



# Cash, freedom and crime

## Use and impact of cash in a world going digital

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With the growing use of electronic payments, the need for physical cash is no longer self-evident. Indeed, cash has come under scrutiny for reasons of monetary policy, law enforcement and efficiency. Although cash-related evidence is scarce, facts rather than emotions should found the debate on the future of physical cash.

**Demand for euro cash is on the rise.** Euro cash in circulation grew to EUR 1.1 trillion by Q3 2016, three times as much as in 2003. Also, cash grew faster than GDP at current prices.

**In the field of monetary policy, physical cash can be a crude instrument in anyone's hands.** If bank deposits are withdrawn in cash on a large scale, financial institutions and monetary authorities can be pushed to the limits of their power.

**Abolishing cash will not eliminate profit-driven crime.** Alternative ways of transferring the proceeds from illegal activities can substitute cash, albeit at higher transaction costs.

**Payments go digital and fraud follows: An (almost) cashless Sweden sees card fraud rising.** However, the general safety of both cash and cashless transactions in Europe is high.

**Cash provides data protection and can therefore act as a guarantor of civil liberties in the event of an administration abusing its powers.** The abolition of physical cash may be regarded as an attempt to tighten control over citizens. Trust in public authorities would erode.

### Cash and deposits – both are money but not always the same

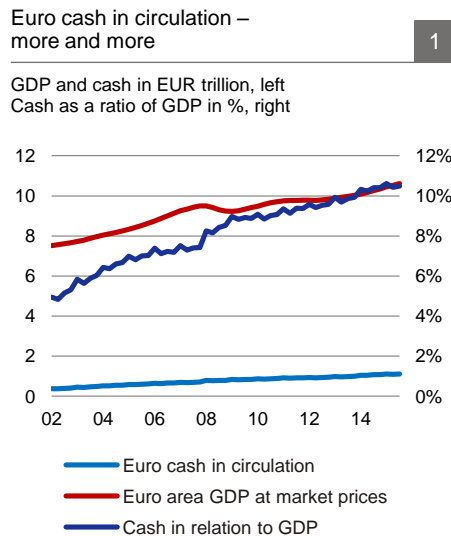
	Physical currency	Deposits
Monetary policy	Limits monetary policy	No limitation on monetary policy
Financial stability	Risk of bank run by withdrawal of cash	Risk of bank run by transfer of funds to other bank
Individual savings	Protection against – default of single institution or financial system – negative interest rate No protection against – inflation	Protection against – default only if mitigation exists (deposit insurance, lender of last resort)  No protection against – inflation – negative interest rate
Criminal abuse	Easy	Needs combination with further methods to hide true owners/activities
Security of transaction	High	High
Data protection	Strong	Dependent on compliance with data protection laws

Source: Deutsche Bank Research

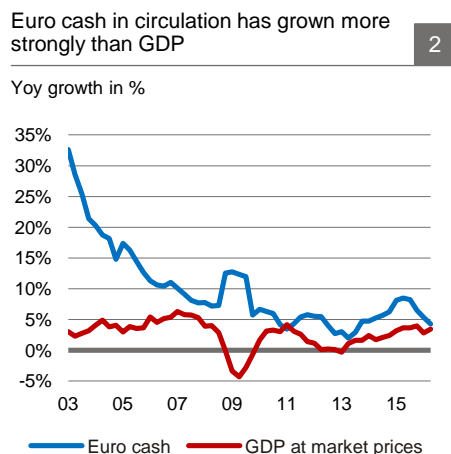


## Cash, freedom and crime

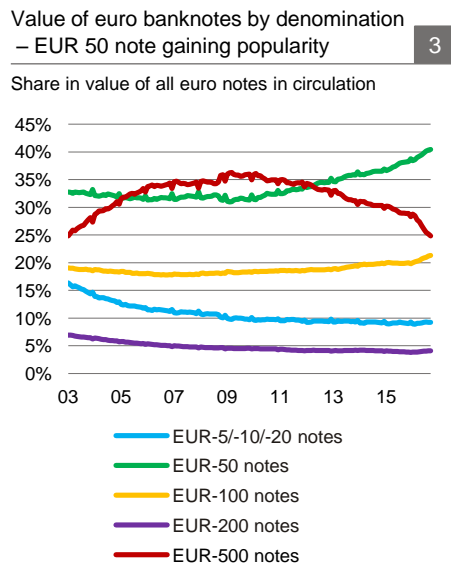
### Cash – euro basics



Sources: ECB, Deutsche Bank Research



Sources: ECB, Deutsche Bank Research



Sources: ECB, Deutsche Bank Research

Euro currency in circulation – “cash” – consists of euro banknotes and coins issued by the European Central Bank (ECB).<sup>1</sup> To be exact, the ECB decides the volume of euro banknotes to be issued in the European Monetary Union (EMU), while national central banks physically issue the number of banknotes assigned to them. Euro coins are issued by national governments via the national mint and the national central bank, but volumes and values have to be approved by the ECB.<sup>2</sup>

Cash is money as it is a medium of exchange, a store of value and a unit of account. This is not unique though, as sight deposits at banks also serve as money and both add up to the total narrow money supply (M1). In fact, euro banknotes and coins represent only one fifth of the narrow money supply in the EMU, while sight deposits account for 80%.<sup>3</sup>

However, cash has two distinctive features. Firstly, cash is physical. Neither intermediaries nor electronic devices are necessary to hold or transfer cash (for the latter: in face-to-face situations). In fact, there are no technical or contractual hurdles to cash ownership and transactions are settled immediately. Both cash ownership and transfers are difficult to track. Secondly, euro banknotes and coins are legal tender in the EMU. This means that the seller has to accept cash for payment, unless seller and buyer agree on a different means of payment.<sup>4</sup>

In practice, the meaning of “legal tender” in daily commercial life differs between European Union (EU) member states, inducing the European Commission in 2010 to issue recommendations on the use of cash as legal tender.<sup>5</sup> For example, no surcharges should be imposed on cash payments, and cash should be regularly accepted as a means of payment by retailers. However, the notion of legal tender is losing importance as commercial practices are changing, e.g. card usage and online shopping are increasing, and ever more national laws restrict the size of cash payments in order to combat illegal transactions.<sup>6</sup>

### Cash – the numbers

By the end of Q3 2016, euro currency in circulation amounted to EUR 1.1 trillion, three times as much as in Q1 2003. As cash grew faster than GDP in most periods, the ratio of cash to GDP rose from 5% to 10%. Euro coins represent a value of EUR 26 bn, and banknotes EUR 1,087 bn. A closer look at the importance of banknotes by denominations is worthwhile in order to gain insights into the use of cash.<sup>7</sup>

Small-value notes (EUR 5, 10, 20 notes) are used to a great extent for day-to-day payments and amounted to EUR 101 bn in Q3 2016. EUR 50 notes account for the lion’s share of all banknotes by value (EUR 444 bn) and are probably used for both payments and cash hoarding, as are EUR 100 notes, which totalled EUR 234 bn. Large-value notes, by contrast, serve mostly as a store of

<sup>1</sup> While many of the principal features and concepts discussed in this paper apply to all currencies, this paper will focus primarily on the euro, Europe’s single currency.

<sup>2</sup> See European Commission, Euro banknotes and Euro coins.

<sup>3</sup> ECB, Statistical Data Warehouse.

<sup>4</sup> See article 128 (1) TFEU on legal tender status of euro banknotes, article 11 of regulation EC/974/98 on legal tender status of euro coins.

<sup>5</sup> See European Commission (2010).

