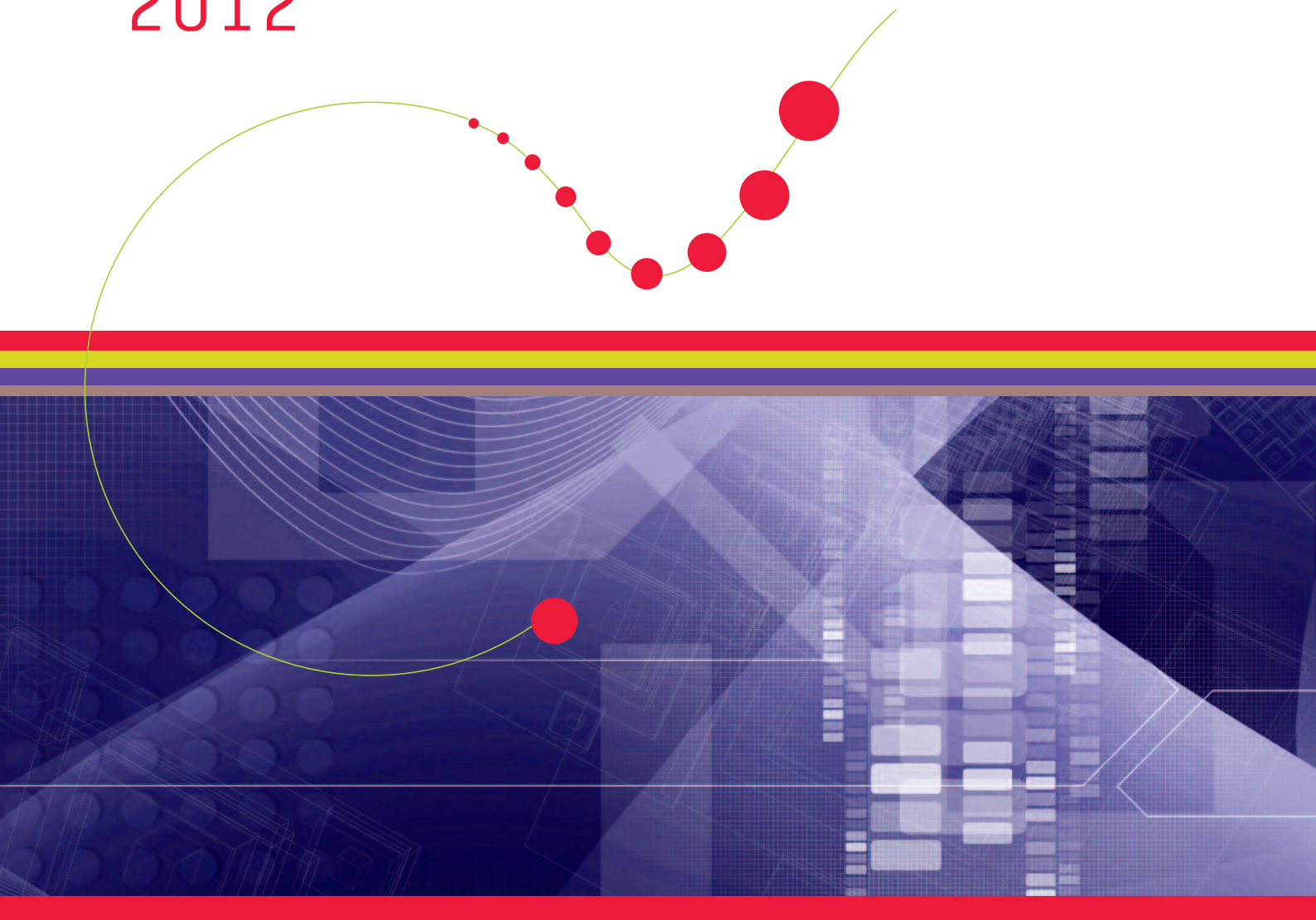


The Future of Cash

2012





. Foreword

Every day, consumers and businesses engage in transactions, which fuel the growth of local, national and global economies. In today's globalized and digital societies, cash plays a prominent role in enabling these transactions. For most people, paying has become a physiological need in the sense of Maslow's hierarchy of needs as it has become necessary to pay for even the most basic needs such as food, water or shelter. For some, cash is the only available payment mechanism. Others have a variety of instruments at their disposal but cash remains a strong and viable option for both consumers and businesses alike.

As key stakeholders in the cash cycle, our aim is to ensure it continues to support economic development. We believe it is our responsibility to bring awareness to its importance in our daily life so that all stakeholders can effectively contribute to the availability of and access to cash and to ensure that it remains a secure, trusted and efficient payment mechanism.

Therefore, we commissioned this fourth edition of the Future of Cash study to shed light on the status of cash in four distinct and different markets namely; Brazil, the euro-zone, South Africa and the United States of America. Participants in the study represent seven central banks; six commercial banks and two logistics/cash-in-transit (CIT) companies.

In addition to recognizing the wealth of knowledge we acquired from our reference sources, we gratefully acknowledge and thank our participants for their invaluable time and contributions and the ATMIA Cash Council, for its valued support. With much gratitude, we would like to also thank Mr. Dan Littman of the Federal Reserve Bank of Cleveland, who graciously agreed to review and edit our report for content and clarity.

Eric Boissonas
General Manager
KBA-Notasys

Jean-Yves Ray
Marketing Director
SICPA

Christopher George
Chief Operating Officer
iCVn

. About us



www.kba-notasys.com

KBA-NotaSys is regarded as the main driver of innovation and excellence within the high-security printing industry. Working hand in hand with our clients and partners, we have continuously elevated the art of banknote printing to new levels. By listening to our clients' needs we have expanded our range of products and services to meet the ever-changing challenges of our market.

Today we offer a unique range of products and services to authorised security printers and central banks enabling them to design, produce and issue banknotes according to their specific and individual needs.



www.sicpa.com

Leading global provider of security inks and integrated security systems for governments, central banks, security printers and brand owners, SICPA is the trusted partner in matters of currency, security documents and the protection of government revenues and brand products against illicit trade.

Established in 1927, the company has expanded to a multi-national group with headquarters and research centres in Switzerland with offices and manufacturing facilities in 26 locations on five continents. SICPA believes in the power of knowledge and innovations, and its continued success is built on talents coming from a wide range of competencies, notably chemistry, engineering, computer and material science.



www.icvn.com

iCVn, a Maryland USA company, has patented and implemented the world's first cash tracking and validation network. Our proprietary *CashTrakker*™ desktop software and mobile application allow for the validation and tracking of currency banknotes, negotiable instruments, wire transfers and prepaid cards using our dynamically updated proprietary databases that reside in a global network. iCVn is currently tracking multiple currencies worldwide and has sold systems to law enforcement, intelligence agencies and financial institutions, domestically and internationally. iCVn's next generation cash tracking solutions will target the retail and gaming industries. We are honored to sponsor this international study on the Future of Cash.



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.



www.asi-consulting.com

ASI Management Consultancy provides business development and strategic consulting to financial institutions, gaming enterprises and technology companies serving these industries. Additional areas of focus and expertise include product development as well as marketing and sales support. Leveraging the experience and knowledge of a network of consultants throughout the world, ASI provides its strategic consulting services in North and Latin America and EMEA.

Table of contents

FOREWORD	3
ABOUT US	4
TABLE OF CONTENTS	5
1. EXECUTIVE SUMMARY	6
INTRODUCTION	8
2. DEMAND FOR CASH	10
2.1 Cash in Circulation	10
2.2 Understanding Cash Usage	13
2.3 The Impact of the 2008 Financial Crisis on Cash Demand	16
2.4 The Share of Cash in Retail Payments	17
2.5 Why is Cash Used	19
3. THE EVOLUTION OF THE CASH CYCLE	21
3.1 The Four Cash Cycles	21
3.2 Key Trends Impacting the Cash Cycle	24
4. LONG-TERM PERSPECTIVES	33
4.1 Growth in Global Transaction Volumes	33
4.2 Adapting to Changes	36
4.3 Winning the Efficiency Battle	37
4.4 Long-term Scenarios	41
APPENDICES	44
List of Participants	44
Bibliography	45

. Executive Summary

Cash Demand is Growing

During the past decade, cash in circulation has been growing at exceptional rates in all four markets covered by this research – Brazil, the euro-zone, South Africa, and the United States. In Brazil and South Africa, this has been driven primarily by transactional cash, fuelled by sustained growth of GDP and consumer expenditure. In the euro-zone and the US, the larger part of this growth results from hoarding, both at domestic and international levels; nonetheless, transactional cash has been growing as well.

The 2008 financial crisis and ensuing debt crisis have demonstrated the fundamental contingency role of cash. The crisis has led to significant peaks in cash demand, as consumers reallocate their savings in times of instability. It has also changed spending behaviors as many consumers have shifted away from electronic payment instruments to cash in order to tighten their control over their budget. The crisis has reminded us that cash is far more than a payment instrument; it is the foundation of the modern financial system.

Cash remains, and by far, the most widely used payment instrument; it is used to settle between 8 and 9 transactions out of 10. Nonetheless, the relative share of cash is declining with the development of alternative payment instruments, but in most countries, this is compensated by growth in transaction volumes. A reduction in cash usage at the point of sale leads to lower demand for transactional banknotes but does not impact demand for banknotes used for hoarding. Consequently, a reduction in transactional cash

would only have a moderate impact on the overall value of cash in circulation.

The Cash Cycle is Changing

The role of central banks in the cash cycle is changing. Strong developments in fitness sorting technology have led to significant productivity gains and have enabled central banks to consolidate their infrastructure. Furthermore, central banks have evolved their cash distribution models to facilitate commercial recirculation of banknotes. The level of involvement of central banks in fitness sorting varies significantly between countries; some central banks mainly process unfit banknotes prior to destruction – e.g. South Africa, the Netherlands; others continue to play an important role in the processing alongside the commercial sector – US, France, Germany... In all cases, central banks are increasing their supervisory and monitoring role to ensure the quality and authenticity of cash in circulation.

Commercial recirculation has developed in different ways in different markets.

- Some markets have implemented 'industrial' or cash centre recirculation; this is particularly the case where central banks offer some form of balance sheet relief to the commercial sector to compensate the opportunity cost of holding additional cash inventories. It also enables commercial processors to merge stocks from different customers and therefore achieve economies of scale. This is the case in the US, in the Netherlands, in South Africa and Brazil.

- Other markets have opted to recirculate at the bank branch either at the front-office using recirculating ATMs or teller cash recyclers, or in the back-office. This includes but is not limited to Belgium, France, Germany, and Spain. Local recirculation contributes to shorten the cash cycle.

The increase in commercial processing has led commercial banks to rethink their own infrastructure and achieve the optimal balance between in- and outsourcing. One model which has been developing recently is the 'interbank utility' where banks pool their cash centers into a single entity. This model is present in Austria with GSA, in the Netherlands with GSN, in South Africa with SBV. Some countries have opted to pool their ATM estates into a single jointly-owned company such as Automatia in Finland. For commercial banks, this model is aimed at reducing the cost of the cash infrastructure. For the central bank, it contributes to a more robust cash cycle, by reducing the number of entities involved, thus easing the oversight and enforcement responsibilities.

Another trend is emerging in several markets: cash is being processed closer to the point of sale. This has been driven by technology, as a range of new solutions has been emerging: smart safes, self check-out devices for notes and coins, end-to-end automated solutions... It has also benefited from lower interest rates which reduce the opportunity cost of holding cash and limit the need to transport cash back to the central bank. Commercial banks have been replicating the strategies of the central bank as they in turn have been pushing processing down the food chain towards their customers and crediting cash which is still held on the customer's premises.

Long-term Prospects

There is strong consensus that the overall volume of payments will increase in the future. The evolution towards knowledge-intensive

societies will change traditional ways of doing business and create new business models, new distribution channels, more tailored and segmented products and services. This will result in the emergence of new transaction spaces. Cash will face increasing competition from new payment instruments in this environment. Nonetheless, cash will continue to play an essential role. On the one hand, the resilience of cash is such that the substitution of cash would be a very slow process. On the other hand, the fundamental attributes of cash – universality, trust and anonymity – will continue to play key societal roles in the future.

The diversification of payment instruments will accelerate the competitive pressures on cash, which faces a significant efficiency challenge. The societal cost of cash is widely used as an argument in favor of cash substitution, but there are significant opportunities to further optimize the efficiency of cash. Key levers to further reduce the cost of cash are:

- Incremental productivity gains through new technology and process improvements
- Further integration of the cash cycle through standardization
- Optimization of cash inventories by industry-wide management information systems

However, the real question is not the actual cost but rather how and by whom it is funded. Today, the costs are split between the stakeholders – central banks, commercial banks, retailers, consumers – and this balance is based on a high level of cash usage.

Innovation will benefit cash. It is often assumed that new technologies will foster alternative payment instruments and cash substitution. Historically, cash has largely benefitted from new technologies; the ATM and the payment card have largely improved the availability and access to cash. We believe new technologies will further increase the availability of cash, broaden the range of uses and improve its efficiency and convenience.



. Introduction



*When I was young I thought that
money was the most important
thing in life; now that I am old
I know that it is.*

Oscar Wilde



In this fourth edition of the Future of Cash report, we endeavor to understand the ongoing forces which are driving change in the cash cycle, affecting the fundamentals as well as accommodating weak signals from the market place. It is not our intention to provide all the answers but we hope to inspire innovative thinking and new responses to the challenges faced by the stakeholders.

The previous editions of the Future of Cash were focused on the euro-zone following the introduction of the euro, which represented an unprecedented logistical operation. This edition covers four markets: Brazil, the euro-zone, South Africa and the United States of America.

The first section analyses the evolution of demand for cash both in quantitative and qualitative terms. The second section addresses how the cash cycle has been changing and compares the evolutions across different markets. The third section looks at the long-term prospects.

This report has been authored by Guillaume Lepecq of AGIS Consulting and Hamlet Ambarsoom of ASI Management Consultancy. It is based on desktop research as well as a series of interviews with key stakeholders in the cash cycle - including central banks, commercial banks, and third-party cash logistics and processing companies in all four markets. The list of organizations interviewed appears in appendix 1.

The information and opinions included in this report have been gathered to the best of our knowledge, but the authors do not accept liability for any loss arising from its use.

Before we begin, for comparison purposes, here we present some relevant data across the four markets of the study.

