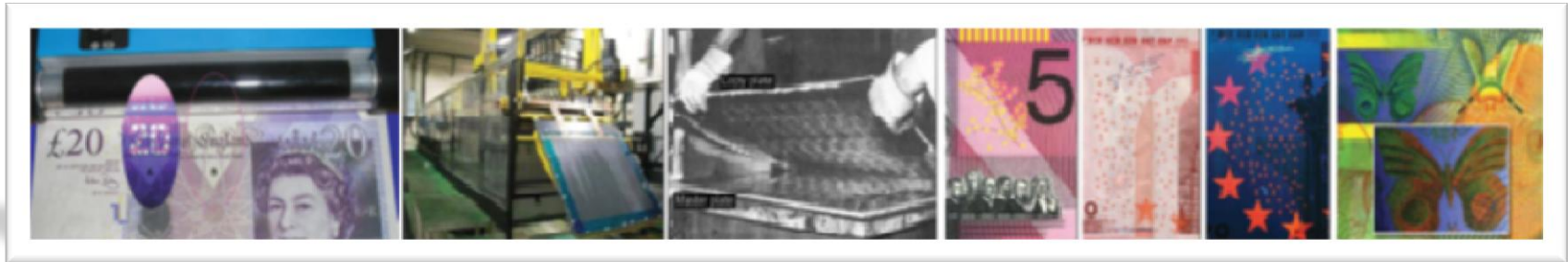




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Smithers Pira White Paper



# Banknotes

The future of paper money

**Money** is a product that serves as a medium of exchange and a store of value. As with any commodity, the only value inherent within the medium is its perceived value.

*In a respect, banknotes are like works of art, they are only precious whilst there is a general and sustained belief, or faith, in their worth.*

Modern banknotes have to service the needs of several different stakeholders. Central banks are the prime contractors who have the responsibility for commissioning banknotes that will fulfil the needs of the other groups. The final customer is the public, as either retailers or individual citizens, as the public's acceptance of the banknote as legal tender is ultimately the factor that determines the success of the design.

The banknote printing industry is dominated by a small number of intensely competitive companies – printers, machinery manufacturers, materials suppliers, etc.

Over 90% of the banknotes produced worldwide are manufactured by state printing

works (SPWs), many of which also have state-owned materials suppliers. It appears to be an extremely conservative industry, but companies continually pursue technological developments to gain competitive edge and at the same time combat counterfeiting, which has serious economic consequences for countries and their issuing authorities.

The counterfeiter is the stakeholder who determines the rate at which banknotes must be re-designed. Were it not for the requirement to upgrade the defences against copying, banknotes would remain largely unchanged, especially those depicting historical figures rather than living political ones.

### **Are banknotes disappearing?**

Since the introduction of cheques in the mid-19th century, people have regularly forecast the decline – even the demise – of banknotes as the main instruments of transaction. More recent alternatives – postal orders, money orders, credit cards, cash cards, debit cards, electronic bank transfers, plus e-purse and internet transactions – have continued to fuel the belief that paper currency will decline.



*The growth of alternative payment systems over the past decade has recently led to several commentators suggesting that we are moving towards a cashless society, and that banknotes will gradually be phased out as payments are made digitally*

The issue of a cashless society is debated on a regular basis and, despite the introduction of many alternative payment mechanisms, currency in circulation continues to grow.

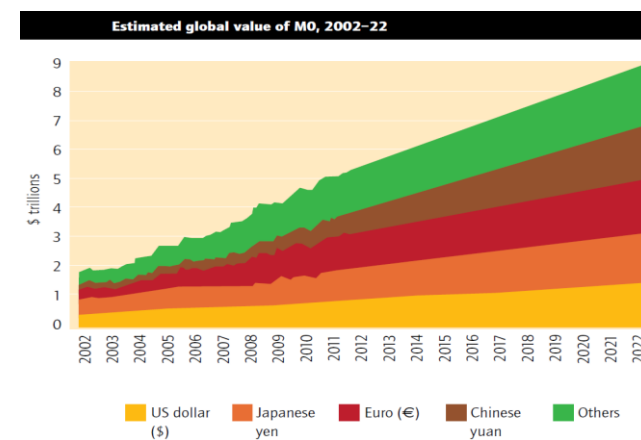
It is true that there is a cost to making banknotes, of the order of \$6.4 billion per annum globally, which theoretically could be saved if cash were eliminated, giving way to the new digital payment systems; however, there are several reasons why cash will continue to flourish over the next decade.