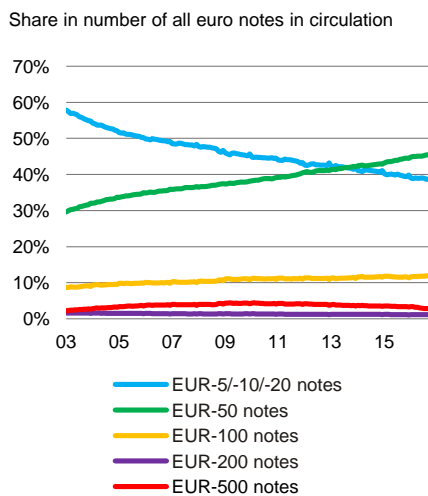
<sup>6</sup> See European Consumer Center France.

<sup>7</sup> For estimations on the use of coins, please see Deutsche Bundesbank (2015a).



## Cash, freedom and crime

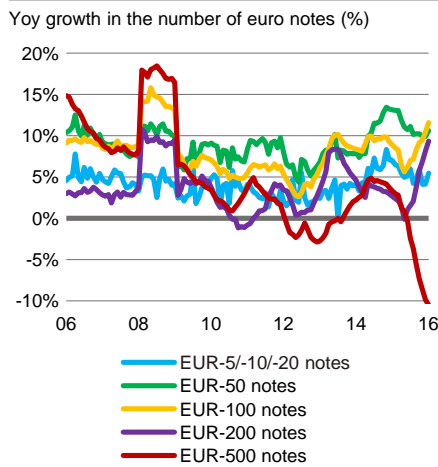
### Share of small-value notes in total number of banknotes decreases 4



Reminder: There are EUR 19.5 bn of banknotes in circulation. Euro coins in circulation total 120 bn pieces (September 2016).

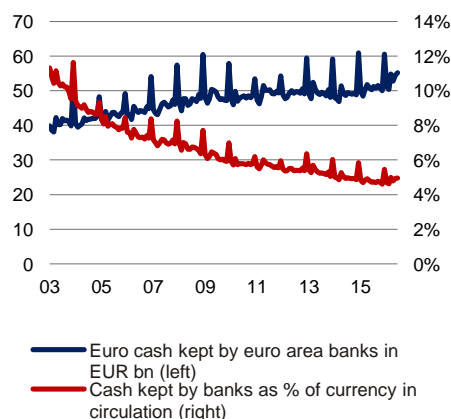
Sources: ECB, Deutsche Bank Research

### Surge in high value banknotes – run on cash after Lehman collapse 5



Sources: ECB, Deutsche Bank Research

### Euro-area banks keep their cash on stock stable 6



Sources: ECB, Deutsche Bank Research

value – be it as an alternative to bank deposits, or for illegal purposes. EUR 500 notes with a total value of EUR 273 bn are more popular than EUR 200 notes (total value of EUR 45 bn).

Although the number and value of all banknotes increased since the introduction of the euro, their relative importance in total value showed differing developments. Small-value notes lost importance over the years, maybe reflecting a growing use of card payments for retail purchases. EUR 50 notes gained significantly in popularity. This also holds true for EUR 100 notes, which became somewhat more important. Large-value notes – mostly EUR 500 notes – were used as a “safe harbour” during the Lehman crisis. Interestingly, this increase in euro cash was also driven by foreign demand.<sup>8</sup> Nevertheless, the absolute increase in cash of EUR 44 bn from September to October 2008 was not dramatic, given the size of seasonal surges at year-ends in the range of EUR 20-30 bn. Later on, the growth rate of EUR 500 notes came down again.

In May 2016, the ECB announced the discontinuation of the production and issuance of the EUR 500 banknote by the end of 2018, “taking into account concerns that this banknote could facilitate illicit activities”. However, the ECB assures that EUR 500 banknotes already in circulation will continue to be legal tender and as such will remain a means of payment and a store of value. Eurosystem central banks will always – without a final deadline – exchange them into other denominations.<sup>9</sup> Since May, the demand for EUR 500 notes has dropped, while the demand for EUR 200 notes has picked up.

## Who uses cash and for what?

The ECB assumes that domestic transaction balances represent 25% - 35% of the euro currency in circulation.<sup>10</sup> The indirect estimation methods used by the ECB derive conclusions from available statistical data on economic activity and currency in circulation.<sup>11</sup> However, an estimation for Germany based on the results of a representative survey revealed a much lower share of domestic transaction balances (5% of banknotes issued by Deutsche Bundesbank).<sup>12</sup> To some extent, the difference could result from sample biases or untruthful responses on cash use and holdings. Also, the volume of euro notes issued in Germany but exported abroad is much larger than for other EMU countries,<sup>13</sup> thus reducing the transaction balance as a percentage of total cash issuance.

As another component, euro area banks store cash in order to meet clients’ demand for it. This “bank vault cash” is sometimes regarded as part of the cash used for domestic transactions. Euro area banks have kept their vault cash rather stable at around EUR 50 bn since 2009, with peaks at year-ends.<sup>14</sup> However, its share in total currency fell somewhat to 5% (6% at year-ends) as total cash kept growing.

According to ECB estimates, a minimum of EUR 175 bn (18%) of euro cash was used outside the EMU at the end of 2014.<sup>15</sup> This lower bound is calculated by cumulating the net shipments of euro banknotes by euro area banks to recipients outside the EMU. However, banknotes are not only transferred via the bank channel. Tourism and workers’ remittances, for example, may also add to a net outflow of euro banknotes, so the share of euro cash circulating outside

<sup>8</sup> See European Central Bank (2011a).

<sup>9</sup> See ECB (2016).

<sup>10</sup> See ECB (2011a).

<sup>11</sup> See Fischer, B., Köhler, P., Seitz, F. (2004).

<sup>12</sup> See Deutsche Bundesbank (2010).

<sup>13</sup> See Bartzsch, N., Rösl, G., Seitz, F. (2011).

<sup>14</sup> Own calculation, based on ECB, Monetary Statistics and Statistics on banknotes and coins.

<sup>15</sup> See ECB (2015).



the EMU might rather be around 20%-25% of total euro currency.<sup>16</sup> This seems reasonable given that some legacy currencies, especially Deutsche Mark, were used as parallel currencies in other countries before the introduction of the euro. Approximately 30%-40% of Deutsche Mark banknotes and coins (by value) circulated outside Germany, mostly in Eastern Europe and Turkey.<sup>17</sup>

The share of banknotes used for domestic cash hoarding is simply derived as the residual of the above. Due to the figures and methods used for estimating, euro currency abused for illicit purposes will be mostly included in domestic cash hoarding and euro holdings outside the EMU.

#### Use of euro banknotes in circulation – estimates

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Purpose	User	2008		2014	
		Share of total	EUR bn	Share of total	EUR bn
Domestic transaction balance	Households, non-bank companies	33%	250	30%	305
Banks' vault cash	Euro area banks	8%	60	6%	61
Holdings outside the EMU	No sectoral information	20%	150	23%	230
Domestic cash hoarding	Households, non-bank companies	39%	300	41%	420
Total value of euro banknotes in circulation			763		1017

Sources: ECB statistics on banknotes, ECB monetary statistics, Fischer, B., Köhler, P., Seitz, F. (2004), ECB (2009), ECB (2010), ECB (2011a), ECB (2015), Deutsche Bank Research

## Cash in the monetary system of the EMU

In the course of daily business, a euro is a euro. However, when taking a closer look at the monetary system of the EMU, there are different “types” of euros as regards their legal and economic characteristics. This usually goes unnoticed, as all euro “monies” are exchangeable at par by law. Nevertheless, in defined situations, the special characteristics of cash can impact financial stability as well as monetary policy, because cash is non-interest bearing central bank money available to all.