	Brazil	Euro-zone	South Africa	USA
GDP 2010 ¹ (in USD billions)	2,088	12,140	363.9	14,587
Population (in 2010, in millions)	195	331	50	309
GDP per capita In USD in 2010	10,707	36 566	7,280	47,207
Surface area sq km	8,514,877	2,752,623	1,219,090	9,826,675
Population Density Per sq km	23	120	36	31
Banknotes in Circulation ² (in USD billions, 2010)	81	1,113	11	942
Banknotes in circulation ³ (in millions of pieces 2010)	4,815	14,171	962	30,350
Banknotes in Circulation per capita in USD	415.38	3,392.75	220.00	2,873.79
Cash in Circulation/GDP in %	3.88	9.25	3.02	6.09
Central Bank branches ⁴	10	257	7	26
Commercial bank branches ⁵	31,657	180,639	3,429	110,465
Number of ATMs ⁶	155,566	319,717	23,259	425,000
ATM density ATM per million people	712	966	429	1,359
Number of Major Cash-In-Transit companies	4	4	4	3
Population Growth in % ⁷	+0.9	+0.3	+1.4	+0.8
Unbanked Population ⁸	57%	9% Range: 1%-25%	54%	9%
Number of electronic transactions per capita ⁹	102	166	44	320

1: The World Bank & Eurostat

2: Central banks, end of year figures except for South Africa (end of March)

3: Central banks, end of year figures except for South Africa (end of March)

4: Central banks

5: CPSS Red Book Statistical Update – January 2012 and ECB

6: CPSS Red Book Statistical Update – January 2012 and ECB

7: 2010 data from the World Bank and Eurostat

8: Half the World is Unbanked ; Financial Access Initiative & McKinsey, October 2009

9: World Payments Report ; RBS Capgemini EFMA and CPSS Red Book Statistical Update – January 2012



2

. Demand for Cash

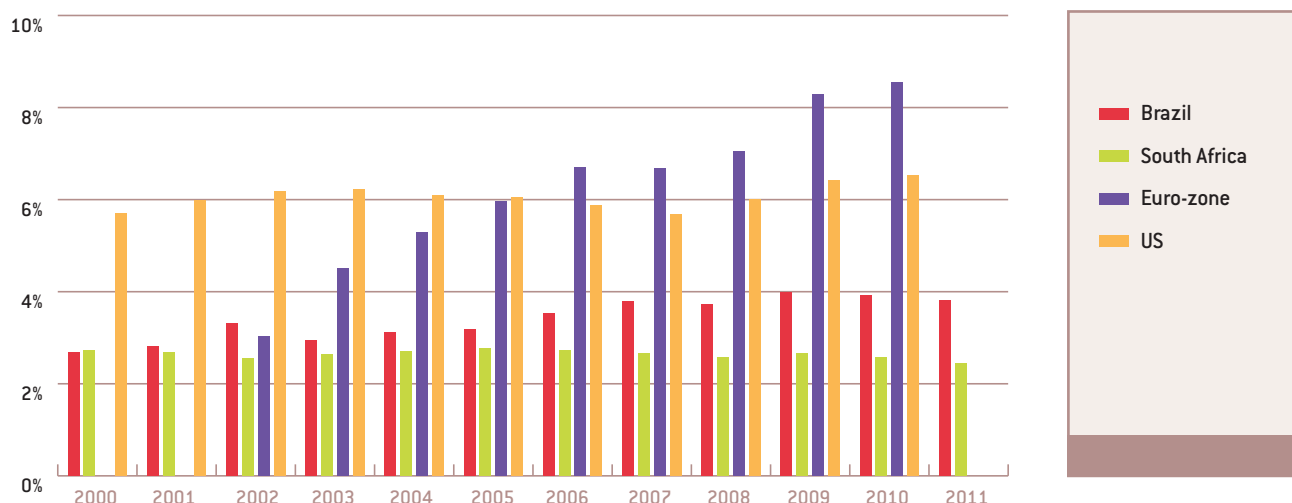
2.1 > Cash in Circulation

Currency in circulation refers to the number and value of banknotes issued by the monetary authority, regardless of who holds it: consumers, businesses or financial institutions. It is the most widely used metric to measure cash demand. In the four markets studied in this report, the 2002-2011 Compound Annual Growth Rate of the value of banknotes in circulation was 14% in Brazil, 10.6% in the euro-zone, 9.5% in South Africa and 5.5% in the US. The value of banknotes in circulation in these markets exceeds USD 2,000 billion.

During this period, the transition economies of Brazil and South Africa have experienced sustained growth; however, cash in circulation has exceeded GDP growth. In both countries, demographics have had a positive impact on cash in circulation, as the economically active population has been increasing and moving up the social ladder. In the case of the euro-zone exceptional growth rates followed the euro changeover as the reserves of hoarded cash in the legacy currencies of the euro which had disappeared, prior the changeover, were reconstituted; also, the international demand for euro has fuelled growth over the period. However, following the changeover, annual growth rates have constantly fallen to between 4 and 7% per annum in the course of the years. In the US, the cash-in circulation to GDP ratio has remained remarkably stable over the period, with a slight increase since 2007.

At a macro-economic level, cash demand is traditionally related to GDP growth, private consumption and inflation as well as the exchange rate, which drives international demand. In more mature economies such as the USA or the euro-zone, there are alternatives to cash both as a store of value and as a payment instrument and this could in theory challenge historic models. However, during the last decade the weight of cash in the economy has been stable in the US and has almost trebled in the euro-zone, from approximately 3% in 2002 to 8.5% in 2010. It is likely that the euro has challenged the dollar as an international reserve currency, especially in the countries surrounding the euro-zone and this explains the growth differential between the two currencies. Low interest rates since the 2008 financial crisis have reduced the opportunity cost of holding cash.

CASH IN CIRCULATION/GDP

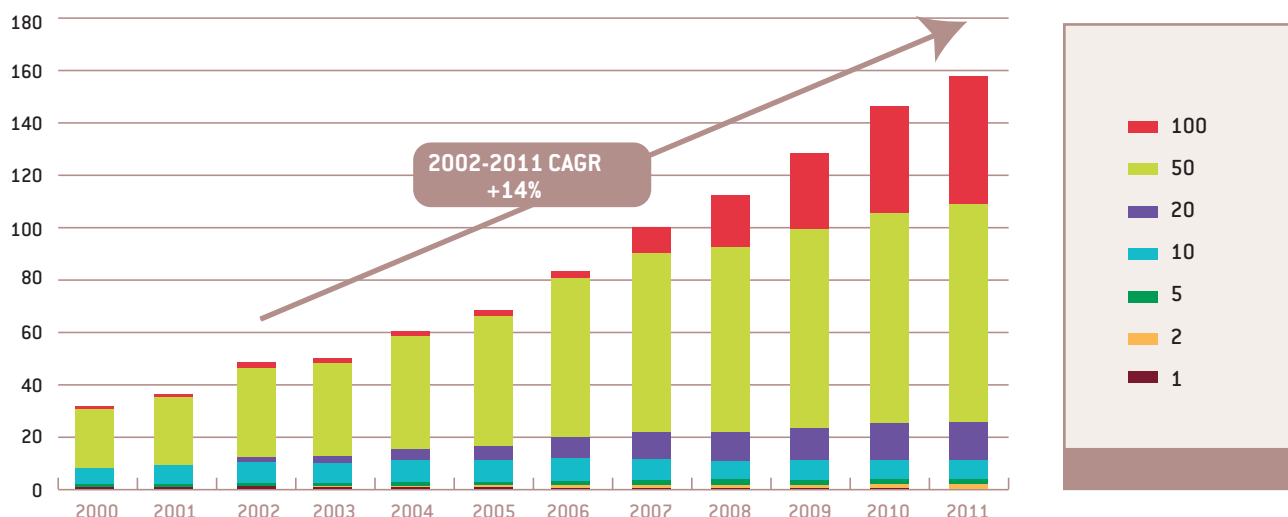


In the four markets, all denominations have been growing. But the relative growth rates of each denomination are an indication both of the usage of cash and the organization of cash distribution. In Brazil, cash in circulation is dominated by the, BRL 50 note, which represents approximately 50% of value. In South Africa, there is an overdependence on the ZAR 100 denomination, which represents 75% of value

and 50% of volume. The SARB has set an objective to reduce its weight in favor of lower denominations. In the euro-zone, the EUR 500 represents a third of value, while in the USA the USD 100 represents 80% of the circulating dollars clearly illustrating the international dimension of these currencies as these high-value denominations are to a large extent used overseas.

• Brazil

VALUE OF CASH IN CIRCULATION IN BILLIONS OF REAL, AT YEAR END

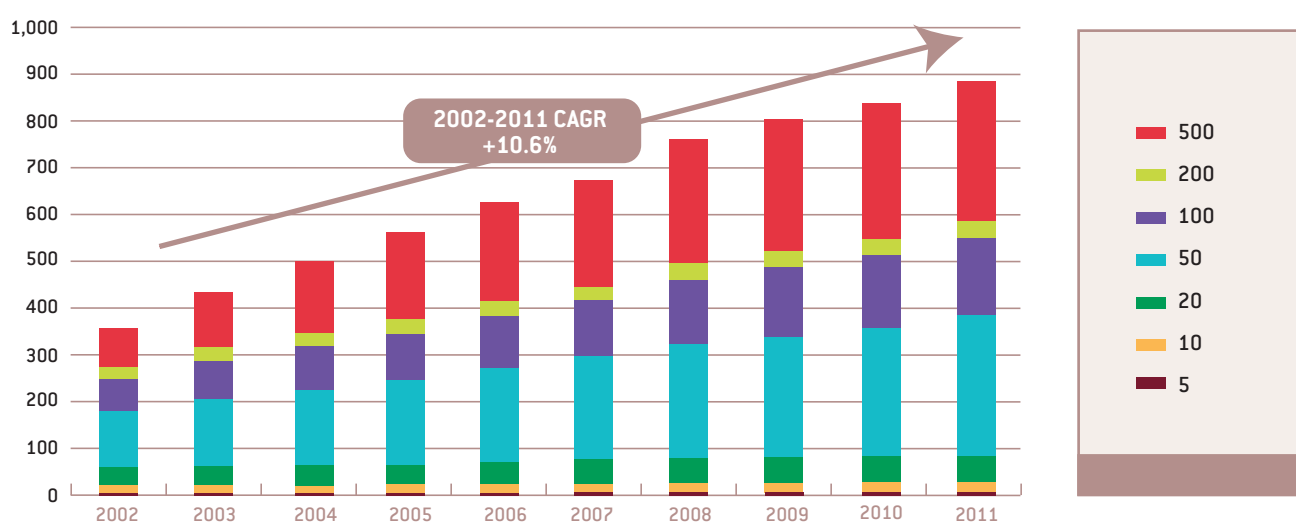


2

. Demand for Cash

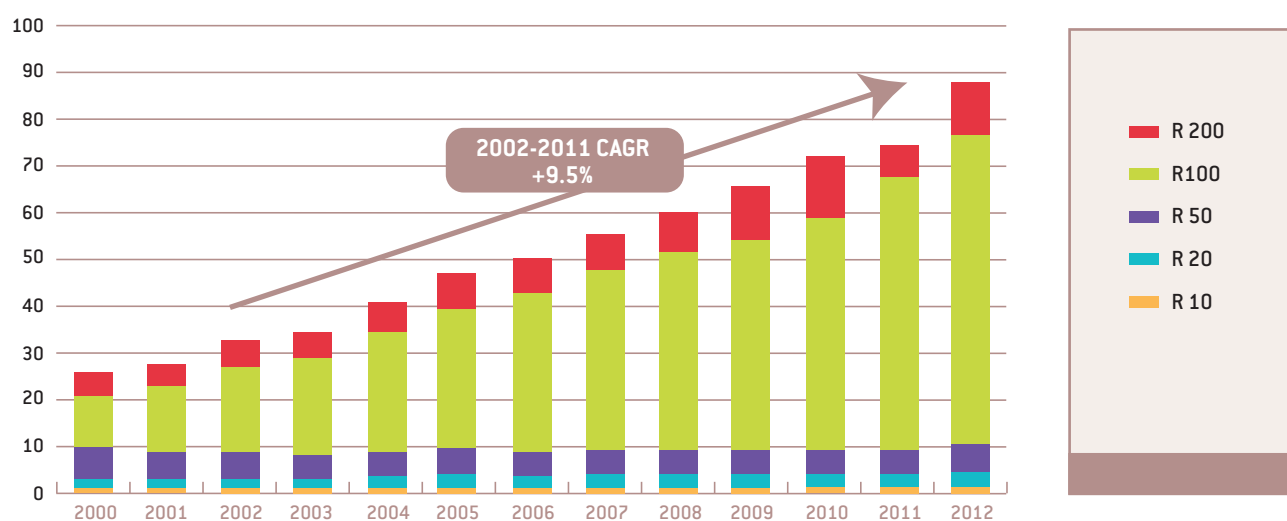
• Euro-zone

VALUE OF CASH IN CIRCULATION IN BILLIONS OF EUROS, AT YEAR END



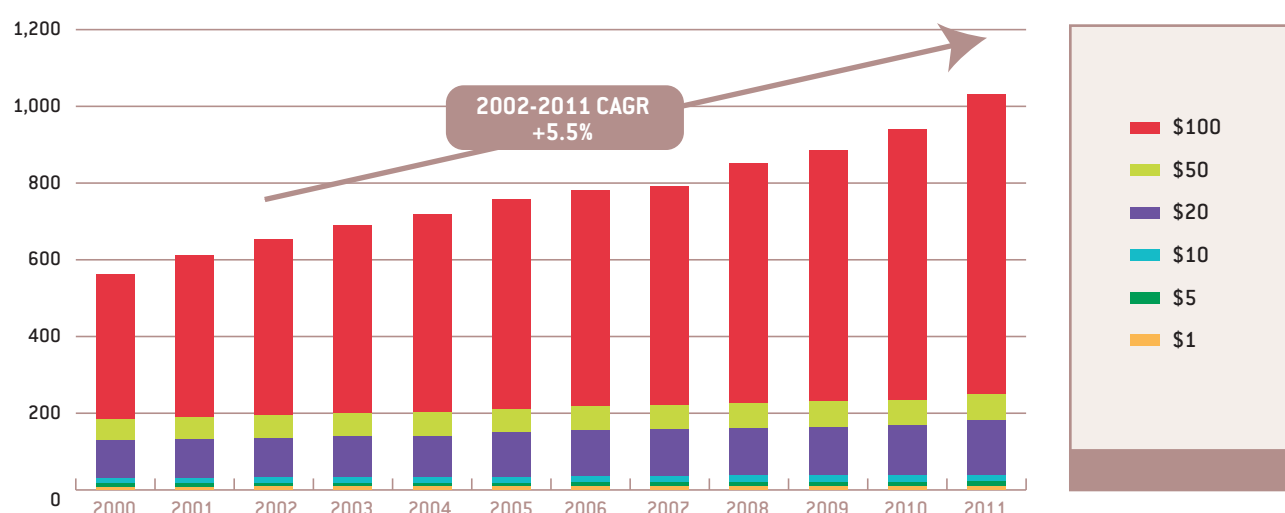
• South Africa

VALUE OF CASH IN CIRCULATION IN BILLIONS OF RAND, AS OF END OF MARCH



• United States

VALUE OF CASH IN CIRCULATION IN BILLIONS OF DOLLARS, AT YEAR END



2.2 > Understanding Cash Usage

While central banks know precisely the amount of outstanding currency, less information is available as to where it circulates, who holds it and why. Money is often defined in terms of three functions: a medium of exchange, a store of value, and a unit of account. Cash fulfils all three functions and the first two account for growth in circulation.

