a digital format. In this case, new technologies and initiatives by actors throughout the value chain – including musicians, record labels, distributors, remixers, listeners... - have brought both threats and opportunities to traditional business models. This scenario would lead to important diversification of transactions which in turn would foster strong innovation in the payments area with new payment instruments and new business models. Rather than beating cash, payment providers will focus on supporting the emerging transaction economy. In this environment of fast innovation and high risks, cash would remain the foundation of the system.

FIGURE 13. TOWARD A LEARNING-INTENSIVE SOCIETY





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