#### The monetary system of the European Monetary Union (EMU)

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The euro – as most currencies today – is **fiat money**. Banknotes represent a claim on the issuing central bank, but the holder of the note is only entitled to a rather theoretical repayment in new banknotes or in central bank account balances denominated in that currency. In a fiat currency regime, the monetary authority is in principle not subject to a limit on money creation, and thus cannot become illiquid. Today, central banks issue money – “central bank money” – in the form of cash and reserves, i.e. balances kept by commercial banks in accounts at the central bank. As (almost) only banks are allowed to maintain accounts at the central bank, cash is the only type of central bank money available to households and companies.

According to its mandate, the ECB’s monetary policy primarily aims at **price stability**. Besides, the ECB is bound to support the general economic policy of the European Union.<sup>18</sup> The ECB aims to keep inflation below, but close to, 2% by using a variety of policy tools. The interest rate level is a crucial parameter to transmit monetary policy, so the central bank aims to set or influence the interest rates on loans and deposits in different financial markets throughout the economy.<sup>19</sup> Since cash might limit a central bank’s ability to substantially lower interest rates below zero, some voices demand the abolition of cash (see Cash and monetary policy: The zero lower bound).

<sup>16</sup> See ECB (2010).

<sup>17</sup> See Seitz, F. (1995).

<sup>18</sup> See Protocol on the statute of the European System of Central Banks and the European Central Bank, Official Journal of the European Union, 26 October 2012.

<sup>19</sup> See ECB (2011b) for more details.



The EMU is based on **fractional reserve banking**. In this two-tiered system the central bank issues central bank money while commercial banks create bank deposits or so-called “commercial bank money”. Banks do so by granting loans to customers on the one hand, and crediting (other) customers’ deposit accounts on the other hand.<sup>20</sup> Banks record deposits as a liability on their balance sheets. Upon client request, they have to redeem deposits in central bank money, be it in cash or be it in reserves needed to transfer funds to an account at a different bank. Therefore, in order to be liquid, commercial banks hold central bank money on the asset side of their balance sheets. But since central bank money is less profitable than other investments, they only keep central bank money for that fraction of deposits which are habitually withdrawn or transferred in the course of business and the minimum reserve as required by the central bank. This means, though, that commercial banks can become illiquid (see Cash and financial stability: Run risk).

### Cash and financial stability: Run risk

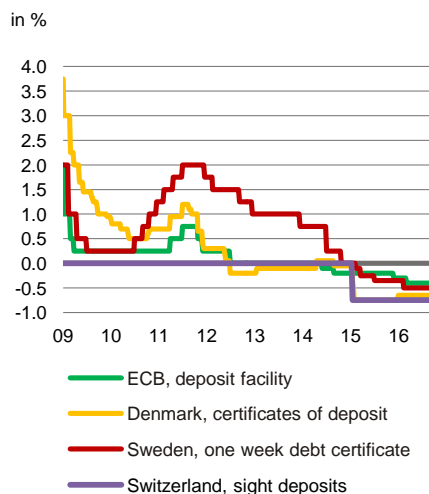
Bank deposits are a convenient way for holders to “hoard” and to transfer money. However, commercial banks can become illiquid and default on their obligation to repay the depositor: in this case, depositors lose their funds. Cash, by contrast, is central bank money and does not carry default risk in a fiat currency system. It offers default protection to the individual money holder, albeit at the cost of forgone interest and at the risk of physical theft or loss. But at the same time, it is exactly the default protection and the right to exchange deposits for cash that can accelerate the failing of a bank: depositors might run to withdraw their money in cash from a bank believed to be in trouble, leaving the bank illiquid. In the worst case, the loss of trust can spread and destabilize the entire financial system. In order to mitigate this risk, deposit insurance schemes and the central bank’s (implicit) function as lender of last resort were introduced.

Nevertheless, depositors’ trust can still deteriorate, as evidenced by the crisis of Northern Rock in 2007.<sup>21</sup> This incident also showed that abolishing cash will not eliminate the run risk in fractional reserve banking because concerned depositors can, and did, also withdraw their money by credit transfers to other banks, aggravating the situation of the ailing institution.<sup>22</sup> Of course, if depositors lose trust in more than one credit institution or in the payment system, cash withdrawals will be the rescue of choice.

Eliminating run risk would require replacing fractional reserve banking with full-reserve banking: only the central bank would create money, i.e. only one “type of money” would be issued. However, this would lead to a fundamental transformation of the financial system.<sup>23</sup>

Journey into negative territory:  
rates for deposits at central banks

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Sources: Central banks, Deutsche Bank Research

### Cash and monetary policy: The zero lower bound

The variation of the interest rate level in the economy is a crucial instrument for the central bank to influence price stability and economic activity. Since the onset of the financial crisis with prolonged weak GDP growth, central banks have taken a strongly expansionary stance on monetary policy. But once interest rates were very low there was not much leeway to cut policy rates further, and the usual set of policy tools was deemed to be insufficient. Therefore, central banks have taken to “unorthodox” measures: they have started and enhanced their asset purchases – by volume and type of security – to influence money supply and to lower interest rates (“quantitative easing”).

<sup>20</sup> See McLeay, M., Radia, A., Thomas, R. (2014).

<sup>21</sup> See Bruni, F., Llevellyn, D. (2009).

<sup>22</sup> In fact, the 2008 peak of the financial crisis was essentially an institutional bank run that simultaneously hit many institutions which were perceived as being susceptible to failure. Institutional investors transferred funds from those to other banks that were regarded as safe havens, without any involvement of cash, but nonetheless resulted in dramatic consequences for the affected institutions and the stability of the financial system as a whole.

<sup>23</sup> For a discussion of full-reserve banking, see e.g. Benes, J., Kumhof, M. (2012); Niepelt, D. (2014).



Also, some central banks introduced negative deposit rates on commercial banks' reserves.

However, central banks will probably not be able to push their policy rates significantly below zero since paper currency is expected to function as a Zero Lower Bound (ZLB): In order to avoid having to pay interest on bank deposits, the depositors could easily withdraw their funds in the form of physical cash, which is effectively a zero coupon bearer bond<sup>24</sup> issued by the central bank. In fact, the tipping point will be somewhere below zero because there are costs for storage, transportation and insurance associated with cash holdings. Against this background, physical cash has come to play a pivotal role in the debate on the power and the limits of monetary policy.

If further expansionary monetary measures failed to lift growth and inflation rates, cash would indeed be an obstacle, which makes it impossible for a central bank to cut interest rates as much as deemed necessary, especially if global interest levels are low. Consequently, some economists supporting stronger monetary expansion are calling for the abolition of physical currency<sup>25</sup>, or for its substitution by an electronic blockchain-based "cash" which would allow for the application of negative interest.<sup>26</sup> Alternatively, methods to "depreciate" cash vis-à-vis bank deposits are considered, e.g. by levying taxes on cash holdings or by introducing an exchange rate below par. The latter would signify that only deposits ("electronic money") would be the unit of account.<sup>27</sup> All proposals aim to eliminate the possibility of avoiding negative interest rates on money holdings. The ultimate intention is to make households and companies spend instead of saving money, thus spurring economic growth and defeating deflation.

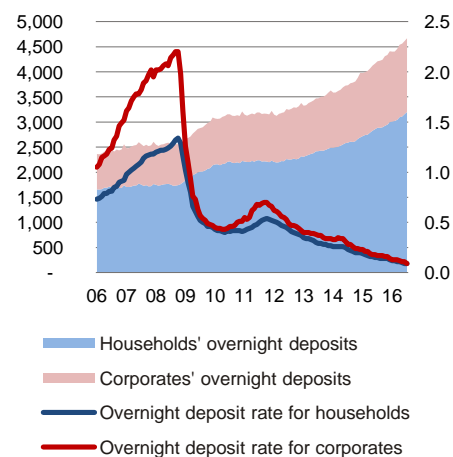
The reaction to an extreme measure such as the abolition of cash is unclear. It could lead to a decline of public trust in the euro and the EMU's financial system, especially if done to impose negative rates on deposits. Also, people might still want to save, and thus start to shun the official currency by shifting parts of their funds into privately issued "currencies" not subject to negative interest, even if these are less convenient than bank deposits. Such substitutes could be as simple as gift and bonus cards or as sophisticated as virtual currencies.<sup>28</sup> Foreign official currencies in the form of physical cash or account balances would be readily available alternatives. Also, funds could be shifted into less liquid investments like property and inflate asset prices. The bigger the shift away from the official currency – euro in the EMU –, the more significant the loss of monetary power for the central bank would be.