Cash as a Medium of Exchange

Assuming cash represents between 8 and 9 transactions out of 10, over 2,000 billion transactions are carried out using cash every year across the globe.

Measuring transactional cash is a challenge as the same banknote can be sometimes hoarded and then used for a transaction and vice-versa. Based on an earlier study from 2004, the ECB estimated that around one-third of the total

value of banknotes in circulation at the end of 2008 was held for transaction purposes¹. In September 2011, the Deutsche Bundesbank estimated that only 10 to 15% of net banknote issuance in Germany was used for domestic transactions. However, the Deutsche Bundesbank is the main supplier of euro banknotes to countries outside the euro-zone and this significantly increases the German net-issuance figure. Assuming that around one third of euro banknotes in circulation are used for transaction purposes, this amounts to roughly EUR 290 billions at the end of 2011.

There is no clear separation between hoarded and transactional cash but a first-cut approach consists of considering low-value denominations as transactional and high-value as hoarded, i.e. for the euro, the 5, 10 and 20 denominations and for the dollar the USD 1, 5, 10 and 20 denominations are transactional. In the euro-zone, the growth for transactional notes has

1: ECB Monthly Bulletin April 2011

. Demand for Cash

been higher than private consumption, with an average annual growth of 3.6% between 2002 and 2010. In the US, these denominations represent 17% of the total value of cash in circulation and 70% of the volume.

It should be noted that there are significant seasonal variations of transactional cash, which reflect the variations in consumer spending across the week, the month or the year. Typically, in all four markets analyzed cash in circulation will peak towards the end of the year as consumers prepare for Christmas.

Cash as a Store of Value

As cash is a non-interest bearing asset, there is an opportunity cost of holding cash equal to short-term interest rates. Theoretically, this should limit the attractiveness of cash as a store of value. Nonetheless, cash presents a number of attractive features for those who hoard it:

- **Liquidity:** by definition, cash is a liquid asset which can be immediately transformed for consumption purposes or to acquire other assets.
- **Availability:** cash is available to all, including those who do not have access to banking services or who do not understand or trust other assets.
- **Trust:** currencies which are hoarded are perceived as strong stable currencies. As an illustration, in spite of the recent debt crises which have hit both the USA and the euro-zone, there has been little impact on currency demand.

In Brazil and South Africa, little information is available with respect to hoarding. However, given the relatively high interest rates it is unlikely that people who have access to banking services would hoard cash. This leaves the unbanked and under-banked, who have limited alternatives, but while hoarding is naturally important for these groups it is unlikely to represent a significant share in value.

International and/or Regional Use

Both the dollar and the euro are prominent international currencies and they are used extensively outside of their borders. In the case of the dollar, it is estimated that between 55 and 66% of the value of US currency is held in foreign countries, primarily in USD 50 and USD 100 denominations.

In the case of the euro, the ECB has estimated that, at the end of 2008, between 20% and 25% of the euro banknotes in circulation were held abroad, essentially in neighboring countries such as Russia. However, this estimate is based on essentially on registered bulk bank shipments outside the euro area and we expect that the real figure is closer and possibly higher than the upper band.

The Rand is emerging as a regional currency; it is legal tender in the Common Monetary Area which links South Africa, Lesotho and Swaziland into a monetary union and it is also increasingly used in bordering countries such as Namibia and Zimbabwe. The Real on the other hand cannot be considered as a regional currency but it is used marginally in the bordering countries namely Argentina and Paraguay.

Supply-chain Inventories

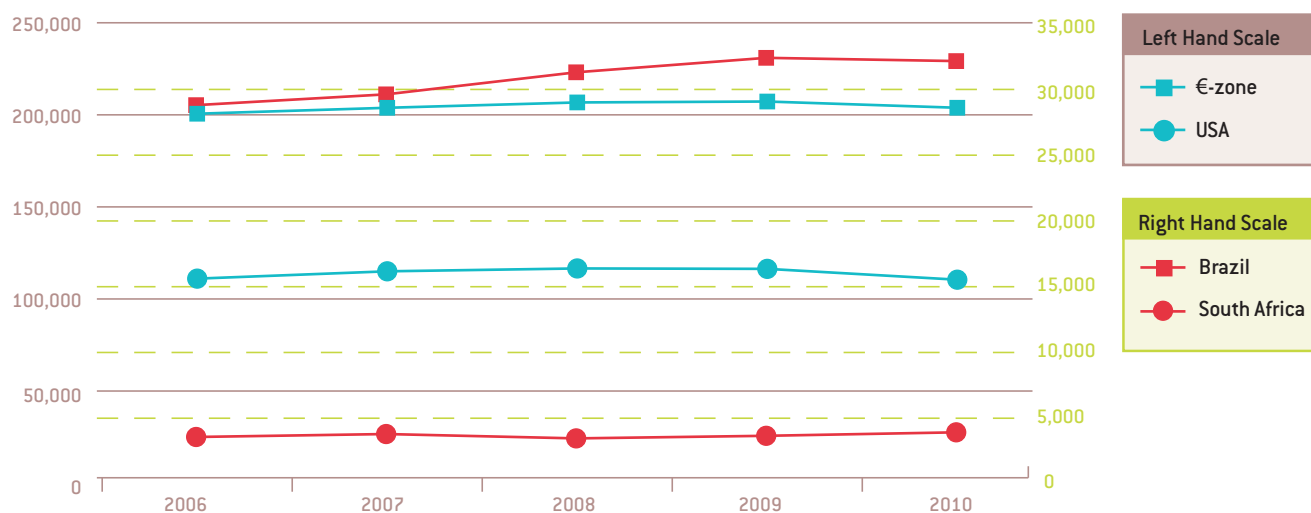
The smooth functioning of the cash cycle requires a certain amount of cash: retailers require change in their tills before accepting a cash payment at the beginning of each day; ATMs are stocked with cash in order to fulfill cash withdrawals.

As described in the next section of this paper, there has been a decentralization of the cash cycle over the past decade. Ten years ago, cash was essentially counted and sorted in cash centers, as banks were reducing processing at their branches; today, cash is increasingly processed and recirculated closer to the point of sale. The multiplication of cash delivery points and the increase in automation have led to an increase in cash inventories throughout the cash supply chain. The growth in the installed base of ATMs is a clear illustration of this process. While the number of bank branches has remained

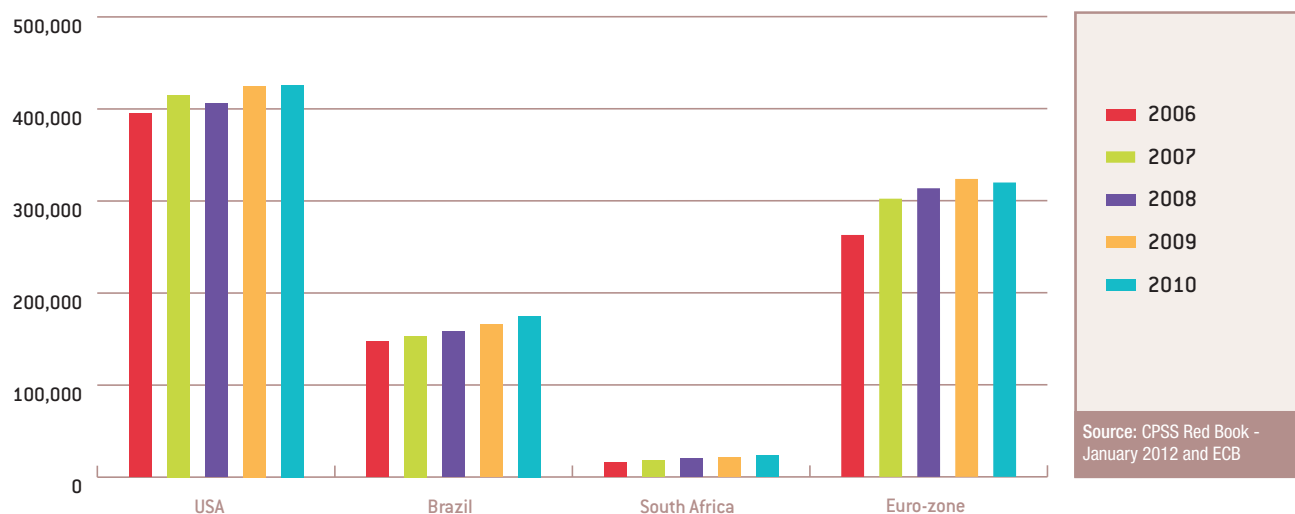
stable in the four markets during the past five years, the installed base of ATMs has grown. However, a recent study¹, predicts that by 2020, in America and Europe, the number of bank branches will be as much as 50% less than the current count, attributing this reduction to

technological advancements and higher levels of financial sophistication amongst consumers. More recently, there has been growth in retail devices such as smart safes, recycling units, self-check-outs... which also lead to additional inventories.

NUMBER OF BANK BRANCHES



NUMBER OF ATMs



1: Global Retail Banking 2020 – Key trends and implications for retail banking real estate; James Brown, Lee Elliott, Colin Burnet; Jones Lang LaSalle



2

. Demand for Cash

2.3 > The Impact of the 2008 Financial Crisis on Cash Demand

The financial crisis which shook the world in 2008, has had a considerable impact on cash demand across the globe. The most visible consequences in the mature economies of the US and the euro-zone, have been a loss of confidence in global finance and a significant increase in demand for cash. The crisis actually had multiple and complex impacts on cash demand.

Increase in Hoarding

The first and most visible impact has been an increase in hoarding, in the wake of the collapse of Lehman Brothers in October 2008, as anxious customers withdrew their money from their bank accounts. The ECB has measured that the additional demand for euro banknotes resulting from the financial crisis represented EUR 35 billion during the months of September and October 2008¹, a large part of which came from abroad. Two thirds of this demand was for EUR 500 banknotes.

Increase in Transactional Cash

But the financial crisis has also led to an increase in transactional denominations as consumers moved away from credit cards to debit cards and cash. Part of this shift is mechanical: with the economic slowdown, consumers have been reducing their spending and consequently the average transaction values have dropped. And cash is more widely used for lower-value transactions. The 2010 FRB Boston Survey of Consumer Payment Choice (SCPC) shows that consumers shifted toward cash payments in 2009 and reduced their use of payment cards. As a result, the

share of cash in consumer payments increased from 20.8 percent in 2008 to 28.2 percent in 2009 and nearly 29% in 2010. And even though the cause is not clear, a survey of the British Retail Consortium shows that cash usage has increased by 5.7% in the United Kingdom in 2011².

Budget Control

It also appears that some consumers have returned to envelope budgeting; in order to better control their monthly budget they prepare cash envelopes for their main expenses. This process illustrates another key function of cash – the unit of account. More than any other payment instruments, cash enables consumers to understand and measure the value of goods and services and control their budgets. This becomes critical at a time when consumers need to de-leverage.

The financial crisis has clearly demonstrated the contingency role of cash, which becomes a refuge value in times of crises. Besides the 2008 financial crisis several other crises have unfortunately reminded us of this important role: the earthquake and tsunami in Japan in 2011, Hurricane Katrina in New Orleans in 2005, the September 2001 terrorist attacks in the US, not to mention the Y2K changeover. In the US, cash in circulation grew by 20% in 1999, in anticipation of the Y2K changeover. At the time of writing of this report, the Greek debt crisis led to a sharp increase in cash demand in May 2012. Large outflows of cash during all these events have contributed to keep the financial system afloat by enabling transactions in times of instability.

1: ECB Monthly Bulletin, April 2011

2: Cost of Collection Survey, British Retail Consortium

One key question remains: how long will the impact of this crisis last? Will consumers go back to their pre-crisis payments and savings habits as soon as the economy recovers or will this have a long-term impact? It is worth mentioning that the Great depression shaped the saving behavior of an entire generation. In

the USA, consumers rate cash highest in virtually every payment characteristic (acceptance, convenience, cost, and security) and the rankings have strengthened between 2009 and 2008. This suggests that consumer demand for cash is unlikely to disappear any time soon¹.

2.4 > The Share of Cash in Retail Payments

Measuring the Share of Cash

The value of cash in circulation is not directly related to the share of cash as a retail payment instrument, essentially because cash is also used for other purposes than transactions.

Unlike other payment instruments, cash transactions are not registered and monitored individually by banks and payment schemes. Accurate data on the volume and value of cash transactions is not available and surveys are required to estimate these figures. Two main approaches are used. The first is a top-down approach, which consists in measuring private consumption and deducting the value of cashless payments; the difference gives an approximation of the value of cash payments. The second is the diary method whereby a representative sample of consumers is invited to register all their transactions during a given period of time. Both methods however only provide estimates and the margins of error can be significant; one survey carried out in the Netherlands² indicated that the volume of cash transactions ranges from 3 to 7 billion transactions.

In Europe, the ECB's company survey on the use of cash estimated that the value of transactions paid in cash in 2008 amounted to

around EUR 1,400 billion in the sectors of activity covered by the survey. This exceeds the transactions paid with debit and credit cards which amounted to just below EUR 1,000 billion.

In South-Africa, the reserve bank has estimated that 86% of retail transactions volumes and 56% of value were settled in cash in 2011.

In the United States, the Federal Reserve Bank of Boston conducts an annual survey of consumer payment choice¹. In 2009, the survey concluded that the average consumer made 64.5 payments in a typical month. Debit cards were the most commonly used instrument with 29.3% of payments, followed by cash with 28.2% and credit cards with 11.2%. These figures include all types of payments, i.e. bill payments, online payments, retail, service and person-to-person payments; if we look at retail, service and person-to-person payments – then cash is first with 25.2% followed by debit cards with 19.8%.