## “WE ARE MOVING TOWARDS A CASHLESS SOCIETY”

- Research conducted by the Dutch National Bank (DNB) in 2012 showed that in 2011, debit card payments in the Netherlands had reached an all-time high. In one year, the number of debit card payments increased from 2.15 billion to 2.29 billion, while the total value involved went up from €81 billion to €83 billion. At the same time the number of point-of-sale cash payments went down from 4.4 billion to 4.1 billion and the total value of cash transactions fell from €53 billion to €51 billion.
- Today, the overall number of banknotes printed in the US is one billion down on the average of nearly 9 billion notes per annum recorded on average during the decade 1990-1999. The amount of one dollar bills printed by the Bureau of Engraving and Printing of the US Department of the Treasury (BEP) has been in decline since 2006.
- According to the DNB, the shift from cash to debit card payments is evident in practically all sectors and types of shops. “Even in places where, on average, the amounts to be paid are small, the Dutch increasingly tend to use their debit card instead of cash; cases in point are bakeries, pubs, vending machines and the marketplace. Moreover, the use of cash has decreased among all sections of the population.”
- Research from the Clydesdale Bank, published in September 2012, found that 29% of people now withdraw less than 10% of their wages in cash and are becoming increasingly reliant on card payments, direct debits, standing orders and online transactions. According to this report, “banknotes and coins are on the verge of disappearing from our daily lives as Britain moves a step closer to the cashless society”.
- David Wolman’s book *The End of Money*, published in 2012, forecasts the end of the use of cash. “In an era when books, movies, music, and newsprint are transmuting from atoms to bits, money remains irritatingly analogue; physical currency is a bulky, germ-smeared, carbon-intensive, expensive medium of exchange.”

## “TANGIBLE MONEY IS A VALUABLE MEDIUM OF EXCHANGE”

- In the UK, the Bank of England (BOE) has shown no signs of abating the quantity of currency that is in circulation, which has continued to increase since the middle of the 20th century. The actual figures published by the BOE show that the total value of cash in circulation has risen 300%, from about £15 billion in the mid-1990s to nearly £50 billion in 2012.
- It is expected that the US will be the first country where new payment technologies begin to have a real impact – especially in the case of mobile payment systems and pre-paid plastic cards – but despite the decline in banknote printing output it is still the case that the amount of low denomination banknotes in circulation continues to grow.
- Contrary to the suggestion that the use of the \$1 bill is in decline, the number bills in circulation has actually nearly doubled over the last couple of decades, from 5.1 billion in 1990 to 10.0 billion in 2011. In fact, the number of notes in circulation has continued to rise for each denomination.
- There is no evidence for the decline of the banknote in statistics on global banknote usage and, if anything, the forecast is that global cash usage will rise rather than plummet. The cash component (M0, the value of all banknotes and coins circulating on the planet) continues to grow each year.



The figure shows the estimated global currency in circulation (M0) from 2002 to 2011 and the forecast to 2022, in trillions of US dollars.

Source: Smithers Pira

### Cash as means of storing value

Despite the fact that the value of cash is in almost all instances depreciating constantly due to the effect of inflation (because each additional banknote in circulation results in a devaluation of the whole), cash continues to be viewed as an important means of storing wealth for two principal reasons – the liquidity and anonymity of currency.

Cash is a liquid asset relative to other forms of stored wealth such as gold bullion, real estate or works of art; cash is readily accepted by other citizens of the same country or abroad. Even relative to funds in a savings account, certificates of deposit, stocks and shares or bonds, currency is by far the most straightforward instrument to exchange for goods and services.

Cash is anonymous, leaving no record of the exchange. Unlike transactions made by cheque or any digital form of payment, cash can be used to purchase goods and services, leaving both the buyer and the seller unidentified.

The continued demand for banknotes as instruments to store value is illustrated by the proportion of high-denomination banknotes printed today, versus the notes that are more typically used for everyday cash transactions.

- ▶ Demand for \$100 bills has increased each year since 2000 as they are used to hoard value in politically and economically unstable parts of the world; during the last recession, demand surged and, in response, the number of \$100 bills went up 47.9% from 1.21 billion notes printed in 2008 to 1.79 billion in 2009.
- ▶ In Europe, of the \$1.2 trillion-worth of euros circulating in 2010, over one third of value was made up of €500 notes.
- ▶ In Japan, over 90% of the value put into circulation in 2010 was in the highest denomination, the ¥10,000 note (about \$127 or €104).