Evidence of cash indeed acting as a zero lower bound is scarce, despite the intense debate. In Europe, the ECB and the central banks of Denmark, Switzerland and Sweden have cut their deposit rates moderately below zero between mid-2014 and early 2015. However, no substantial withdrawal of client deposits from banks has been observed so far. This might also be owed to the fact that negative policy rates have been transmitted to money and bond markets but less so to bank deposits. Commercial banks have avoided charging negative interest on retail deposits so as not to trigger large deposit outflows. Instead, they seem to consider price rises for other retail bank services like debit rates or account fees, as suggested by anecdotal evidence.<sup>29</sup> In the EMU, overnight bank deposit rates are, on average, still positive for both retail and business clients, albeit only by a few basis points. Very large corporate

Euro area: rates fall but deposits grow

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EUR-denominated overnight bank deposits; volumes in EUR billion (left), rates in % (right)



Sources: ECB, Deutsche Bank Research

<sup>24</sup> Zero coupon bearer bond: debt security which does not pay interest, and which is owned by whoever holds it physically (no records are kept on ownership or transactions).

<sup>25</sup> See Rogoff, K. (2014).

<sup>26</sup> See Haldane, A. (2015).

<sup>27</sup> See Buiter, W. (2009); Agarwal, R., Kimball, M. (2015).

<sup>28</sup> See Cochrane, J. H. (2016).

<sup>29</sup> See Bech, M., Malkhozov, A. (2016).



depositors are already facing negative bank rates, and this is to some extent also reinforced by regulatory restrictions on such deposits like Basel III liquidity requirements.

Still, wholesale depositors in Europe have not withdrawn significant cash from their bank accounts, despite some rather symbolic public moves like MunichRe depositing gold and a double-digit million sum of cash in its vault for test purposes.<sup>30</sup> Nevertheless, professional market participants are gauging the costs of cash holdings as compared to the cost of (central) bank deposits.<sup>31</sup> Economists are also trying to estimate the zero lower bound, taking into account various factors like the highest bank note denomination or insurance fees. But even if policy and market rates would undercut the ZLB eventually, it is not clear how depositors will react: if they will withdraw bank deposits at all, to which extent and how fast. It is also uncertain if they would reallocate their funds to cash, other assets or consumption.

#### How much does a million euro weigh?

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Selection of international high value banknotes in circulation

	Banknote	Currency	Value in EUR	Approx. weight (g)	Weight (kg) of EUR 1 million	Issuance (to be) ceased*
Singapore	10,000	SGD	6,564	1.6	0.2	2014
Switzerland	1,000	CHF	919	1.3	1.4	
Canada	1,000	CAD	681	1.1	1.5	2000
Singapore	1,000	SGD	656	1.4	1.8	
Euro Area	500	EUR	500	1.1	2.2	2018
Euro Area	200	EUR	200	1.1	5.4	
United States	100	USD	90	1.0	11.0	

\*Notes in circulation remain legal tender.  
Exchange rates as of 30 September 2016.

Sources: ECB, national central banks, Deutsche Bank Research

## Cash and crime

Cash cannot be tracked – which makes cash attractive for transactions related to the shadow economy, bribery, finance of terrorism or the breach of sanctions. “Shadow economy” refers to legal activities conducted off the books as well as to illegal activities. Business dealings and jobs which are legally allowed but not recorded in order to avoid tax and social security payments are part of the shadow economy as are illegal employment and criminal for-profit activities like drug dealing, trafficking, fraud, counterfeiting of merchandise, etc.

### Cash not a reliable indicator of size of shadow economy

Surprisingly, surveys and estimations for different countries show that a high share of cash in total payments does not always indicate a large shadow sector: Germany and Austria are cash-intensive countries with relatively small shadow economies. In Sweden, cash payments have become rare but the country still has a midsized shadow economy. However, in many cases the degree of cash usage and the size of the shadow economy do seem to be related: Spain, Italy and Greece are characterized by intense cash usage and large shadow

<sup>30</sup> See Spiegel Online (2016).

<sup>31</sup> See Frankfurter Allgemeine Zeitung (2016).



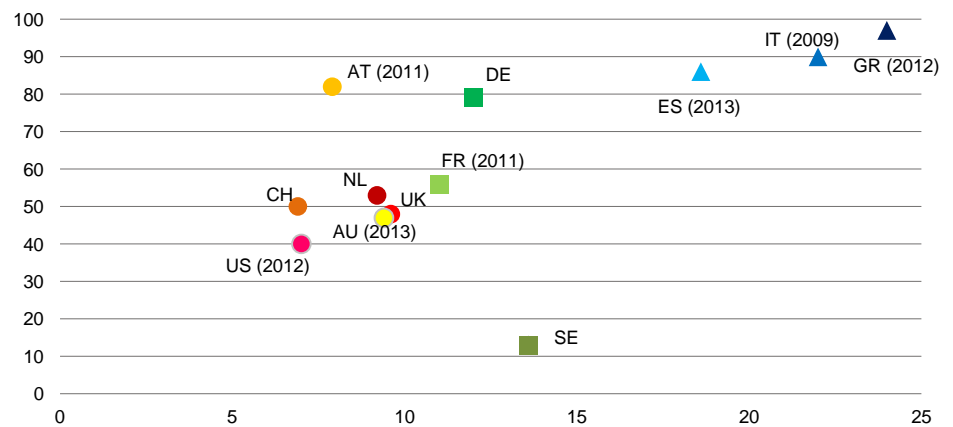
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economies while countries with relatively low cash usage tend to show low levels of shadow activity (Anglo-Saxon countries as well as Switzerland, the Netherlands or France). Given these diverse findings, it becomes clear that cash is scarcely the reason for conducting shadow activities. Rather, other parameters like the tax level and the quality of public institutions, the tax morale and the level of per capita income drive the size of the shadow economy.<sup>32</sup> The abolition of cash would not eliminate the shadow economy, but it would raise the cost of illegal payments and thus, might reduce the size of the shadow economy by an estimated 2-3%.<sup>33</sup>

Share of cash payments not a reliable indicator of size of shadow economy

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Share of cash payments in total number of payments in % (y-axis); shadow economy as % of official GDP (x-axis); data refers to 2014 unless otherwise indicated



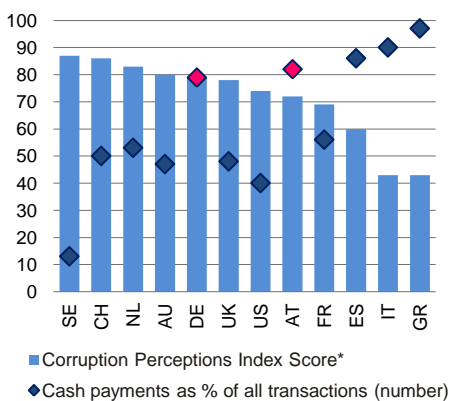
Annotation: Surveys and estimations on cash payments differ between countries. All focus on consumer payments at POS, but surveys may or may not include P2P or online payments or only refer to payments below a certain value.