In Brazil, for 72% of the population, cash was the most frequently used payment instrument in 2010. Nonetheless, the figure dropped from 82% in 2007. On average, 59% of consumer spending was paid in cash in 2010, down from 77% in 2007³.

1: *The 2009 Survey of Consumer Payment Choice*, by Kevin Foster, Erik Meijer and Michael A. Zabek; Federal Reserve Bank of Boston.

2: *Explaining cash usage in the Netherlands: the effect of electronic payment instruments*; DNB Working paper N° 136, March 2007.

3: *O brasileiro e sua relação com o dinheiro – III*; Banco Central do Brasil, 2010.

. Demand for Cash

The rational arguments for selection of cash as a payment instrument are well known – budget control, convenience, anonymity... - but there are also subconscious reasons which will trigger this decision and which are less well known. Payment behavior differs according to the payment instrument used: e.g. people spend more in coins than in banknotes; in NYC, taxis receive larger tips with cards than with cash; card issuers often argue that card usage increases spending... Research from the DNB¹ has shown for instance, that Dutch residents originating from countries which are more cash intensive are likely to use more cash in the Netherlands as well.

The Relative Share of Cash at the Point of Sale is Declining

In the long-run, cash has been challenged and substituted by other payment instruments and the debit card in particular. The competition first came from checks, followed by credit and debit cards. The competition is intensifying with the multiplication of alternative payments instruments, many of which are specifically targeting low-value transactions – pre-paid cards, contactless cards, mobile phones.... While the share of cash within all payments has declined, in most cases this has been offset by the growth in transaction volumes.

One country which has seen a stronger decline in cash usage than most is the Netherlands, where DNB research shows a decline both in the number of transactions and in value between 2007 and 2010. A major driver for this cash substitution has been a joint campaign in 2008-2009 from banks and retailers to promote card payments. Following an agreement with retailers, banks agreed to stabilize the cost of interchange fees if retailers promoted electronic transactions. This resulted in growth in card transaction volumes. The effect of the campaign stabilized in 2010. This could be a signal that there is a threshold below which it is difficult or costly to reduce the level of cash usage.

In the case of the Netherlands, the decline in cash usage has been driven by an industry initiative to promote card payments rather than by consumer preferences. Nordic countries have also seen a decline in cash usage; in these cases banks have rendered access to cash more difficult and costly by reducing their ATM fleets and closing down cash services in their branches. As a result, ATMs in Finland and Sweden have the highest usage rate in the European Union with 8,500 and 5,000 withdrawals per month, respectively.

A finer analysis shows that cash is crucial in some segments. This is the case for example in restaurants and bars, in convenience stores as well as many service providers. In Brazil, bakeries receive 95% of their revenue in cash, and public utilities 83%². As stated earlier, in general, cash is more widely used for low-value payments.

Cash usage is very much influenced by lifestyle factors, and in particular where people shop. Typically, smaller stores tend to be more cash intensive, whereas large retailers see more card usage. If online shopping increases, then cash usage is likely to decline. However, in recent months major on-line shopping sites and on-line stores of major retailers have indicated they accept cash for on-line purchases. For example, shoppers in the United States can now make on-line purchases at Walmart and make a cash payment at a local store. Two factors are driving this new convenience. One, this form of payment allows the unbanked and or the under-banked with no access to credit or debit cards to make on-line purchases. Two, retailers can offer products and services on-line, which are not available at their stores. One potential long-term benefit for the retailers is their ability to reduce the store size by offering larger products on-line only.

1: *Choosing how to pay: the influence of home country habits*; Anneke Kosse and David-Jan Jansen, DNB working paper n° 328, December 2011

2: *O brasileiro e sua relação com o dinheiro – III*; Banco Central do Brasil, 2010

2.5 > Why is Cash Used

The success of cash is based on three key values: universality, trust and anonymity.

Universality

Universality means that cash is widely accepted, in a variety of situations. It does not require technology to pay or be paid. It can be used by all, young or old, rich or poor and accepted by all. For some segments of the population it is the only available payment instrument e.g. the unbanked, children... For other groups, it is the most convenient payment instrument e.g. the blind, those suffering from mental illnesses, the illiterate... as it provides ease of use. Banknote printers have invested in the designs to facilitate the use of notes by these groups. The fact that cash does not require an infrastructure means that it is the preferred payment instrument for those who do not process large volumes of transactions. Cash is also available for a broad range of transactions; face-to-face transactions, peer-to-peer transactions. Cash is suitable for micro transactions – e.g. parking meters; it is the most common instrument for low-value transactions (under USD 20) but it is also used for high-value transactions, which exceed credit-card limits. It is widely used for remittances either through formal or informal systems, such as 'Hawala' (meaning transfer, also

known as hundi) which is an informal value transfer system based on the performance and honor of a huge network of money brokers, primarily located in the Middle East, North Africa, the Horn of Africa, and South Asia. It is basically a parallel or alternative remittance system that exists or operates outside of, or parallel to traditional banking or financial channels.

Trust

The second core value of cash is trust and this is based on a combination of factors. As legal tender, cash is issued by a public monetary authority and is perceived as public money, with the backing of the state. Ever since the gold standard was abandoned in 1971, cash is fiat money i.e. derives its value from a governmental – or in the case of the euro – inter-governmental mandate. Trust also applies to the technology developed on the banknotes to ensure the quality and security of the banknotes as well as the infrastructure and processes in place to ensure counterfeit detection.

While counterfeit deterrence remains an ongoing battle, the authenticity of banknotes is under control as demonstrated by the counterfeit levels for each market and their corresponding percentage of banknotes in circulation.

ANNUAL COUNTERFEIT BANKNOTE VOLUME OR VALUE

Year	2009		2010		2011	
	Volume/Value	As % of BN in Circulation	Volume/Value	As % of BN in Circulation	Volume/Value	As % of BN in Circulation
Brazil ¹	501,890	0.011%	420,969	0.009%	424,232	0.008%
Euro ²	860,000	0.006%	751,000	0.005%	606,000	0.004%
US ³	\$182,000,000	0.020%	\$261,000,000	0.028%	\$154,700,000	0.015%

1: Banco Central do Brasil

2: European Central Bank

3: US Secret Service Annual Reports

. Demand for Cash

Anonymity

Anonymity is a value which is specific to cash as it is the only payment instrument which does not require the transmission of identity data between the payer and the payee. The transfer of identity represents the risk of identity theft but also with the development of loyalty schemes, data mining and one-to-one marketing an increasing invasion of one's privacy. It is legitimate to ask whether it is necessary and desirable, from a societal point of view, to communicate one's identity when you make a transaction. And it raises a number of questions: how is the information stored? How is it used? Is it passed on to other parties? Who owns the information? etc...

The anonymity of cash is restricted. Firstly it is limited by the sheer bulk of cash. Secondly, it is restricted by regulations which impose reporting obligations to payment institutions and other exposed persons (casinos, real-estate dealers, lawyers and accountants) as established by the Financial Action Task Force and laid down in the Anti-Money Laundering and Counter-Terrorist Financing standards. Thirdly, many countries have restricted cash usage to avoid tax evasion.. In the wake of the European debt crisis several countries have established a cap for cash transactions: in Spain a limit of EUR 2,500 has been set on cash transactions for business owners and independent contractors and in Italy, the government reduced the maximum permissible payment in cash from EUR 2,500 to 1,000 in December 2011. Lastly, anonymity is also restricted by technology, e.g. serial number tracking systems are in use by law enforcement agencies to combat criminal activity.

3

. The Evolution of the Cash Cycle

3.1 > The Four Cash Cycles

Let us first review the current cash cycle for each of the four markets and the factors that have influenced change over the years.

THE BRAZILIAN CASH CYCLE

As the socio-economic landscape of the country has evolved, so has the role of the Banco Central do Brasil (BACEN) in managing the cash cycle of Brasil. With cash in circulation increasing at an average annual rate of 14% over the last ten years coupled with the proliferation of automation solutions that have increased consumer access to cash, BACEN has had to increase processing capacity and enhance its infrastructure to keep pace with this growth.

Given the changing dynamics of the country, in 2006 BACEN decided to outsource all cash processing and recirculation to Banco do Brasil (BdB), which is the largest bank by assets and controlled by the government, under a custodial inventory scheme. Under this program, all commercial banks make deposits to and withdrawals from their reserve account with BACEN operated and managed by BdB at over 140 cash centers and almost 1,400 bank branches throughout the country. The cost of the services is covered by the users (commercial banks). A Custody Council, with BACEN, BdB and commercial bank members was created to help manage this system.

BACEN remains the exclusive entity that manages the introduction, distribution and destruction of cash and through its 10 cash centers around the country, BACEN maintains supervisory oversight over the performance of BdB by checking the compliance with custody regulations, the quality and authenticity of cash in circulation as well as conducting all banknote destruction. The transportation is shared: BACEN is responsible for transportation from the print works to the main cities while BdB are responsible for the other stages, from the main cities to other distribution points. BACEN periodically conducts research studies with the public to assess the perception that it has about the quality of money in circulation and the use of banknotes and coins.

In support of its continued role in the Brazilian cash cycle, the 10 BACEN cash centers have undergone several modernization projects including a new IT Cash Operation Control System introduced in 2009, new high-speed banknote sorting machines installed in 2010 and on-line and off-line destruction systems introduced in 2011.

In the last quarter of 2010, the two higher denominations of a new banknote series were launched, updating the design and security features. The medium denominations were launched in July 2012 and the last two denominations will be launched in 2013. The replacement of the current series will be gradual and the banknotes will not lose their legal tender.

. The Evolution of the Cash Cycle

THE EURO-ZONE CASH CYCLES

The Eurosystem, which comprises the European Central Bank (ECB) and the national central banks of the Member States whose currency is the euro, is the monetary authority of the euro area. The ECB has the exclusive right to authorize the issuance of banknotes within the euro area and is responsible for maintaining its integrity. The Eurosystem is responsible for defining certain common principles such as the recirculation of banknotes, the free-of-charge services provided by the national central banks... The Eurosystem consists of several national cash cycles. Cross Border cash transports only takes place on a very limited scale. Due to different circumstances and historical developments in the euro area countries, each of these cash cycles has its own characteristics and peculiarities. Each national central bank is responsible for the physical distribution and processing of banknotes within their territories and for defining their cash distribution models. For this purpose, each central bank maintains a network of cash centers. There are currently 257 central bank branches in the euro zone, which is half the number at the moment of the introduction of euro banknotes and coins in January 2002. As for cash distribution models, some countries have largely delegated processing to the commercial sector – Finland, the Netherlands, Spain – while in other countries, the central banks process the majority of banknotes – Germany, France, Italy... and are continuing to consolidate their footprint.

The euro area established a banknote recycling framework in 2004, following complaints from the market that in some countries, banks had to lodge all banknotes received by them with the National Central Bank, while in other countries banks could recirculate banknotes. Following the recycling framework, which was cast in an ECB Recirculation Decision in 2010, some National Central Banks have stimulated banks and cash processing companies to recirculate fit banknotes received by them, by introducing some form of balance sheet relief – Cyprus, Finland Greece, Ireland, Malta, the

Netherlands, Slovenia, Spain. These markets have seen the development of industrial or cash center recirculation. In other markets, the recirculation takes place closer to the point of use, either through recirculating ATMs, as in Belgium or in branch back offices as in France or Germany. The implementation of banknote recirculation as of 2005 has led to the stabilization of the volume of banknotes which are fitness sorted at the central bank facilities which fluctuates between 2.5 and 3 billion pieces per month.

In 2007, the ECB Governing Council adopted a roadmap towards medium-term convergence of the cash services of the national central banks. The Eurosystem does not envisage a “one-size-fits-all” model and has provided for flexibility and a transition period for this convergence process. Some measures have been implemented such as: remote access to national central bank services in the whole euro area; harmonization of basic services such as coin lodgements from professional clients, common free-of-charge services; common minimum opening hours. One important measure currently being implemented in the harmonization of the electronic data exchange between national central banks.

THE SOUTH AFRICAN CASH CYCLE

The South African cash cycle is undergoing fundamental changes.

The South African Reserve Bank (SARB) used to process a third of the banknotes; cash centers owned by commercial banks or SBV the bank-owned wholesale processor would process another third. The rest was processed at the retail locations. Fitness standards were introduced in 2006.

In 2010, the SARB introduced changes to its distribution policy and established fees for lodgements and withdrawals which has led commercial banks to develop recirculation. In 2012, the central bank has indicated that it will reduce its role as a processor and eventually

only process unfit notes i.e. between 20 and 25% of cash in circulation. The SARB will maintain a network of 6 branches with online shredding; the current processing capacity is being transferred to the commercial sector. The SARB will increase its monitoring of the fitness sorting and will conduct an annual inspection of equipment.

The existing Notes Held To Order (NHTO) system which offers overnight relief will be capped and eventually phased out to be replaced by a Custodial Inventory System (CIS) which aims at compensating intra-month volatility of cash flows. This model will require an improved forecasting and inventory management system which is currently being developed.

In the last quarter of 2012, a new banknote series bearing the portrait of Nelson Mandela will be launched. The five denominations will be circulated simultaneously and a 12-month co-circulation period is expected. The new series are expected to have an increased lifespan than the current one which is 18 months for the ZAR 100 denomination and 6 for the ZAR 10.

The objective of the new cash distribution model is to improve the efficiency of the holistic value chain. The introduction of central bank fees will incentivize banks to seek for efficiencies and will encourage recirculation of banknotes both at wholesale and at point of sale level. SBV will play a central role as it is the sole entity entitled to operate the NHTO and CIS mechanisms.

THE US CASH CYCLE

“The Federal Reserve’s mission and fundamental objectives in providing cash services have been constant over the years, but its approach to meeting these objectives has evolved steadily to take advantage of advances in technology and to respond to changes in the way depository institutions (DIs) use the Fed’s cash services. Advances in currency processing equipment and sensor technology have increased productivity

and improved note authentication and fitness measurement, thereby reducing the premature destruction of fit currency while maintaining the quality and integrity of currency in circulation.