### Cash as means of payment

At the other end of the scale, for low-denomination banknotes that are used for everyday purchases, the benefits of liquidity

and anonymity still apply; in addition, an advantage of cash over digital payments systems is that transactions are free of charge. Although this is not strictly true in the case of ATMs that make a charge for dispensing banknotes, once in hand, currency can be passed between individuals without any further transaction fee.

Credit cards can be too expensive for part-time merchants and individual sellers as account charges and transaction fees can consume upwards of 6% of each payment received, more than most banks pay in interest on money held in an account for a full year.



Fees charged by online payment facilitators such as Google Checkout and PayPal are typically a 2.9% charge plus a \$0.30 fixed fee per transaction. Other digital payment systems charge a fixed fee for the service, or a fee for each transaction, or both. Paying a \$0.30 fee is a burden when the item costs under \$5.

*Given that 80% of the world's citizens live on less than \$10 a day – indeed many are living on less than \$2 per day – it is apparent that the use of cash will continue to play a vital role in many countries around the world for several years to come.*



There are a few reasons why banknotes are set to prevail:

1. **Banknotes work independently of any device**  
Unlike credit or debit cards, e-payments via the internet or m-payments via mobile telephones, banknotes are stand-alone payment instruments that can be used in rural areas with no infrastructure.
2. **Banknotes facilitate direct person-to-person transactions**  
Unlike cheques or digital payment systems that are conducted via an intermediary, cash is a direct payment.
3. **Banknotes do not require a fee or commission for each transaction**  
Other payment systems attach a transaction cost, either to the seller or the buyer, or both.
4. **Banknotes are an instant form of settlement**  
Relative to writing a cheque or using a credit card, cash is conveyed in a few seconds, although contactless payments systems now rival cash for speed.
5. **Banknotes are a means of irrevocable settlement**  
Several of the alternative payment systems hold money in escrow if there is a disagreement between the buyer and seller, retaining it until the dispute is settled.
6. **Banknotes guarantee anonymity**  
Alternative payment systems log details of transactions and make the records available to third parties.
7. **Banknotes allow for hoarding**  
While currency is generally affected by the impact of inflation, it is still regarded as a suitable means of storing value.
8. **Banknotes provide liquidity**  
While other investments may gain in value, such as gold or works of art, they are harder to convert back, whilst money is readily accepted for goods and services.

## Cashless or less-cash society

According to World Bank research, over half the world's adult population remains "unbanked" or "under banked", so moves to extend the reach of formal banking access is a key global development goal.



While mobile telephone-enabled payment systems such as M-PESA in Kenya have the potential to displace cash, initial results suggest that in actual fact the increased participation of Kenyans in the formal banking sector has also fuelled growth of cash in circulation. The number of M-PESA customers increased from 6.18 million in 2009 to 14.91 million in 2012, but currency in circulation in Kenya rose from 89.94 billion Kenyan shillings in 2007 to 147.76 billion in 2011.

International remittances, underpinned by global organizations such as MoneyGram and Western Union, have huge potential to move money from developed to developing countries, which could be spent in electronic format, but at least for now are often converted to hard cash on receipt.

The advent of the most recent payment mechanisms – specifically contactless cards, used in combination with smartphone technology – will no doubt make some impact on cash usage. While it is impossible to predict the exact impact of initiatives such as the Google Wallet, for example, one of the key challenges for central banks over the coming

years is to identify and react to the impact technology may have on cash use.

### **Payment of the last resort**

Whatever the impact of new payment mechanisms, cash is certain to remain the payment system of last resort. All other payment mechanisms require a high degree of technology support – including power and communications – to be effective.

Even with robust back-up provisions, there are occasions – such as in times of natural disasters – when cash becomes the only viable means of payment. There is much anecdotal evidence from events such as Hurricane Katrina in the US or the Christchurch earthquakes in New Zealand of how cash is relied upon to maintain commerce in the face of major calamities.

Given that maintaining the integrity and accessibility of a nation's payment systems remains a key objective of every central bank, the robustness of the cash cycle and the cash distribution infrastructure of a country remain paramount.