Sources: Schneider, F. and Boockmann, B. (2016); Bagnall, J. et al (2014), Deutsche Bundesbank, Payments Council, Banca d'Italia, Banco de Espana, De Nederlandsche Bank, Sveriges Riksbank, Verband Elektronischer Zahlungsverkehr, G4S, Federal Reserve Banks of Boston, Richmond and San Francisco, Reserve Bank of Australia, Deutsche Bank Research.

Strong cash usage does not equal "high" public sector corruption

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2014 or most recent data available



\*The Corruption Perceptions Index measures the perceived levels of public sector corruption worldwide on a scale of 0 (highly corrupt) to 100 (very clean).

Sources: Transparency International, Bagnall, J. et al (2016), Payments Council, Verband Elektronischer Zahlungsverkehr, G4S, national central banks, Deutsche Bank Research.

Similarly, cash cannot be blamed for bribery. In many countries, the simple equation of "much cash, much bribery" seems to hold true. However, in countries such as Switzerland, Germany and Austria, low levels of perceived public sector corruption coincide with a high share of cash in total payments and/or a low number of cashless payments per person.

By contrast, and less surprisingly, there is evidence of a causal relation between cash and crimes committed to capture cash. A recent US study found that a reduction in cash circulation reduced the overall crime rate, as well as the rates for larceny, burglary and assault. The local crime rates in poor neighbourhoods had improved after the introduction of card-based social security benefits which was assumed to have reduced the amount of cash "on the street".<sup>34</sup> In Sweden, the shift from cash to electronic payments, with many bank branches having reduced or abolished cash services, led to a pronounced decline in the number of bank robberies and security van robberies over the past years.<sup>35</sup> Less cash seems to mean fewer crimes committed to steal cash. However, electronic payment fraud increased in Sweden (see below, "Cashless" Sweden).

<sup>32</sup> See Schneider, F., Boockmann, B. (2016).

<sup>33</sup> See Schneider, F. (2016).

<sup>34</sup> See Wright, R. et al. (2014).

<sup>35</sup> See Brå (Swedish National Council for Crime Prevention).



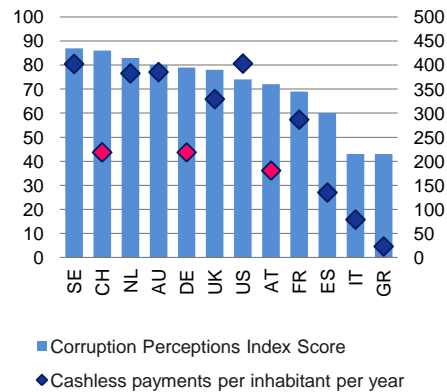


## Cash, freedom and crime

Use of cashless payments and public sector corruption in 2014

14

Corruption Perceptions Index Score\* (left), number of cashless payments per inhabitant (right)



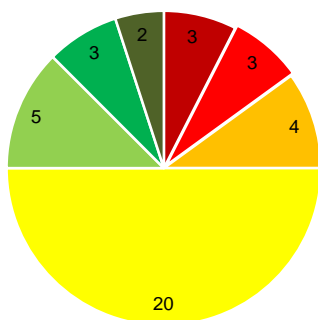
\* The Corruption Perceptions Index measures the perceived levels of public sector corruption worldwide on a scale of 0 (highly corrupt) to 100 (very clean).

Sources: Transparency International, ECB, BIS, Deutsche Bank Research

Most terrorist attacks in Europe in past 20 years cost less than USD 10,000

15

Number of attacks by estimated cost



- Disrupted before any costs incurred
- < 100 USD
- 100-1,000 USD
- 1,000-10,000 USD
- 10,000-20,000 USD
- > 20,000 USD
- Not possible to estimate

Sources: FFI (Norwegian Defence Research Establishment), Deutsche Bank Research

## Cash and international organised crime

There are only very few and vague estimations on the size of proceeds from international crime. The United Nations Office on Drugs and Crime (UNODC) valued the illicit global drug market in 2003 at an estimated USD 322 bn<sup>36</sup>, and the OECD assumes that counterfeiting of tangible products generated USD 250 bn in 2007.<sup>37</sup> Based on these studies and estimates on other illegal proceeds (human trafficking, etc.) the illicit drug business accounts for an estimated 50% and counterfeiting for 39% of total proceeds from international crime.<sup>38</sup> Drug business is said to rely more heavily on cash transactions (80%) than counterfeiting business (30%). Political measures limiting the use and circulation of cash would certainly raise the transaction costs for international crime, but as margins seem to be high this would probably only lead to a moderate decline (10-20%) in international criminal activity. Moreover, the size of financial and tax fraud is roughly estimated to be about twice as large as the proceeds from international crime<sup>39</sup>, and related flows may not rely as heavily on cash transactions as suggested by scandals like the Panama Papers.<sup>40</sup>

In order to invest or spend the funds obtained from criminal activity or tax fraud, criminals will launder “dirty” money, i.e. introduce it into the official economy. Authorities have taken measures to fight money laundering. The detection of money laundering also helps to convict the perpetrators of the underlying crimes. Besides, the more difficult it becomes to use funds with illegal origins in the legitimate economy, the lower the profit margin will be for criminal activities. According to a recent Europol report, money laundering continues to rely strongly on traditional methods and mostly involves cash at some point in the process, despite the rise of new technologies. The Europol study is based on an analysis of detected money laundering schemes. It finds that the initial step of money laundering is often to get rid of cash by placing cash receipts e.g. from retail drug selling in bank accounts or small businesses without arising suspicion. Also, cash is found to be used as a means to interrupt the audit trail, e.g. when the proceeds from online fraud are withdrawn in cash from a mule’s bank account.<sup>41</sup> A recent Financial Action Task Force (FATF) study concludes that money laundering usually encompasses cross-border transfers of funds and that the physical transport of cash plays an increasingly important role due to AML-measures in the financial system.<sup>42</sup> Both FATF and Europol studies demonstrate the importance of cash for money laundering schemes based on reports by authorities from many jurisdictions. However, it cannot be ruled out that law enforcement agencies are simply more prepared and successful in detecting illegal cash movements than illegal (cashless) financial flows.

## Most terrorist attacks are cheap to perpetrate

Similar to money laundering, the raising and transferring of funds for terrorist purposes relies on techniques to disguise these financial flows, including cash transactions. Detecting the money trail helps investigators to identify terrorists and to prevent terrorist attacks, according to FATF.<sup>43</sup> But terrorism has been on the rise despite counter terrorist finance measures since 2001, raising the question of whether FATF measures have been insufficient and poorly implemented or if terrorism is generally hard to combat by using financial

<sup>36</sup> See United Nations Office on Drugs and Crime (2005).

<sup>37</sup> See OECD (2009).

<sup>38</sup> See United Nations Office on Drugs and Crime (2011).

<sup>39</sup> See Schneider, F. (2015).

<sup>40</sup> See The International Consortium of Investigative Journalists (2016).

<sup>41</sup> See Europol Financial Intelligence Group (2015).

<sup>42</sup> See Financial Action Task Force (FATF) (2015).

<sup>43</sup> See FATF (2016).



controls, which are primarily driven by Western governments. Terrorist organisations controlling territories can raise funding in the occupied territory.<sup>44</sup> As regards terrorism in Europe, an analysis of 40 jihadist attacks in the past 20 years shows that most funding came from delinquents' own funds and 75% of the attacks cost in total less than USD 10,000<sup>45</sup> to carry out – sums that will hardly raise suspicions even if paid by card.