The Federal Reserve has significantly altered its cash operations “footprint” over the past 15 years. These changes have balanced the increased (societal) cost of transporting currency farther to and from the market where it is needed, on the one hand, and the efficiency gains and cost savings associated with leveraging greater economies of scale through consolidation of processing volumes and elimination of redundant (fixed cost) support and overhead expenses, on the other. As a result, the Federal Reserve has opened one additional cash processing operation in 2001 and closed ten processing operations in the past 15 years. However, the Fed has not closed any operations without establishing a “cash depot” in that market. Cash depots are operated under outsourcing arrangements by a third-party vendor that acts as a secure collection point for Federal Reserve currency deposits from a region’s DIs, and as a secure distribution point for currency orders that DIs have placed with the servicing Reserve Bank located in another city. The work of verifying deposits and preparing orders is performed by the servicing Reserve Bank. The currency is transported between the depot and the Reserve Bank in sealed containers. The Federal Reserve pays for the transportation between the depot and the servicing Reserve Bank. Credit for deposits is passed to the DI upon receipt and bulk verification at the depot, and the charge for orders does not occur until the day that orders are picked up from the depot.

Policy changes in recent years have also contributed to the evolution of the Federal Reserve’s role in providing cash services. With implementation of the Custodial Inventory (CI) Program in 2006 and the cross-shipping fee in 2007, the Federal Reserve significantly altered the costs faced by some DIs in processing and recirculating currency, and as a result, encouraged significant changes in their behavior.

3

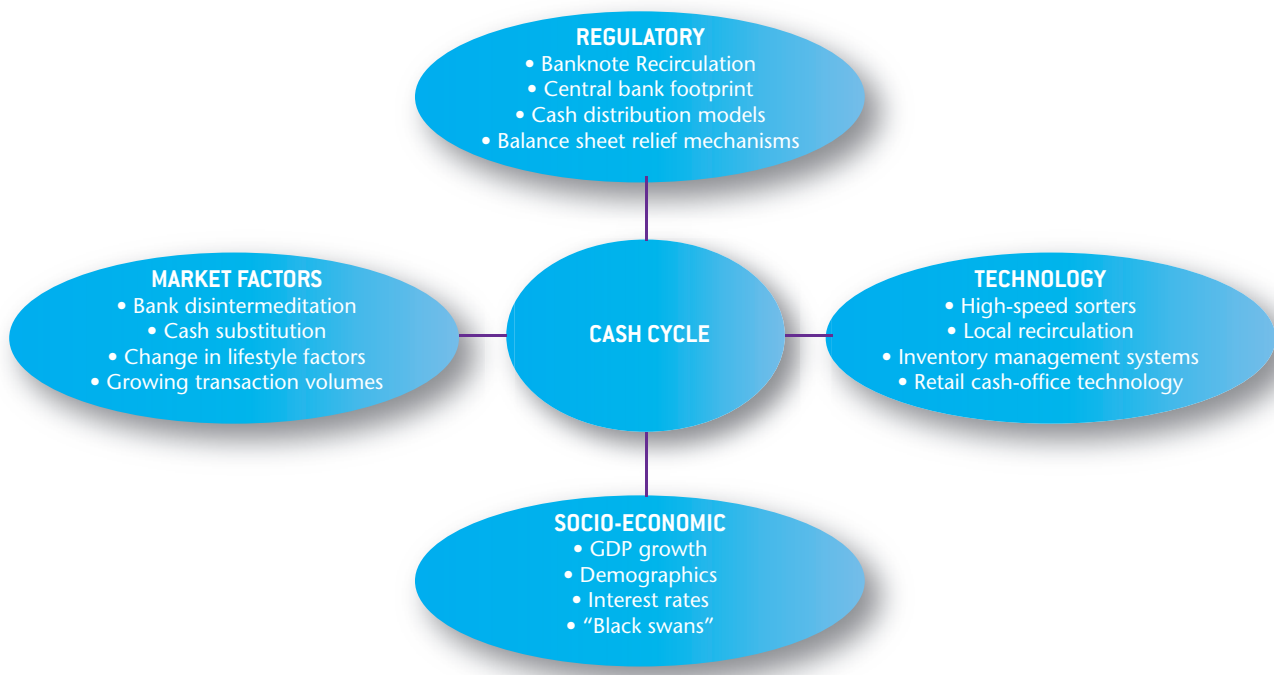
. The Evolution of the Cash Cycle

Provided they could meet the operating and financial requirements, DIs that could demonstrate the ability to recirculate a significant volume of currency on a weekly basis became eligible to participate in the CI Program, which afforded them “balance sheet relief” by enabling them to hold \$10 and \$20 notes in their vaults that are accounted for on the Fed’s books. About 16 DIs currently operate 92 CI vaults. Coupled with the cross-shipping fee, DIs

responded strongly and quickly to these incentives by reducing their cross-shipping of \$10 and \$20 notes. Within a span of less than eighteen months, the Fed saw a 50% decrease in cross-shipping and a 20% decline in orders and deposits, accounting for most, but not all of the decline in total FRB volumes in 2007 and 2008.”¹

3.2 > Key Trends Impacting the Cash Cycle

The cash cycles in the four markets have undergone an evolution resulting from changes in regulations, improved technologies, growth and sophistication of their consumers, distribution and availability of cash, and pressure from non-cash payment alternatives.



1: Federal Reserve Cash Product Office

While the cash cycle in the four markets are similar in terms of representative stakeholders, the role and function of each stakeholder group is different indeed. It could be argued that the primary factors influencing these differences are the model of the central bank and the business strategy of the other stakeholders in the cash cycle. Needless to say, the higher up the cash cycle food chain, the more the business strategy of the stakeholder group influences the what, where, when and how further down the chain! One key change in this evolution has been the functional and operational changes in the central bank profile, which have pushed cash processing functions to commercial entities thus resulting in a new “wholesale” (central bank + commercial processors) and “retail” (financial institutions + retailers + consumers) recirculation cycle.

Central Bank Footprint

One key trend impacting the cash cycle is the reduction of central banks’ footprint. The consolidation of central bank cash centers has first resulted from improvements in technologies, which have led to the increase in the throughput of high-speed banknote sorters. This has resulted in the emergence of a new generation of larger, more industrialized cash centers, often located in the vicinity of communication hubs, to facilitate and expedite logistics. Thanks to improved sensor technology, central banks have also reduced the volumes of banknotes shredded prematurely.

Technology and improvements through operational best practices have been instrumental in the reduction of the brick-and-mortar infrastructure in the four markets studied. While central and commercial banks and third party processors will continue to look for this type of infrastructure improvements, these will primarily represent consolidations in the industry. Regardless of the technological improvements, there will remain a need to sort and recirculate cash at both the “wholesale” and “retail” level for the foreseeable future so a physical

infrastructure is a necessary components of the cash cycle.

In the US, in addition to the recirculation policy the introduction of the “Check 21” (check truncation) policy eliminated the need to move the physical checks from the processing bank to the domiciling bank and eliminated the Federal Reserve’s role as the check clearing-house for their member banks. As such, Federal Reserve branch offices that supported both cash and check processing were faced with increased costs for cash processing since the fees from check clearings were eliminated. Therefore, the Federal Reserve undertook a study to reduce their cash operations footprint through closures and redistribution of their incoming and outgoing volumes from 36 to 26 locations.

As more central banks shift their role from a sovereign entity, (controlling) overseeing all aspects of cash processing and cash circulation to an administrative role, (involved and delegated) that participates in and monitors the industry’s performance, they have pursued a consolidation effort to reduce their footprint. Whereas the controlling model forces the central bank to remain active and maintain processing centers in all regions of their country, the changing model has allowed central banks to consolidate further and close operation centers where commercial entities have taken on the role of local processing and recirculation.

The introduction of technology platforms that allowed commercial entities to closely emulate the fitness sorting and recirculation as well as counterfeit detection functions historically performed by central banks has enabled central banks to reduce their infrastructure. These technologies include high-speed sorters, intelligent (smart) safes; multi-function and recirculating ATMs and teller and retailer cash recyclers.

High speed sorters entered the commercial sector some fifteen years ago and while they enabled non-central bank entities to effectively and efficiently perform verification, fitness

. The Evolution of the Cash Cycle

sorting and suspect counterfeit detection, their price point made them cost prohibitive for most commercial cash processors to adopt the technology. Even today, these high-speed sorters remain the domain of cash processors with operations in metropolitan areas where the density of clients and their associated volumes of cash justifies the expenditure. However, as the “retail” cash cycle has progressively gotten shorter, and thus closer to the consumer, smaller and less expensive sorters have closed the gap between the large and small commercial operators.

The assumption of cash processing and recirculation functions by commercial banks and other third-party service providers has resulted in policy and profile changes and or enhancements to existing policies. However, budgetary constraints and improved technologies have contributed to the closures and consolidation of central bank operation centers, as well.

The availability of cash has been enhanced through the deployment of existing and new devices (ATM, recyclers, multi-function kiosks, etc.) that have introduced more cash access points for consumers. The continual migration of the cash cycle from a centralized (wholesale, central bank controlled and facilitated) to a diversified (retail, expansion of recirculation to stakeholders down the cash supply chain) model will continue to increase the availability of cash.

Changing Cash Distribution Policies of Central Banks

While many factors have influenced the evolution of cash in circulation, the smooth functioning of the cash cycle is primarily the responsibility of the central bank. As such, central bank models and policies determine the flow and exchange of cash in the cycle. To better understand the changing role of central banks, it is important to review the prevailing central bank profiles. There are currently three models employed by nearly all central banks around

the world.

- “Controlling” – the central bank exclusively performs banknote authentication, fitness sorting, recirculation and destruction.
- “Involved” – the central bank allows or requires commercial banks to perform authentication, fitness sorting and recirculation.
- “Delegated” – the central bank effectively delegates all cash processing related activities, except for initial distribution and final destruction, to commercial banks.

As recently as twenty years ago, the “Delegated” model was non-existent and few central banks employed the “Involved” model. Today, most central banks have adopted the “Involved” model - US, France, Germany, Italy, Spain...- and several have completely delegated – Brazil, South Africa, the Netherlands... - the cash processing and recirculation function to the commercial sector. The “Controlling” model is the dinosaur of the industry and thus nearly extinct.

Involved	Delegated
Belgium	Brazil
France	The Netherlands
Germany	South Africa
Italy	
Spain	
US	

Regardless of the model, the central bank establishes the criteria for fitness sorting and defines what constitutes a “fit” banknote. Furthermore, by its nature, the central bank is the only entity in the entire cash cycle that can effectively cull out all counterfeits from circulation.

One of the most important functions of a

central bank, whether as a sovereign or an administrator, is to ensure the integrity and availability of cash. The effectiveness of the cash cycle is determined by two key factors. The first being the volume of cash in circulation that at some point or another must be processed (verified, authenticated and fitness sorted) and the second is the velocity with which the cash is processed and made available to the cycle. Both of these factors are critical in determining the processing bandwidth requirements within a specific geography. Therefore, delegating and involving central banks have introduced recirculation policies that encourage participation by and organizational commitment from financial institutions.

In the euro zone, the ECB have enacted policy changes that permit banks to process and recirculate cash deposited with their institution. There are no incentives or penalties associated with the ECB policy. The velocity of cash is increased if recirculation is done locally. However, in other cases, such as the US and South Africa, the recirculation policy is more of a mandate to encourage banks to perform their own sorting and recirculation or pay a fee for the same functions to be performed by the central bank. In the US, the Federal Reserve maintains an involved profile but has delegated cash recirculation of the USD 10 and USD 20 to commercial banks through a Recirculation Policy introduced in 2007.

Balance Sheet Relief Mechanisms

Recirculation may lead to an increase in the volume of vault cash as banks process cash in their facilities rather than returning it to the central bank, thus resulting in additional inventories and consequently higher opportunity costs. Some central banks have introduced policies to incentivize recirculation and compensate the cost of funding these additional cash inventories through balance sheet relief mechanisms. The most notable and frequently used policies are “Notes Held to Order” (NHTO) and “Custodial Inventory” (CI).

The Bank of England was the first central bank to introduce a Notes Held To Order scheme and the following is an excerpt from “Managing the Circulation of Banknotes” by the Bank of England’s Notes Division published in 2010.

“A significant development came in 1982 when the Bank introduced the Notes Held to Order (NHTO) scheme to address the risks and costs associated with excessive volumes of notes being transported to and from the Bank. Before the 1980s, financial institutions would physically return large volumes of surplus notes to the Bank (including its regional branches) for storage, then collect them when required to fulfill public demand. This was because the alternative — of holding the surplus notes themselves — would mean that a financial institution would incur the cost of funding a non interest bearing asset on its balance sheet. Over time, the volumes being transported each day grew in size and the associated risks and costs rose commensurately. The principal feature of the NHTO scheme was that it allowed scheme members (the major financial institutions handling large quantities of notes) to be paid the face value for selling surplus notes to the Bank, but without physically returning those notes to the Bank. They could hold these notes — with no balance sheet funding cost — securely in their own cash centers until demanded by the public. This removed the financial incentive for physical movements of notes to and from the Bank. As a result, the NHTO scheme substantially reduced the transport costs and associated risks of commercial note distribution. By 2001, note sorting was established as an activity wholly in the commercial sector and the NHTO scheme was replaced by the Note Circulation Scheme (NCS). The NCS incentivized greater efficiency in members’ processes and improved the risk management of the overall scheme. Importantly, it retained as a central principle the mechanism for relieving members of the funding cost of holding notes that are being sorted, or held as surplus to current demand.”

. The Evolution of the Cash Cycle

While balance sheet relief mechanisms all aim at reducing the funding costs of cash inventories, the actual models vary significantly from country to country: some offer overnight relief while others compensate intra-month variations in demand; in some cases, they are solely an incentive; in others, the central banks introduced fees for lodgements and/or withdrawals. Custodial Inventory in various forms has been in existence for decades as well. However, in recent years these policies have been undertaken to influence the behavior and function of the commercial banking sector. Custodial Inventory works much like the NHTO program and the following is an excerpt from the US Federal Reserve's "Cash Services Custodial Inventory Program", which was introduced in March of 2006.

"A custodial inventory enables an institution to transfer currency to the Federal Reserve Bank's books, but physically hold the currency within their secured facility, thereby reducing the investment cost of holding currency long enough to recirculate it to customers. The Custodial Inventory program is applicable only to USD 10 and USD 20 notes. Under the program, an institution may hold in a Custodial Inventory up to four days average daily payments in USD 10 and \$20 notes, provided it holds one day of average daily payments on its own books."

Balance sheet relief mechanisms are available - in different forms - in Brazil, Cyprus, Finland, Greece, Ireland, Malta, the Netherlands, Slovenia, Spain, South Africa and the US. These systems support the large scale recirculation of banknotes between banks and other commercial parties. They also enable the clearing of cash between participants.