*In order to make any predictions of the paper money, one needs to understand not only the effects of alternative payment methods on banknote circulation, but also the reasons behind the growth of banknotes.*



Source of picture: [www.123rf.com](http://www.123rf.com)

### **What drives the growth of banknotes?**

Understanding trends in currency in circulation is a complex task as there are many

variables in play. Banknotes are printed not simply to replace old and worn-out notes, but to service the growth of money, driven by inflation, changes in real gross domestic product and the demographics of an increasing world population.

### Population growth

Demographics are an inexorable driver for banknote demand: the world's population is growing and in most countries the standard of living is gradually rising – often in line with increased urbanisation – especially in China, India, Africa and Brazil. As affluence and consumerism spread, so demand for cash increases.



Source of picture: [www.flickr.com](http://www.flickr.com)

### Economic growth and decline

Changes in the nation's economic growth rate measured by gross domestic product (GDP) can cause increases in demand for banknotes on the part of the general public. However, it is not only in times of positive growth that there is increased demand; ironically in times of recession the demand for cash can also increase.

*When shoppers have less money available, they try to control spending by purchasing with cash rather than credit cards and cheques; also the demand for high-denomination banknotes increases as citizens use cash to hoard value, as occurred in several countries in 2009.*

While it is logical to see currency in circulation grow in times of general economic prosperity, it is perhaps paradoxical that the currency in circulation also increases in times of economic adversity. Nearly every currency across the globe reported sharp spikes in demand – often in higher denomination 'store of wealth'

banknotes – at the onset of the recent global financial crisis as many people moved savings from potentially vulnerable banks to hard cash.

### Political policy regarding money supply within the state

Changes in political policy with regard to changes in the level of currency per head that is in circulation within a nation (the number of banknotes per person varies widely between different countries) can lead to an augmented money supply. Economic measures such as quantitative easing introduce additional funds electronically in the first instance, but this typically leads to an increased demand for cash as the funds flow through the system to local banks and institutions.

### Fiscal control with respect to the currency of other countries

Political policy with regard to the level of currency that is retained in reserve, for example, in order to maintain a constant exchange rate against other currencies, can lead to increased production of banknotes to maintain parity. For example, China has used

reserve requirements as a policy instrument intensively since 2008.

### The growth in the use of ATM (automated teller machines)

There has been a steady growth in the distribution of ATMs in the past 30 years and although this has levelled off in developed countries such as the US, growth continues to be strong in Asia and South America.



Source of picture: [www.flickr.com](http://www.flickr.com)

### Central bank policies for clean banknotes

Changes in central bank policy with regard to the standards of banknotes in circulation, which result in an increase in the number of

worn and soiled banknotes removed from circulation, lead to a greater demand for new crisp, clean, genuine banknotes.

### Changes in political regime or leader

Political changes, such as a new head of state to be depicted on the banknote or the emergence of a new nation, can lead to an unexpected demand for new banknote designs that replace the previous series.

### Changes in the denominational structure

A change in the values for a monetary system can lead to the introduction of new banknotes. Conversely, such changes can also lead to a decrease in demand for banknotes – for example, in the UK, prior to decimalisation in 1971, a 50p coin was introduced in 1969 to replace the 10-shilling note.

### Changes in the currency type

The most significant change of currency was the switch from several European currencies to the euro. The Portuguese escudo, the Spanish peseta, the French franc, the Belgian

franc, the Irish pound, the Dutch guilder, the Greek drachma, the Deutsche mark, the Luxembourg franc, the Austrian schilling and Finnish mark were all replaced by the new euro banknotes in 2002.

### Changes in counterfeiting levels

Changes in the level of counterfeiting of a banknote series can prompt the introduction of a new design or the addition of new security features. This happened in Canada when the high level of counterfeiting prompted the introduction of a new hologram stripe onto banknotes, which dramatically lowered the proportion of fake notes.