### Abolishing cash will not eliminate crime

Figures on crime and criminal cash usage are scarce and often imply the use of estimates. Nevertheless, the available evidence suggests that restrictions on cash use will probably reduce for-profit crime but will certainly not eliminate it. Other means of storing and transferring illegally obtained assets without leaving many traces are already in use. They include the transport of other physical valuables (e.g. prepaid instruments, precious metals) as well as using false identities, criminal middlemen and shell companies to facilitate cashless transfers via regulated entities like the banking system, money transmitters or online payment service providers. Also, funds can be moved through traditional or new, alternative transfer systems like hawala or private virtual currency schemes.<sup>46</sup> As of now, though, cash does make criminals' lives easier, especially when transacting with "retail customers", and it might take some time until an alternative means of payment with equal reach and anonymity as physical official currency emerges. Besides, handling cash does not require special knowledge of technology, accounting or legal constructions. The alternative techniques may only be feasible for "white collar" criminals.

Against this backdrop, cash payment thresholds and the abolition of high denomination banknotes are suggested. More radical voices are calling for the abolition of physical currency altogether. However, the shift to transparent and traceable electronic funds would also deprive citizens of an easy way to protect personal data. This could open the door to data abuse and infringement of civil rights by authorities, companies and criminals. Any decision to limit the use of cash would have to be justified by the reduction in crime that could reasonably be expected. As crime reduction looks likely but limited in scale, less controversial and radical law enforcement measures should be considered first. And conventional law enforcement methods can still be improved, for example via better coordination and information sharing between different agencies (police, customs) and countries – measures which will help to detect and deter criminals.

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<sup>44</sup> See Zeit Online (2015).

<sup>45</sup> See Oftedahl, E. (2015).

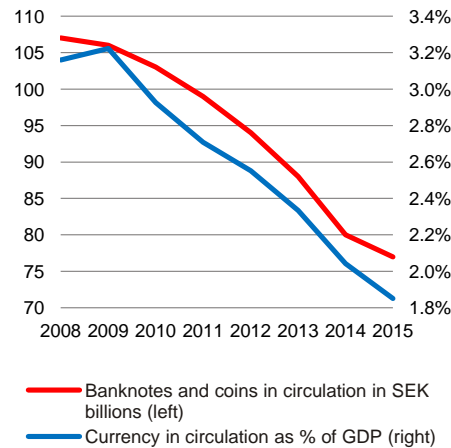
<sup>46</sup> For a detailed description of illicit flows going digital, see World Bank (2016).



“Cashless” Sweden: Fewer bank robberies, more card fraud

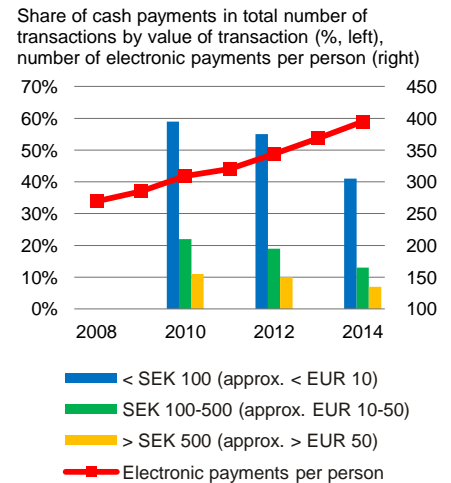
In Sweden, cash in circulation as well as the share of cash payments has been in steady decline for several years. At the same time, the use of cashless payment instruments has risen.

Sweden:  
Cash in decline



Sources: Sveriges Riksbank, Statistics Sweden, Deutsche Bank Research

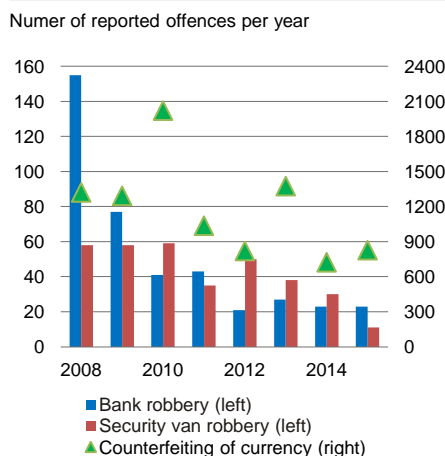
Sweden:  
Less cash and more electronic payments



Sources: Sveriges Riksbank, Statistics Sweden, Deutsche Bank Research

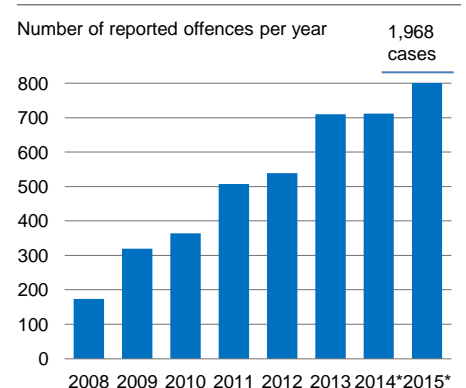
Rather surprisingly, though, the number of reported money laundering offences increased over the past years. This could signal that money laundering is not directly related to or even dependent on the usage and availability of physical currency. However, the reported cases may not fully reflect the actual picture. First, the value of the offences is not captured in these figures. Second, with authorities giving more attention to money laundering, banks might have become ever more careful in screening transactions and reporting suspicious payments. And finally, the extent of money laundering could be underestimated anyway, as almost only banks and payment service providers file suspicious transactions, whereas there are hardly any reports from lawyers or dealers in art or other precious goods.

Sweden:  
Less cash – less cash crime



Sources: Brå/Swedish Ministry of Justice, Deutsche Bank Research

Sweden:  
Less cash – more money laundering?



\*In mid-2014, the legal provisions regarding money laundering were changed.

Sources: Brå/Swedish Ministry of Justice, Deutsche Bank Research

The number of electronic payments has grown over the past years by over 7% on average, with card payments expanding more strongly than direct debits or paperless credit transfers. Fraudulent card payments grew even faster than the total number of card transactions. Since 2013, the number of

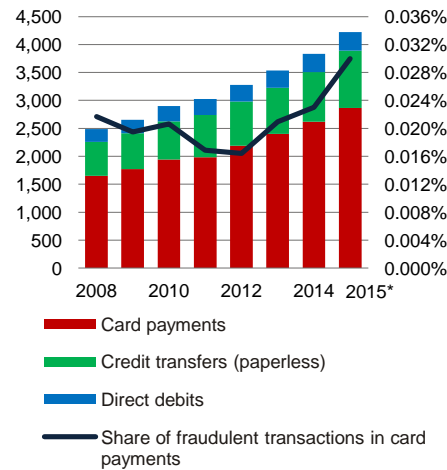


## Cash, freedom and crime

fraudulent transactions based on stolen card details has surged. This coincided with a pronounced decline in cash payments between 2012 and 2014.

### Sweden: Electronic payments and card fraud

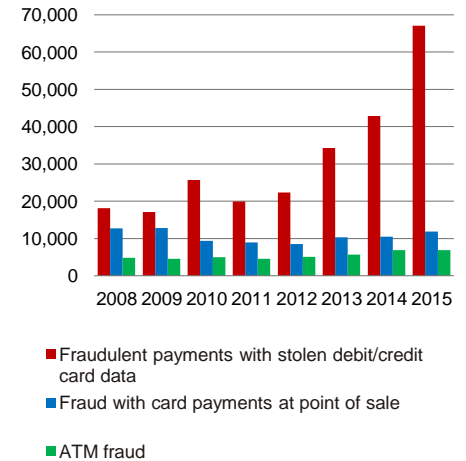
Number of transactions in millions (left);  
share of fraudulent card payments in % (right)



\* Number of electronic payments estimated  
Sources: Sveriges Riksbank, Brå/Swedish Ministry of Justice, Deutsche Bank Research