Changing Business Model of Commercial Banks

The physical handling of cash is an industrial process, far away from the perceived core competencies of banks. Cash is also generally perceived as a cost center and cost reduction

has been the driving strategic focus. In the past, the main response has been outsourcing. In all markets, transportation has been fully outsourced to cash-in-transit companies. The picture is far more heterogeneous for both cash center operations and ATM servicing: some banks are fully outsourced while others continue to run both their cash centers and their ATM networks. The trend however has been to increase outsourcing. Our observations and feedback from participating commercial banks indicate a strong desire on their part to exit cash processing as independent operators. Outsourcing to third-party vendors has become a norm throughout the world over the last decade or more.

The development of recirculation has altered this evolution. On the one hand, recirculation has pushed processing towards the bank branch and therefore led banks to re-insource some level of processing. On the other hand, it has enabled banks to reduce their dependency on third-party providers.

As with any business, the lower the fixed costs, the more efficient and cost effective the endeavor. Therefore, some central banks are reducing their national footprint and pushing the responsibility down the food chain through recirculation and other policies. Since the cash cycle requires processing centers, commercial banks have been forced to establish or expand their own centers and or outsource their work to third party processors. This cost reduction across the industry is another factor contributing to the localization of cash in circulation thus reducing transportation and storage costs.

With governments and commercial entities under constant pressure to reduce costs and increase their efficiency, cash recirculation in most markets has separated into the "wholesale" and "retail" sectors. This shortening of the cash cycle has allowed many stakeholders to achieve cost reductions. Some would argue that localization is as a direct result of these budget cuts while others are convinced that localization was inevitable and cost reductions are the positive by-product.

Additionally, as an alternative to outsourcing in order to create economies of scale and to reduce the cost and increase the efficiency of cash processing, some countries are experimenting with various consortium models that represent a partnership between commercial banks and/or cash-in-transit companies – the later as either service providers and or full-fledged partners.

SBV in South Africa is an illustration of this model. SBV was established in 1986 by the three major banks at the time in order to optimize operational savings through co-operation between the banks in respect of processing and secure transportation of bulk cash. Retail cash processing and ATM services were later added to service offerings. SBV has since evolved into an independent commercial company, now equally owned by the four major banks in South Africa, with a focus on cash risk management. SBV is the sole entity authorized and approved by the South Africa Reserve Bank to operate the Notes Held To Order (NHTO) and Custodial Inventory System (CIS) mechanisms.

In addition to SBV in South Africa, some other examples include:

Geld Service Nederland (GSN) a partnership between the three major banks – ABN Amro, ING and RABO with the Dutch National Bank (DNB) as a Supervisor Board observer – handling more than 90% of cash flow in the banking centers serving its member banks as well as other financial institutions.

GSA, a subsidiary of the Austrian Central Bank (OeNB) in cooperation with commercial banks where cash processing is outsourced to the GSA while the OeNB maintains its core central bank functions of banknote issuance, counterfeit detection, etc... The OeNB bears the initial capital investment requirement and is therefore compensated through rental payments by the GSA consortium as part of its cost structure. Through its participation, the OeNB ensure the quality of the banknotes in circulation.

Automatia Pankkiautomaatit Oy (Automatia), founded in 1994 operates Finland's nationwide 'Otto' ATM network and performs all circulation of cash. Automatia is owned jointly by the 3 largest banks in Finland namely, Nordea, OP-Pohjola Group and Sampo Bank. The high usage through this cooperative (vs. the typical competitive approach) has reduced costs for all member banks and its services are available to all banks operating in Finland.

In Brazil, **Banco do Brasil** (a public-private bank) is the official Custodial Bank of the nation contracted by the Banco Central do Brasil to perform cash processing and recirculation functions as well as managing a custodial inventory program.

In a few countries, the central banks have or are undertaking projects to evaluate and possibly roll-out new concepts such as the shared infrastructure initiative in Belgium. The purpose is to improve the efficiency of the cash cycle by co-hosting the central bank and the CIT in the same facility. This reduces the overall number of cash centers, eliminates transportation between the central bank and the commercial cash centers and enables straight-through processing as the central bank will continue to perform the fitness sorting whereas the CIT will carry out the pre- and post processing. This initiative is well on its way and should be operational in early-2014 so the final impact and whether it's successful or not remains to be seen. A similar project was undertaken by the Federal Reserve bank and several financial institutions a few years ago but it never became operational because during the analysis phase it was determined that the different security policies of the central bank would unnecessarily increase the unit cost of the financial institutions. Therefore, the co-location project was abandoned but a more robust custodial inventory program was implemented by the Federal Reserve.

However, it should be noted that most of these initiatives are taking shape in smaller and technologically advanced countries with a highly concentrated banking sector.

. The Evolution of the Cash Cycle

While indications are that cash in physical form will be with us for years to come, some banks in some markets are attempting to accelerate cash substitution by restricting the access to cash. Regardless of their preference, it is possible that in some countries, such as Sweden, Finland and the Netherlands, at some point in time, consumers may not have the option of using cash for transactional purposes in some locations and even be unable to utilize their bank for cash-based transactions. This could lead to the disintermediation of banks from the cash cycle and the emergence of specialized players as has been the case with independent ATM deployers in the US.

One natural outcome of reduced cash usage is the increased unit costs of processing banknotes due to the fixed costs of the cash infrastructure. This will inevitably lead to increased costs to consumers for any cash transactions in any segment of the cash cycle. While the consortiums mentioned above endeavor to reduce the cost burden for the entire cash cycle, these phenomena will force a behavioral change in the average consumer who will not be willing to bear the increasing costs for transacting in cash, which could inevitably lead to the expanded use of non-cash payment instruments.

The Expanding Role of Retailers

As far as availability of cash is concerned, long gone are the days when consumers and merchants had to make a trip to their local bank branch for cash deposits and or withdrawals. With the introduction of ATM's in the late 1970's and the ubiquity of these devices in today's world, cash is now readily available to consumers. Over the last five years, countries in emerging markets are experiencing substantial growth in ATM installations. At the end of 2011 there were a total of 2.3 million ATM devices installed worldwide. This number is projected to exceed 3.1 million by the year 2015, which represents a 37% increase in four years time or nearly 10% per annum.

In addition to traditional ATM devices, which primarily serve the banked and underbanked, over the last few years, multi-function kiosks are making ATM type transactions available to even the unbanked. Therefore, the infrastructure necessary to make cash readily available to average banked and unbanked consumers continues to grow each year.

Needless to say, technology enablers of an expanded infrastructure of cash in circulation force more "retail" recirculation and thus reduction at the "wholesale" level. Over time, this dynamic will undoubtedly lead to further reduction and consolidation of physical processing infrastructure in the cash cycle.

While ATMs and bank branches were the only places to withdraw cash in the past, an increasing number of alternatives are now becoming more established. It is possible, under certain circumstances, to withdraw cash when paying for shopping in certain stores with cashback. Other companies also offer the opportunity to withdraw cash in cooperation with banks. For example, in Germany, customers of Postbank can withdraw cash free of charge from Shell petrol stations. In addition to creating greater flexibility when it comes to withdrawing cash, such partnerships also facilitate the recirculation of sales revenues for the retail companies involved. Several large retailers have been piloting combined deposit and withdrawal devices in large shopping centers. Most shopping centers already have ATMs, which provide a cost-efficient way for retailers to recirculate their cash

The most recent technology to help with cost reduction and cash cycle contraction has been retail automation, including intelligent safes, recirculation devices, self-service payment terminals and end-to-end closed loop systems. While smart safes were introduced in the early 1990's as a solution to address security problems associated to internal theft and robberies, they have evolved into solutions that allow banks to offer "Remote Cash Capture" (RCC) and "provisional credit" products where merchants

can maintain their cash deposits on premises for longer periods of time instead of contracting daily armored transportation service thereby reducing their operating costs without negatively impacting their access to available capital. These services are leading to the electronification of the cash cycle, whereby physical cash need not be transported between the various stakeholders. This is reducing the overall cost of cash handling and transportation in particular. In the United States, the installed base of smart safes skyrocketed fourfold in six years from approximately 15,000 units in 2005 to over 60,000 in 2011. It should be noted that historically low interest rates are making this technology very attractive and it remains to be seen whether commercial banks will continue to offer these products when the cost of cash goes back to historical levels without imposing new fees.

Development of Local Recirculation

The previous five recurring trends lead to the eventual and unavoidable requirement for increased local recirculation. Through the deployment and use of new retailer and consumer oriented technologies, local processing

and recirculation of cash will maintain and increase the availability of cash in circulation and increase the velocity of the cash cycle. With these dynamic changes, either technology or central bank policy will be required to ensure the integrity of banknotes in circulation both in terms of fitness and authenticity. One critical challenge is to achieve a balance between the push for processing and recirculation closer to the end-user and the quality and authenticity of banknotes in circulation.

In the beginning of the modern era of cash circulation, the cash cycle was very elongated and had fewer stakeholders. Today's cash cycle is much more diversified with more stakeholders each with a distinct function and demand on the cycle. The following two diagrams depict, in simple terms, the evolution and the resulting increase or decrease of recirculation in the various segments of the cash cycle, which reflects the influence and participation of the relevant stakeholders.

In this first diagram we can see how the thicker grey oval reflects the large role played by the central bank in the overall recirculation of banknotes with lesser influence by the other stakeholders.

The old cash cycle reflected the larger influence of the CB on cash-in-circulation



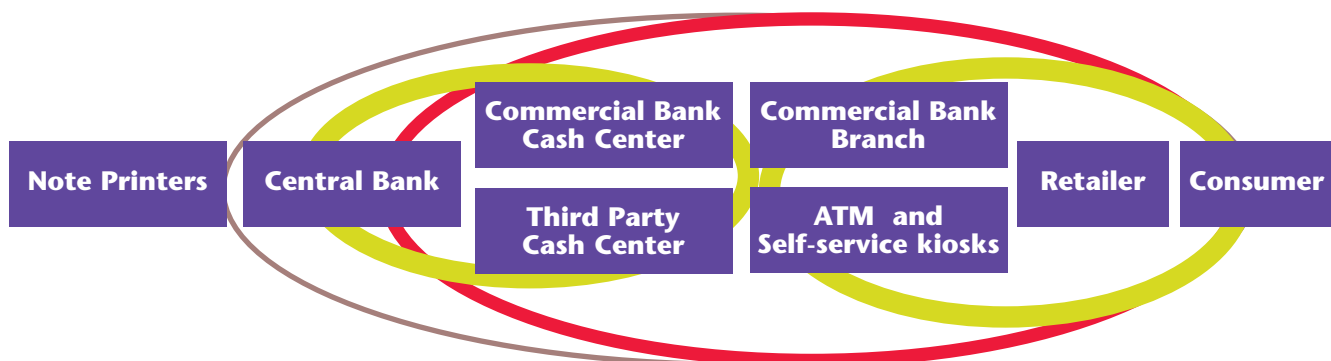
3

. The Evolution of the Cash Cycle

The second diagram shows how central banks through policy changes and resulting market dynamics have reduced their role while recirculation has increased at the “wholesale”

level between commercial banks and third party cash processors as well as at the “retail” level between commercial bank branches, ATM’s, self-service kiosks and the consumer.

The new cash cycle reflects the localization of cash recirculation and a more defined separation between “wholesale” and “retail” circulation with the changing role of the stakeholders.



4

. Long-term Perspectives



There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.

Niccolo Machiavelli ”

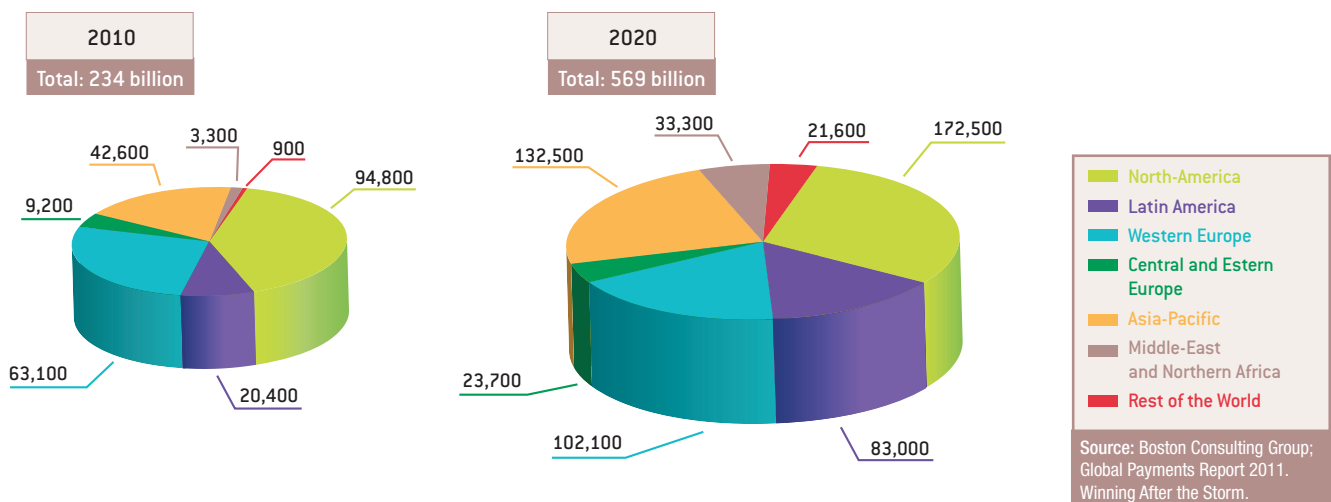
4.1 > Growth in Global Transaction Volumes

Evolution of Payments

On the demand-side, transactions volumes are expected to increase steadily and substantially in the future. According to the Boston Consulting Group, the global volume of retail transactions is expected to grow from 234 billion in 2010 to 569 billion in 2020. The transition towards a knowledge-intensive society is changing traditional

ways of doing business and generating new types of transactions. The distribution of music or films is a familiar example; new technologies have completely altered the business model and value chain and have created additional transactions. The lion's share of these new transaction spaces will likely be captured by cashless payment instruments, but cash will be used for some of these transactions.