Source of picture: [currencvauide.eu](http://currencvauide.eu)



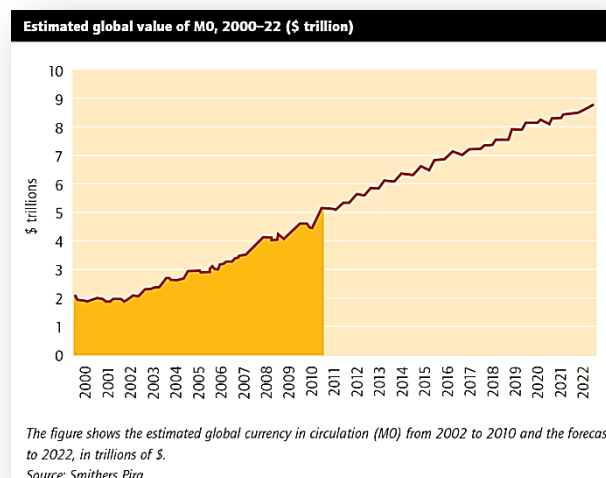
## So what does the future hold for banknotes?

According to Smithers Pira's report *The Lifecycle of Banknotes: scenarios and forecasts to 2022*, worldwide growth in banknote output is predicted to be similar to that of the US, and the estimated global value of currency in circulation (M0) is forecast to approach \$9 trillion by 2022.

## The design of the future

The single most significant design change forecast for the next decade is the increased amount of plastic used in currency. In the form of threads, foil, stripes, straps and windows, the use of polymer is on the increase in modern banknotes and designers now have to think in terms of including these features.

Polymer notes provide a new level of design freedom, as features can be included anywhere on the note without being restricted by the constraints of machine direction, i.e. the orientation of the banknote as it passes through the printing processes,



which determines the direction of features, such as the plastic windows in paper notes.

Securrency International Pty Ltd, which supplies the Guardian® polymer substrate, have even trademarked this freedom of design, branding it Latitude™.

On a paper banknote, the window area can be formed during paper manufacture, as in the case of De La Rue's Optiks®, an 18mm thread that is aligned to a small hole in the paper. Alternatively, the window can be created during the printing process using KBA NotaSys' OPTI-Windows® (One Pass Technology for Integrated Windows).

In both cases, the apertures in the paper have to be made in its running direction and the resulting windows are constrained in size and orientation. The latitude offered to designers by new substrates, such as De La Rue's Flexycoin®, Fortress Paper's Durasafe® and Louisenthal's Hybrid™ has the potential to alter radically the designs of banknotes over the coming decade. However, the conservative outlook of the central banks and the general public will doubtless act as a constraint.

Looking ahead towards 2022, banknotes may include features that link individual notes to the internet to provide track-and-trace and authentication features. Already one designer, Göran Österlund, has incorporated QR (Quick Response) 2D barcodes. 2D barcodes are becoming increasingly widespread, with the use of codes growing exponentially in advertising and marketing, where the codes are used to link a physical object, such as a document, to the internet.

Unfortunately, these designs would appear to be ahead of their time, as the central bank of Sweden will not be including the QR codes on the actual banknotes.

## Case study: US, Federal Reserve System

Throughout the early part of the 2000s the US Federal Reserve observed a significant increase in the level of deposits and subsequent withdrawals, often of the same currency denomination. This growth in volume, which placed significant demands on central bank processing resources, was attributed to a number of factors.

Firstly, the Federal Reserve noted that cash deposits and cash withdrawals were often handled separately. In terms of demand, many depository institutions had established order arrangements to fund their ever-expanding ATM networks, often relying on new or fitness-sorted notes issued by a Federal Reserve Bank to satisfy their needs.

By contrast, deposits, especially from larger retailers, were sent for processing at bank-owned or third-party armoured carrier money-processing centres for value counting, account crediting, deposit consolidation and subsequent deposit at a Federal Reserve office. Commercial fitness sorting and recirculation was rare, hence the levels of banknotes 'cross-shipped' continued to grow.



*Source of picture: [www.auardian.co.uk](http://www.auardian.co.uk)*

The matter was further exacerbated by the introduction in the mid-1990s of an accounting practice known as Retail Sweeping that allowed banks to reclassify certain accounts, limiting their liability exposure and in turn reducing their required reserves. As cash made up significant parts of a bank's required reserves, excess cash was increasingly seen as non-earning assets with the most effective cost-reduction measure being to deposit surplus cash at the Federal Reserve as quickly as possible.

While the Federal Reserve System already had some regulations in place to manage over-use of resources, these were not easily policed

and in some cases inconsistently enforced. After very extensive industry dialogue the Federal Reserve introduced a series of reforms collectively known as its Currency Recirculation Policy.

Recognising the need to offer both incentives as well as impose penalties, the central bank started by introducing a domestic Custodial Inventory Program, in part styled on its already successful international Extended Custodial Inventory Program.