### Sweden: Online card fraud on the rise

Number of reported fraudulent transactions



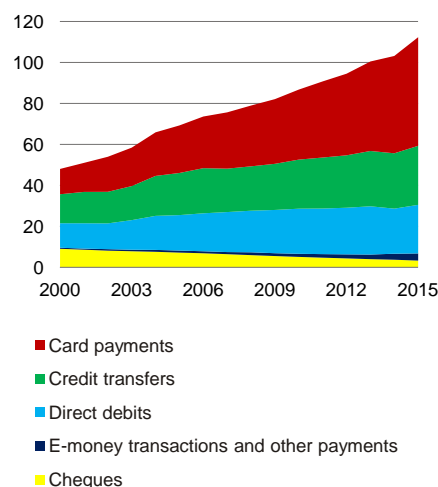
Sources: Brå/Swedish Ministry of Justice, Deutsche Bank Research

## Cash versus cashless payments

### Payment choice: it's all about convenience, with safety taken for granted

#### Cashless payments on the rise in the EU 17

Number of transactions in billions



Sources: ECB, Deutsche Bank Research

Several factors influence a payer when choosing whether to pay cash or cashless. For retail users, payment habits and convenience – including reach – seem to be decisive.<sup>47</sup> Characteristics such as age or income influence payment habits. Also, the preferences for cash payments differ across Europe, which is reflected on the merchants' side. The (still) broad acceptance of cash is certainly an important aspect of convenience, as is the transparency it offers in terms of personal cash management. Convenience, though, is also the strong driver behind card payments which have grown tremendously in volume and value and have reduced cash usage at the point-of-sale over the past decades. A card removes the liquidity restriction posed by cash in a purse. This is a strong case for merchants to provide the infrastructure to accept card payments. The infrastructure needed, though, is a drawback for card payments: private persons cannot receive them because they lack this infrastructure. Thus, P2P<sup>48</sup> (proximity) payments are overwhelmingly cash payments. New providers and industry initiatives are targeting P2P payments with mobile instant payment solutions.<sup>49</sup> Overall, across countries, albeit at different pace, cash payments are increasingly being replaced by cashless alternatives in a market-driven

<sup>47</sup> Cash also functions as a critical means of financial inclusion. A majority (76%), but not all EU citizens own a current account (Special Eurobarometer 446, July 2016).

<sup>48</sup> Person-to-person.

<sup>49</sup> For payment use cases and cash, see Mai, H. (2015).



Cash, freedom and crime

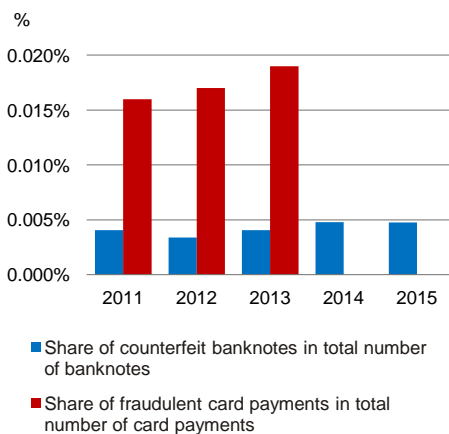
process. Providers offer electronic payment instruments – from card and mobile payments to bitcoins – and users make their choices.

Users' focus on convenience certainly relies on the high level of public trust in the integrity and smooth functioning of cashless payment instruments. Consumers typically pay less attention to safety, speed or cost than to convenience when choosing payment instruments.<sup>50</sup> Indeed, the setup of the traditional electronic payments landscape allows consumers to pay little heed to security or cost when choosing between cash and cashless payments. The technical security standards of existing electronic bank and card payment systems as well as tight customer protection rules protect consumers to a large extent from losses due to fraud or poor execution. Also, retail clients are usually not charged on a transaction basis for cash or (domestic) card payments.

Payment costs do matter, though, for merchants and banks which have to bear the transaction costs. Depending on competition, market practice and regulation, merchants and payment service providers may or may not be in a position to charge consumers for certain payment instruments or cash services. For larger companies, cost and integrity of payments are a concern. They have largely reduced or eliminated cash in favour of electronic payments in order to strengthen internal controls and to manage their funds more efficiently.

Euro area: overall fraud risk very low – even lower for cash than for card payments

18



Annotation: Most recent available figure for card payment fraud is for 2013. Card fraud refers to fraud at POS, ATM and to card-not-present transactions.

Sources: ECB, Deutsche Bank Research

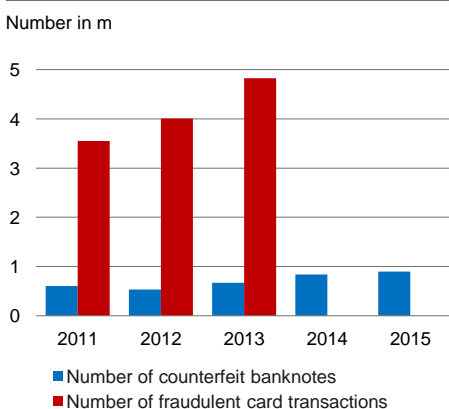
Which are more secure: Cash or cashless payments?

Even if security is taken for granted by retail users as long as there are no major issues, the security of funds and the correct execution of payments is a key element when evaluating cash and different electronic payment instruments. As any payment requires available funds, the security of accounts and cash savings is closely related to transaction integrity. Security breaches can be fraud or theft, or both like in the case of stolen payment details. Fraud does occur but its level is very low in relation to the huge number and value of transactions.

Both of the dominant consumer payment instruments in the euro area – card and cash transactions – show low levels of fraud but physical currency looks more fraud-resistant than card payments when assessing transaction integrity only. In 2013, there was one counterfeit banknote in about 24,600 but one fraudulent transaction in 5,300 card payments. Also, the absolute number of fraudulent card payments is a multiple of the number of counterfeit banknotes. Accordingly, the value of counterfeit cash is smaller than the value of unauthorized card transactions. This is plausible given that card payments tend to be higher in value than cash payments. While the face value of counterfeit euro banknotes detected in 2013 was EUR 32 million, the damage caused by card fraud in the euro area amounted to EUR 430 million. Even though the two parameters are not fully comparable, cash overall looks safer than cards.

Euro area: counterfeit banknotes vs. fraudulent card payments

19



Sources: ECB, Deutsche Bank Research

One reason for the comparatively higher volume of fraud with card payments may be that these are frequently used in the online world where a consumer might not be able to control for fraudulent behaviour to the same extent as in a face-to-face situation. Card fraud at POS is lower than in online situations, probably thanks to EMV technology<sup>51</sup> on physical cards. As regards cash, central banks put great emphasis on the quality and security of banknotes and modernize security features on an ongoing basis.

The risk of theft for cash is difficult to assess due to a lack of specific data. Crime statistics for Germany suggest that the damage through counterfeit

<sup>50</sup> Ibid.

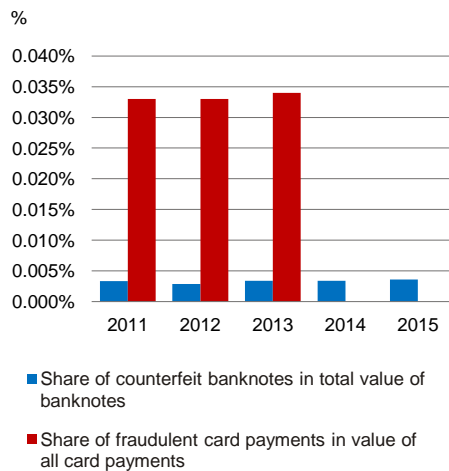
<sup>51</sup> EMV technology enhances card payment security by using a chip instead of a magnetic stripe for data storage on the card. The term "EMV" refers to Europay, Mastercard and Visa who initiated this technical standard.



## Cash, freedom and crime

Euro area: Higher fraud value in card payments than in banknotes

20



Annotation: Most recent available figure for card payment fraud is for 2013. Card fraud refers to fraud at POS, ATM and to card-not-present transactions.