VOLUME OF DOMESTIC RETAIL NON-CASH TRANSACTIONS (IN MILLIONS OF TRANSACTIONS)



4

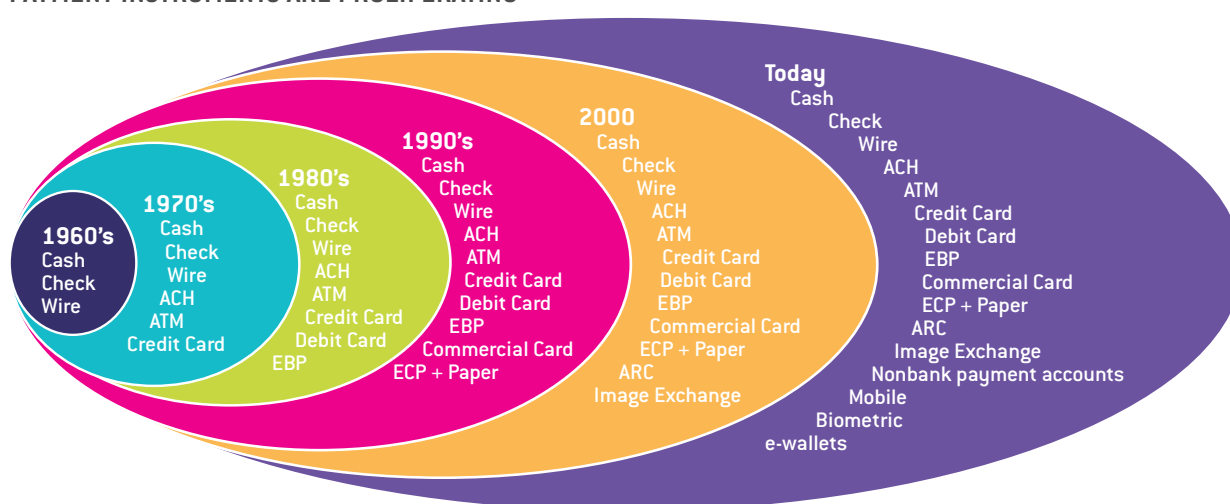
. Long-term Perspectives

On the supply-side, the payments market has become increasingly diversified. It is worth reminding nonetheless that 2.5 billion adults, just over half the world's population do not use formal financial services to save or borrow¹. Some consumers have a vast and increasing array of payment instruments at their disposal. One recent development has been the growth of non-bank online payment accounts – such as PayPal or Google Checkout; in the US, one third of consumers own such an account². While we are seeing a proliferation of new payment options, we seldom see the old payment instruments disappear which would be the real innovation. As a result, the 'payments pie' is divided into an increasing number of payment mechanisms. One payment instrument has been declining in all four markets analyzed, namely checks. This probably benefits cash, as some of the reasons why checks are used also apply to cash: they do not require an infrastructure, they facilitate budget control, they are used for person-to-person transactions... The development of alternative payment instruments is accelerating competitive pressures, leading existing players to fight for transaction

volumes and market share in order to achieve economies of scale. Standardization has been widely used both to increase volumes and achieve economies of scale; Europe has been at the forefront of this evolution with initiatives such as the Payments Services Directive and the Single Euro Payments Area aimed at harmonizing payments within Europe. Technological standards such as the EMV standard for chip cards or NFC standards for mobile phones also contribute to this evolution.

Another trend is the specialization of payment instruments. Payments instruments are being increasingly devoted to a specific type of payment – e.g. online payments, money transfers, bill payments, lunch vouchers, and transport – or to a specific segment of customers – e.g. travelers, different age groups, women... Also, companies are increasingly developing their own internal payment instruments, which are often connected to loyalty schemes: airlines, supermarkets, petrol companies... This is leading to increasing cannibalization between payment instruments as they fight to become 'top-of-wallet' instruments.

PAYMENT INSTRUMENTS ARE PROLIFERATING



As a result, we expect to see in the future the co-existence of universal payment instruments – which enable a large spectrum of transactions

– and specialized payment instruments which will be dedicated to specific uses. Cash will clearly belong in the first category.

1: *Half the World is Unbanked*, Financial Access Initiative, October 2009.

2: *The 2009 Survey of Consumer Payment Choice*, by Kevin Foster, Erik Meijer and Michael A. Zabek; Federal Reserve Bank of Boston.

Cash Demand

Growth of cash in circulation is demand-driven. Unlike other payments instruments where providers and/or financial institutions are actively encouraging customers to acquire and use them, growth in cash demand is exclusively demand driven. The primary role of central banks is monetary policy and consequently the control of money supply, including cash. In other terms, unlike other payment instruments where providers are promoting both the payment instrument and its use, cash usage is exclusively determined by the demand from the end users.

Historically, growth in cash in circulation has exceeded expectations. For years we have read and heard about the demise of cash and or its impending doom but growth in cash in circulation over the last decade proves that cash remains a strong and viable option for both consumers and businesses alike.

Threats are on the supply-side. Cash is targeted by various providers of payment solutions as they see cash substitution as a way of increasing their transaction volumes. This is not a new trend; it has been the case in the past with

checks, credit cards, debit cards, etc... Nowadays, two instruments are specifically geared towards cash substitution: contactless cards and mobile. Both aim at offering a solution which is faster, more convenient and cheaper than cash. It remains to be seen however whether these solutions – or others – will eventually satisfy customer demand. Many of the pre-paid cards schemes which were seen as silver bullets in the war against cash a decade ago have gone out of business since. There is also a phenomenon of cannibalization between cashless payment instruments, as they tend to compete between themselves rather than capture the market share of cash.

The fundamental attributes of cash – universality, trust and, anonymity – are not challenged by new payment instruments. For example, the contactless card is typically targeting low-value transactions for which it offers a supposedly faster alternative than chip or magnetic stripe cards. As a result, consumers and merchants require contactless technology for low-value transactions, typically under USD 10 and magnetic stripe or EMV technology for higher value transactions. Cash is accepted in both these situations.

CASH SWOT ANALYSIS

Strengths	Weaknesses
<ul style="list-style-type: none">• Strong market share• No infrastructure required for payments• Does not require a bank account• Anonymous payment instrument• Ease of use• Immediate settlement• Broad range of uses• Facilitates budget control	<ul style="list-style-type: none">• Cost of cash• Need for physical infrastructure for distribution and processing• Cash poses a security challenge• Counterfeits• Limited use for new distribution channels: e-commerce, m-commerce
Opportunities	Threats
<ul style="list-style-type: none">• Convergence with new technologies• Potential for efficiencies• Events likely to disrupt main trends: natural disasters, financial crises : black swans• Increasing 'electronification' of cash• Development of new uses for cash	<ul style="list-style-type: none">• Government measures restricting cash payments• Increasing competition from new payment instruments• Growth in online and mobile transactions• Banks are concerned with cost of cash• Growth of channels where cash usage is limited

4.2 > Adapting to Changes**The Convergence of Cash and New Technologies**

There is today a strong separation between cash and non-cash payment instruments. In most organizations, the two are run separately and both worlds are largely unfamiliar with one another. One commonplace perception is that technological innovation benefits non-cash payment instruments by providing more convenient, faster, more customer-friendly options.

However, cash has also largely benefited from innovation. The payment card combined with the ATM are undoubtedly a key reason for the success of cash today as they provide 24/7 ubiquitous access to cash. The contactless card and mobile are often presented as a threat to cash but they will more likely further facilitate cash usage. Spanish bank La Caixa was amongst the first to commercially deploy contactless payments technology and upgraded its ATMs to accept contactless cards and mobiles. Customers perceived this as being a faster, more convenient and more secure way to access cash. FNB in South Africa has introduced cash withdrawals using SMS pin codes sent to their mobile phones. Another example comes from the DNB, the Dutch Central Bank, which has developed a smart-phone application to communicate on banknote security features.

Evolution of the Cash Infrastructure

The changes in the cash cycle over the last fifteen years coupled with emerging technologies suggest that the next 5-10 years will see further evolution in the cycle and the industry as a whole. With the changing model of

central banks and more banks wanting (almost needing) to exit this market, an optimized network of cash centers operated by a single entity or a consortium of stakeholder will be one of the possible end products of this evolution. The consortium model will offer reduced risk and cost by allowing partial ownership in a common infrastructure that is aimed at shortening the supply chain.

However, the expanding proliferation of technologies that enable continual recirculation of cash at the local level ("retail") also represent an increase in demand since more cash will have to be in circulation in order to supply these ubiquitous end-points whether they be self-service/multi-function kiosks, cash recyclers at banking centers or retail locations, or multi-function ATMs. This is partially offset by the use of inventory management and demand-forecasting tools aimed at optimizing cash stocks throughout the cycle.

It has taken the banking industry and their suppliers nearly 30 years to effectively manage their ATM networks and optimize the cash supply chain. New technologies that enable the further distribution of cash and an increase in the velocity of the cash cycle should not take nearly the same amount of time. One important driver for the growth of this technology has been provisional credit; whereas commercial banks will credit the accounts of their corporate customers while the cash is in the device on the customers premises. Provisional credit operates in a similar fashion than balance sheet relief mechanisms for central banks. These solutions have been aggressively deployed in all four markets: it seems that the industry is undergoing a learning and adjustment period that will require at least five to ten years to optimize.

Decentralization of Cash Processing

As evidenced by what has taken shape in the cash processing industry over the last ten years, the future will undoubtedly include further decentralization of the cash cycle. New technologies at a lower price will not only increase recirculation by commercial cash processors but also enable recirculation further down the cash cycle and closer to the consumer.

Each passing year seems to introduce new products at the bank branch level that allow for easier and more seamless recirculation of the cash in circulation thus shortening the cycle. Recycling of branch cash increases the availability of cash closer to the consumer as well as reducing costs associated with the back-and-forth transportation.

At the retail level, merchants continue to experiment with both back-office and customer-facing recycling solutions. While the former has shown limited success to date, emerging technologies allowing for a smaller machine footprint will in all likelihood alter the way merchants interact with the customers and their banks. In some countries, notably the US, Germany, the Netherlands, merchants offer “cash back” at the point of sale. This service allows for the consumer to pay for purchases

and request a cash withdrawal within the same transaction. This helps save the consumer an additional stop at a traditional ATM, while at the same time reducing the volume of cash the merchant must process and deposit with their banks.

The historical challenge slowing down and so far preventing the universal use of cash recycling devices will be the lack of balance and equilibrium in the mix of currency denominations. By close of business each day, merchants invariably have a surplus of higher denomination banknotes and a shortage of lower denomination banknotes. Recycling systems to date have been unable to provide sufficient storage capacity to allow for higher inventories of low denominations with an acceptable size and footprint. Even back office recyclers face the same size challenge because retail real-estate is at a premium and every possible inch of space is allocated to product inventory that generates revenues and profits.

So until technology is able to address this problem by introducing a solution that meets the space limitations, denomination mix requirement while offering better than 99% availability, recycling will not be *universally* adopted by banks or merchants.

4.3 > Winning the Efficiency Battle

Cost of Cash is a Priority

The cost of cash is a complex issue as it is influenced by numerous, very diverse cost drivers. Some are fixed or semi-fixed – such as cash centers, bank branches, ATMs, armored trucks... - and therefore not immediately impacted by economic events or an evolution of demand. Other costs are variable such as the opportunity cost of holding cash inventories.

Cost of cash is a balancing exercise between:

- **Inventory costs:** this is the opportunity cost of holding cash inventories and can be approximated by the interest that would be

earned if the money was deposited on an account with the national central bank. Inventory costs depend on the volume of outstanding cash and the central bank deposit rates.

- **Handling:** Costs related to cash transactions (e.g. in- and out-payment of banks, transactions at retailers) many of which are still carried out manually.
- **Processing** costs include the counting, sorting, authentication, fitness sorting and packaging of banknotes and coins. These activities have been largely automated.

. Long-term Perspectives

- **Transportation:** has been extensively outsourced to cash-in-transit companies in all four markets. This remains largely a labor-intensive activity and is subject to increasing security related regulations, not to mention rising fuel prices. As a result, CIT prices have tended to increase regularly. The cost of cash in Transit operations depends on the price per stop and the number of stops performed. Hence, the general trend has been to reduce the volume of stops to compensate for higher prices.

- **Infrastructure** costs include cash centers, ATMs, bank branches, armored trucks....

We will not attempt to estimate the cost of cash as numerous organizations have attempted to do so (see table below) in the past and this has led to significantly different results depending essentially on what is included in the costs and who measures them. These studies however, reach four common conclusions.

- There are significant economy-wide costs involved with making payments: they vary from 0.24% of GDP in Finland to 0.99% in Hungary.
- The cost of cash represents a significant part of these costs, in line with the share of cash as a payment instrument; costs vary from 0.12% of GDP in Finland to 0.8% in Hungary.
- The cost of cash per transaction is cheaper in all countries compared below with the exception of Sweden and Australia.

- The cost structure for cards and cash differ: the cost of card payments are essentially fixed costs related to the infrastructure while cash-related costs are both fixed and variable as items such as transportation and processing vary with the value and volume of transactions. As a result, cash is generally more cost-efficient for low-value transactions. The break-even transaction value roughly varies between USD 10 ad USD 20.

There is also a strong consensus that the cost of cash is increasing¹; research by McKinsey suggests that even though the value of cash transactions across Europe fell by 1% between 2002 and 2006, the cost for banks increased by 2%. Inventory costs are driven by increasing cash volumes, in spite of lower interest rates; transportation costs are driven by increasing prices, even though there is less transportation. The automation of cash processing has led to higher investments in technology, which has also had to match growing ATM networks in the past, even though they reduce operating costs.

Furthermore, these costs are being gradually passed down the food chain. As central banks reduce their networks of cash centers and promote commercial recirculation, they also transfer costs to the banking sector. In turn, commercial banks have been shifting costs to the retail sector as they have outsourced transportation and processing to commercial players. (comment: this leads for them to cost savings).

1: *ATMs: Complex Weapons in the War on Cash*, McKinsey 2008

THE COST OF PAYMENTS

	Cash	Debit	Credit
Dutch National Bank			
Number of transactions in %	86	13	1
Value of transactions in %	56	40	4
Cost per transaction in €	0.30	0.49	3.59
Cost as % of GDP	0.48	0.11	0.04
National Bank of Belgium			
Number of transactions in %	84	15	1
Value of transactions in %	61	35	4
Cost per transaction in €	0.53	0.55	2.63
Cost as % of GDP	0.58	0.11	0.04
Bank of Finland			
Cost as % of GDP	0.12	0.12	
National Bank of Hungary			
Number of transactions in %	94	5	1
Value of transactions in %	98	2	0
Cost of transactions in Ft	74	201	796
Cost as % of GDP	0.8	0.12	0.07
Central Bank of Sweden			
Number of transactions in %	71	25	4
Value of transactions in %	39	50	11
Cost per transaction in €	0.5	0.33	0.48
Cost as % of GDP	0.3	0.08	0.02
Reserve Bank of Australia			
Number of transactions in %	77	11	12
Value of transactions in %	48	26	26
Cost per transaction in €	0.34	0.41	0.74

Sources:

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

Costs, Advantages and Disadvantages of Different payment Instruments, National Bank of Belgium, December 2005.