The program invited depository institutions that agreed to play an active role in currency recirculation to establish dedicated custodial inventory vaults as part of their money centres where currency in the course of processing could be held off balance sheet.

Clear rules relating to the level of recirculation, value held in the Custodial Inventory Vault and various security and operation matters underpin the scheme. There are now about 20 institutions operating over 90 custodial inventory sites contributing significantly to the commercial sector recirculation of currency. The participating

institutions collectively hold on average around \$1.5 billion off balance sheet overnight.

In July 2007 the Federal Reserve followed the Custodial Inventory Program with further recirculation policy changes focused on reducing cross-shipping of currency and introducing prescribed banknote fitness standards. The Federal Reserve introduced a recirculation fee based upon the variable costs incurred by the central bank in processing notes that had been cross-shipped, this being defined as the same denomination of fit notes deposited and notes withdrawn within the same business week based within designated geographic zones or subzones. The Federal Reserve reviewed which denominations would be subject to these cross-shipping fees and determined that the policy would be restricted to \$10 and \$20 bills. The bank decided that, as the lower \$1, \$2 and \$5 notes were not routinely sorted by the commercial sector, there was a risk that the quality of these notes would deteriorate if not routinely returned to the Federal Reserve for examination and processing. For the higher denomination \$50 and \$100 bills, the Federal Reserve also felt it important to see regular returns of these notes

so that high-level authentication and counterfeit detection could continue to take place.

With certain minimum cross-shipping exemptions, so as not to burden very small institutions without the capacity to sort banknotes, the Federal Reserve estimated that in 2006, before implementation of the policy, 4.4 million billable bundles of cross-shipped currency were handled each year, equivalent to \$22 million in cross-shipping fees.

The impact of introducing the cross-shipping rules was dramatic, with billable bundles falling to 2.4 million per annum by the end of 2007 and thereafter to current levels of around 1.2 million bundles. As a consequence, the frequency with which the Federal Reserve now sees banknotes returned to its vaults has fallen significantly.



*Source of picture: [www.flickr.com](http://www.flickr.com)*

Whereas at its peak in the early 2000s the Federal Reserve would process a \$20 bill on average three times a year, these bills are now seen on average around 1.75 times per year. According to Barbara Bennett at the Federal Reserve System Cash Product Office, based at the Federal Reserve Bank of San Francisco, the changes, while significantly reducing the central bank's processing levels, have not been detrimental to the overall quality of currency in circulation in the US.

Various initiatives such as granting waivers during adverse environmental conditions – such as during hurricane season, or more routinely in the lead up to Christmas – support the clearance of borderline fit currency. The optimisation of central bank destruction levels also contributes to this good example of effective delegation of processing activity to the commercial sector without a detrimental impact on the quality of currency in circulation.

The more regular introduction of new series dollar bills and removal of old series notes as part of the returned-note sorting process has also, no doubt, contributed to overhauling the stock of notes in circulation and thereby supporting the overall maintenance of the quality of currency in circulation.

## About Smithers Pira

Smithers Pira is the worldwide authority on packaging, paper and print industry supply chains. Established in 1930, Smithers Pira provides strategic and technical consulting, testing, intelligence and events to help clients gain market insights, identify opportunities, evaluate product performance and manage compliance.

Smithers Pira works with packaging suppliers to identify profitable growth opportunities. Services include bespoke consultancy reports.

If you have a technical or market related question about the packaging, printing or paper industries, challenge our experts to find you the answer.

### UK (Head office)

Smithers Pira  
Cleeve Road, Leatherhead, Surrey  
KT22 7RU  
United Kingdom  
Tel: +44 (0) 1372 802000  
Fax: +44 (0) 1372 802079  
Email: [publications@smithers.com](mailto:publications@smithers.com)

### US office

19 Northbrook Drive  
Portland  
Maine 04105  
USA  
Tel: +1 207-781-9800  
Fax: +1 207-781-2150

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## **The Lifecycle of Banknotes: Scenarios and Forecasts to 2022**

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(Americas)

Heather Adams, T +1 (207) 781-9632; [hadams@smithers.com](mailto:hadams@smithers.com)

(Europe, Middle East & Africa, Asia, Australasia)

Bill Allen, T +44 (0)1372-802086; [ballen@smithers.com](mailto:ballen@smithers.com)

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