Efficiency and costs of payments: some new evidence from Finland, K. Takala.

Payments Costs in Australia: A Study of the Costs of Payment Methods; Reserve Bank of Australia.

The Costs of Paying – Private and Social Costs of Cash and Card; Sveriges Riksbank Working Paper Series N° 212.

Nothing is free: A survey of the social cost of the main payment instruments in Hungary, Dr. Aniko Turjan, Eva Diveki, Eva Keszy-Harmath, Gergely Koczán, Kristof Takacs, MNB Occasional Papers 93 2011.

. Long-term Perspectives

Improving the Efficiency of Cash is a Key Challenge for the Future

A key challenge for the future of cash will be to improve the efficiency of the cash cycle. If cash usage decreases, then the unit cost of a transaction increases because there are fewer transactions to cover the cost of the infrastructure. This could accelerate the trend and lead cash to be priced out of the market. In that case, banks would have no interest in continuing to distribute cash.

A reduction in cash usage at the point of sale leads to lower demand for transactional banknotes but does not impact demand for banknotes used for hoarding. Consequently, a reduction in transactional cash would only have a moderate impact on the overall value of cash in circulation while driving up the cost of cash processing per transaction. In other terms, a reduction in usage would only have a limited impact on the cost of cash, but it will drive up the cost of processing per transaction.

We have identified 9 key levers to optimize the cost of cash. The first five are systemic i.e. they aim at reducing the overall cost of chain across the value chain. The remaining four aim at optimizing the costs for a given stakeholder.

- Banknote recirculation policies aim at shortening the cash cycle by avoiding the unnecessary repatriation of banknotes to the central bank and delegating the fitness sorting to the commercial sector. Recirculation leads to a transfer of processing costs to the commercial sector and therefore incentivizes efficiency. In some cases, additional costs are compensated with balance sheet relief mechanisms.
- Balance-sheet relief mechanisms aim at compensating the commercial banking sector for owning higher cash inventories following changes in central bank policies such as reducing the number of central bank cash centers or the implementation of banknote recirculation. They can take different forms such as Notes (or Coins) Held To Order systems, custodial inventories, depots...

- Utility models consist in sharing an infrastructure between different players, be it a cash center or in some cases ATM networks. In Latin America, some banks are piloting white label branches.
- Cash-cycle re-engineering aims at streamlining processes in order to avoid the duplication of tasks and develop a lean cash cycle. The Belgian National Bank 'shared infrastructure project' is a clear illustration of this as a strong integration of cash-in-transit and central bank processes will enable one-step processing and lean processes.
- Standardization is a tested and proven method to reduce costs in logistics. In the cash arena, standardization has been introduced already for packaging formats for wholesale volumes and several countries have introduced trays or containers of different sizes. In 2009, the European Payments Council launched an initiative to standardize ATM cassettes in order to optimize the complex logistical operations associated with replenishing ATMs. The stakeholders are still debating the business case and feasibility.
- Cash center automation: significant progress has been achieved to increase the throughput of wholesale cash centers. Some central banks and vendors are now looking at developing fully automated facilities with minimal human intervention, often inspired by the manufacturing industry.
- Inventory management and forecasting aims at optimizing the inventories of cash throughout the cycle. Many banks have already deployed inventory managements systems to reduce the volumes of sleeping cash in their ATM estates. There is nonetheless significant room for improvements in this area as few organizations have a holistic view of their cash inventories covering branches, vaults, customer premises etc...
- Branch automation initially aimed at automating withdrawals and the deposits and transferring them away from labor intensive over-the-counter transactions to self-service or assisted self-service channels.

Today, it encompasses recirculation including in some cases across a group of branches in a hub-and-spoke system.

- Retail automation: is being driven by technology which enables local processing and recirculation; it has been accelerated by commercial banks which have replicated central bank strategies by pushing processing down the food chain and compensating the opportunity cost by providing provisional credit.

4.4 > Long-term Scenarios

During the last decade, cash has experienced demand in the four markets covered by this research. In most cases, growth has exceeded expectations and this illustrates the complexity of making long-term forecasts.

Defining Cash

Presumably, we all have a common understanding of what we call cash. In fact, the perception can be rather different depending on where one stands. 'Visa Cash' was a stored value card trialed by Visa in various locations across the globe during the past 25 years. Interestingly a website is dedicated to preserving the history of Visa cash – www.visacash.org. 'Electronic cash' is the debit POS system operated by the German banking industry, generating about 1.5 billion transactions yearly. We believe cash can be defined by three characteristics:

- Cash is a physical form of money, namely banknotes and coins. The actual physical nature has evolved over the years from various commodities - barley, shells...- to gold and silver to paper and more recently polymer and hybrid substrates.
- Cash can also be defined by the issuing authority, usually the central bank and national

governments in the case of coins. In some rare cases, such as Scotland and Northern Ireland banknotes are issued by commercial banks but in this case are not legal tender.

- Lastly, from an economic standpoint, cash is defined as the most liquid form of the monetary base, usually referred to as M0. In other terms, cash is the most widely accepted form of payment.

Long-term scenarios for the future of cash, should be constructed in light of the above characteristics.

Building scenarios

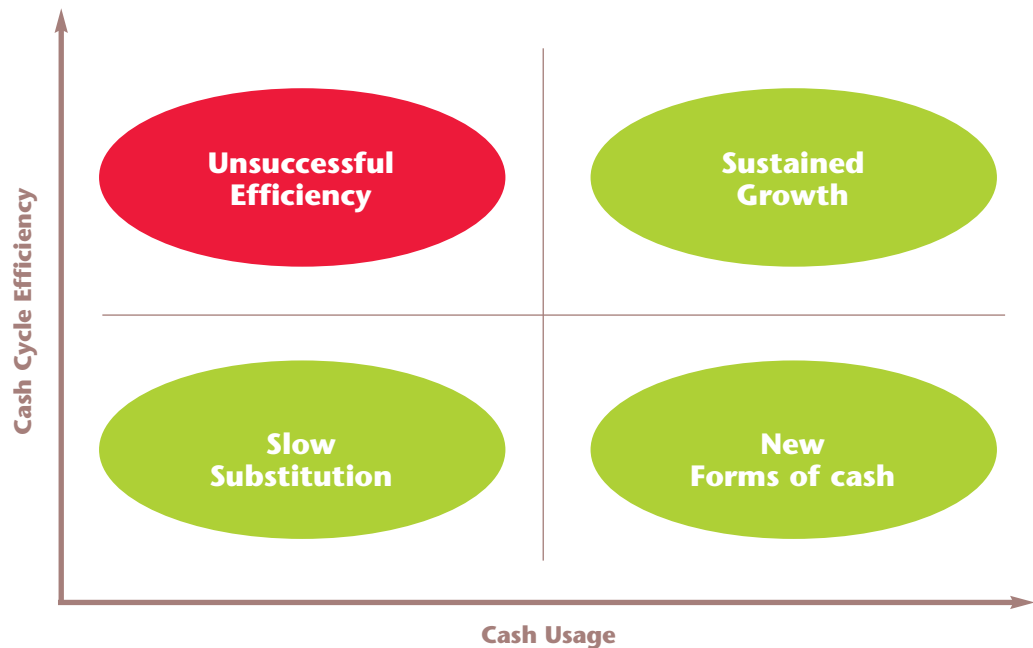
Two major variables will influence the scenarios:

- The first is related to the cash cycle and its capacity to evolve towards more efficiency, enabling cash to compete favorably with other payment instruments (y axis).
- The second is related to cash demand and whether cash will succeed in capturing a larger share of existing or new transactions (x axis).

Based on these variables, we foresee three possible scenarios and one unlikely one.

. Long-term Perspectives

LONG-TERM SCENARIOS



The first scenario is one of slow cash substitution. In this case, cash would suffer from fierce competition from other payment mechanisms. The industry would stick to existing models and methods and the cost of cash would increase in relation to other payment mechanisms. A possible weak signal for this scenario could be the fact that cash usage has been declining in some markets: e.g. the Netherlands, Scandinavia, Finland, New Zealand.... Some see this as an irreversible trend. This scenario will certainly not happen in the short term. If cash were to decline, many factors tend to indicate that there would be a very long tail: the contingency role of cash, the challenge to provide robust payment options to all users, the management of identity and expectations of privacy... These factors will certainly slow down the process but they will not reverse it.

The second scenario is one of renewed cash usage. In this case, growth will be driven by demand. In transition economies, such as Brazil or South Africa, strong economic growth is sufficient to create this additional demand for cash. In the mature economies of the United States and the euro-zone, changes in existing business models and convergence of cash with new technologies could contribute to make cash more user-friendly and ensure that it captures an increasing share of transactions.

The third scenario is one of sustained growth. In this case, the industry engages in radical organizational and socio-economic change in a context of increasing demand. As a result, cash will become more efficient and more widely used thus creating a virtuous circle, whereby increased cash usage further reduces costs. This scenario requires both significant

changes to make the cash cycle more efficient and strong innovation to capture more transactions.

The fourth scenario is one of unsuccessful efficiency and is unlikely. In this case, efficiencies would be found to optimize the cash cycle but this would not result in increase in usage. In this case, stakeholders would either increase their efforts to generate further efficiencies which would generate higher usage and move towards the top right quadrant. Or they would cease their efforts and manage the slow decline of cash and fall back in the bottom left quadrant.



. Appendices

List of Participants

- **Central Banks**

Banco Central do Brasil
Banque Nationale de Belgique
De Nederlandsche Bank
Deutsche Bundesbank
European Central Bank
Federal Reserve Bank (USA)
South African Reserve Bank

- **Commercial Banks**

ABSA
Banco do Brasil
FNB
European Payments Council
Major US Financial Services Company (Requested Anonymity)
Standard Bank
Nedbank

- **Non-Bank Cash Processors and Cash-in-Transit Companies**

Brink's Brasil
SBV South Africa
ESTA

Bibliography

Cost of payment Collection Survey 2011, British Retail Consortium.

Explaining cash usage in the Netherlands: the effect of electronic payment instruments.
DNB Working paper N° 136, March 2007.

The 2009 Survey of Consumer Payment Choice, by Kevin Foster, Erik Meijer and Michael A. Zabek.
Federal Reserve Bank of Boston.

The Use of Euro Banknotes – Results of Two Surveys Among Households and Firms; ECB Monthly Bulletin,
April 2011.

O brasileiro e sua relação com o dinheiro – III; Banco Central do Brasil, 2010.

Global Payments report 2011. *Winning After the Storm*, Boston Consulting Group.

Half the World is Unbanked, Financial Access Initiative, October 2009.

World Payments Report – Capgemini RBS EFMA 2009.

Choosing how to pay: the influence of home country habits, Anneke Kosse ad David-Jan Jansen,
DNB working paper n° 328, December 2011.

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

Costs, Advantages and Disadvantages of Different payment Instruments, National Bank of Belgium,
December 2005.

The Demand for Euro Area Currencies: Past Present and Future, by B. Fischer, P. Köhler and F. Seitz;
ECB Working Paper Series n°330, April 2004.

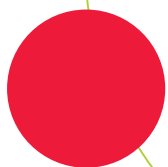
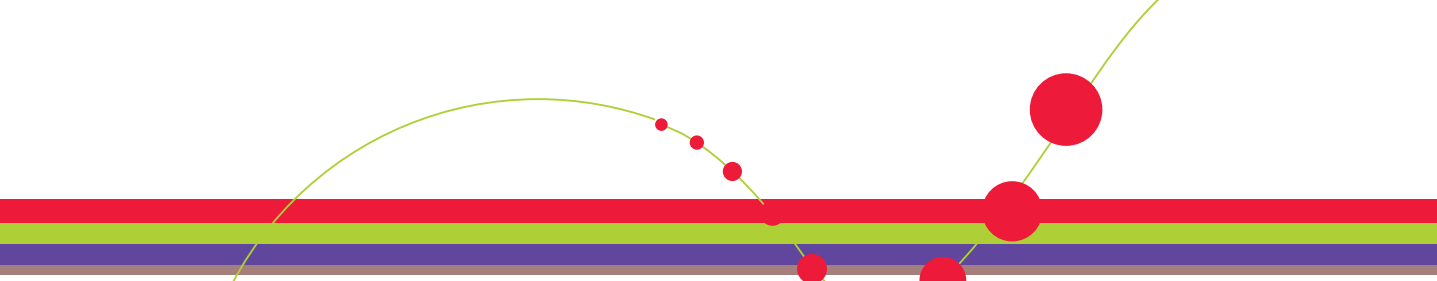
Winning After the Storm – Global Payments 2011; Alenka Graeish, Stefan Mohr, Carl Rutstein,
Jürgen Schwarz, Niclas Storz, Michael Urban; Boston Consulting Group February 2011.

Payments Costs in Australia: A Study of the Costs of Payment Methods; Reserve Bank of Australia.

The Costs of Paying – Private and Social Costs of Cash and Card; Sveriges Riksbank Working Paper
Series N° 212.

Nothing is free: A survey of the social cost of the main payment instruments in Hungary,
Dr. Aniko Turjañ, Éva Diveki, Éva Keszy-Harmath, Gergely Koćzañ, Kristof Takaćs;
MNB Occasional Papers 93 2011.

Global Retail Banking 2020– Key trends and implications for retail banking real estate, James Brown,
Lee Elliott, Colin Burnet, Jones Lang LaSalle.



. Notes

A series of horizontal dashed lines for taking notes, spanning the width of the page below the title.

Copyright Notice & Disclaimer

The information in this document is provided for general reference purposes only. Whilst every effort is made to ensure that information provided is accurate, AGIS Consulting does not accept any responsibility or liability for, the accuracy or completeness of the content or for any loss which may arise from reliance on information contained in this document.

Unless otherwise stated the copyright and any other rights in the contents of this document, including all images & text are owned by AGIS Consulting.

AGIS Consulting grants permission to reproduce short extracts provided the source is stated and permission is granted.

Requests for any further authorisation regarding proposed usage of the material provided in this document should be addressed to:

AGIS Consulting

12, passage Beslay - 75011 Paris - France

Tel. + 33 1 42 52 94 09

Email: contact@agis-consulting.com

Contact

AGIS Consulting
Guillaume Lepecq

12, passage Beslay - 75011 Paris - France

Tel. +33 1 42 52 94 09

E-mail: guillaume.lepecq@agis-consulting.com