Sources: ECB, Deutsche Bank Research

banknotes (EUR 4.4 million in 2015) may be dwarfed by the damage through theft of cash. In 2015, 168,142 cases of pick-pocketing were reported. Given that Germans carry an average of EUR 103 in cash in their pockets, this adds up to a likely damage of over EUR 17 million.<sup>52</sup> Besides, the damage of EUR 441 million resulting from burglary of private residences will also include a share of cash.<sup>53</sup> This rough estimate compares to a damage through card fraud of about EUR 53 million in Germany, according to ECB figures. German police report EUR 62.9 million in fraud conducted with stolen cashless payment means (mostly cards).

However, fraud data for electronic payment instruments other than cards would need to be considered, too, but are not readily available. Also, there is only occasional information in press articles on the damage caused by cyber-theft from accounts maintained at payment service providers. Regulators, for one, are taking the risk of cyber fraud seriously and are developing mitigating measures.<sup>54</sup>

Finally, given that electronic payments and accounts are more dependent on a functioning IT infrastructure than physical cash, the latter can act as a contingency means of payment, i.e. as a backup system in extreme situations like an energy outage or a state of emergency.

To conclude, payments in the regulated sphere carry a very low risk of fraud or theft. Further data is needed though to get the full picture including all payment instruments and related accounts, vaults and similar. Whether it is safer to pay cash or cashless will ultimately depend on the risk of physical theft, fraud and cyber-crime in any given situation or place as well as on the user's ability and attention paid to secure his payment means. In the end, criminal activity is preferably conducted where the value is. In Sweden, the switch from cash to cashless payments is mirrored by a switch from counterfeiting and bank robberies to electronic payment fraud.

### Cost of cash versus non-cash payments

Despite numerous studies in the field of payment system costs, there is no clear picture on the cost of payments to the economy as a whole. The research usually includes estimates of the costs borne by payers, merchants, banks, central banks, service providers (network providers, cash-in-transit companies, etc.) for different payment instruments. However, results differ widely depending on the country, theoretical approach, data availability, assumptions like average transaction size, etc. Krüger and Seitz provide a useful overview of the studies and their estimates of cost per payment instrument.<sup>55</sup> In a study based on 13 EU countries, cash accounted for half of the social and private cost of retail payments. Also due to high usage, though, cash incurred the lowest cost per transaction in most countries, followed by debit card transactions.<sup>56</sup> Given that both cash handling and electronic payments need dedicated infrastructures and are affected by economies of scale, it comes as no surprise that the level of cash usage impacts the unit cost of cash as well as of (substituting) electronic payment instruments.

<sup>52</sup> See Deutsche Bundesbank (2015b).

<sup>53</sup> See Bundeskriminalamt (2016).

<sup>54</sup> See Bank for International Settlements (2016).

<sup>55</sup> See Krüger, M., Seitz, F. (2014).

<sup>56</sup> See Schmiedel, H., Kostova, G., Ruttenberg, W. (2012).



## Payment data – benefits and concerns

Cash leaves hardly any traces, but cashless funds and payments do. While the information accompanying electronic transactions traditionally only used to facilitate the payment execution, it is now a valuable by-product. Modern data analytics allow the extraction and collection of information specific to an identifiable user, which will enable the data processor to approach the consumer with product and service offerings tailored to his (perceived) needs. Companies are interested in this data in order to make their advertising more relevant and thus to raise their sales. Data has become an economic good for which the (unwitting) “producer” is usually not remunerated. However, offerings which serve his needs and suit his preferences better than before can be regarded as a non-monetary benefit.<sup>57</sup> Personal data extracted from payments can be enriched with information from other sources, e.g. from data-generating applications like market places or social media.

However, citizens have a right to preserve their personal privacy. In today's digital world, personal data often allows those who can access and analyse the data deep insights into an individual's life. Banks have long been subject to particularly strict data protection rules, including their payments business. Especially in early stages of development, online-based payment systems and providers are not always subject to the same rules and scrutiny, depending on their home jurisdiction. The most robust data protection is provided by cash, as no data is generated at all.

## Cash and civil liberties

The significance of physical currency runs deeper than the economic aspects discussed above. It touches upon the relation between citizens and the state. The voices calling for a limitation or abolition of cash usage argue that tighter and more comprehensive state control over individuals' financial flows and funds will fight crime effectively. However, the shift to transparent and traceable electronic funds with no easily available option left to pay anonymously can open the door to data abuse and infringement of civil rights. Moreover, this approach carries a flavour of incriminating citizens without fact-based suspicion which will hardly strengthen trust in public institutions.

In fact, comprehensive data on an individual citizen can facilitate surveillance for political reasons. Even in Western democracies which are governed by the rule of law, citizens are well advised to be vigilant that state authorities do not abuse their powers. This not only refers to obvious executive powers like the police's use of force. Knowledge of the private and financial situation of individual citizens gives public authorities additional power over them. Even with stringent data protection rules in place, the unlawful abuse of such information asymmetry cannot be ruled out with certainty. Comprehensive data on individuals might tempt abuse for personal, commercial or political ends, be it by a single civil servant acting unlawfully or by domestic or foreign intelligence services. The willingness of citizens to be transparent towards authorities depends crucially on their trust in public authorities functioning well and not overstepping their mandate.

Anonymous cash can facilitate tax evasion, especially by those who cannot afford to shift their funds into non-registered valuables or complex legal structures. However, cash is clearly not the reason for tax compliance or evasion. Deterrence by audits and sanctions strengthens tax compliance but amazingly, it does not explain the high amount of taxes actually paid. Indeed, it

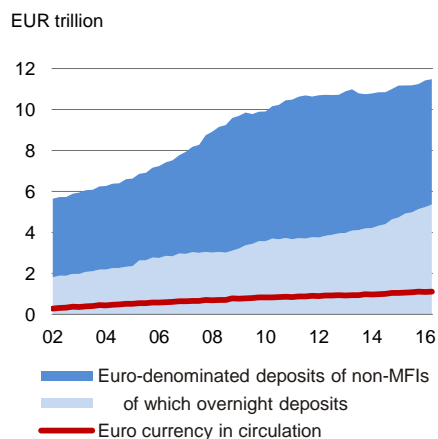
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<sup>57</sup> See Jentzsch, N. (2014).



## Cash, freedom and crime

Euro area deposits are a multiple of cash 21



Sources: ECB, Deutsche Bank Research

is citizens' willingness to pay taxes that is crucial for tax compliance and this tax morale has been found to correlate with the relation between citizens and government: a higher degree of (direct) political influence strengthens tax morale and induces tax authorities to treat taxpayers with respect rather than as suspects.<sup>58</sup> Also, tax morale is stronger if citizens perceive a reasonable relation between taxation and public services.<sup>59</sup> General trust in the quality of public institutions is a key factor for tax compliance.

An abolition or strict limitation of cash usage carries the risk of seriously eroding trust in state authorities. Depriving citizens of a simple tool to escape state control in cases where authorities are regarded as acting illegitimately can easily prove to be counterproductive. Feeling captive to public authorities – as opposed to being a citizen – would loosen the bond between people and government. In spite of this psychological effect, it is objectively unclear if and how much citizens can control government power by choosing physical cash instead of electronic funds.

Given the – real or perceived – importance of cash for civil liberties, a limitation or abolition of cash usage would need to be justified by tangible public benefits. Only then may trust between citizens and authorities remain intact. Significant crime reduction is not a convincing argument, though, as cash is neither the motivation for crime nor the only way to transfer illicit funds. On a less political note, the choice between cash and money in electronic accounts should be left to users, who happen to be citizens, taxpayers, consumers and producers at the same time. So far, fortunately, trust in public institutions and financial infrastructure in Europe seems to be strong, as users have shown a growing preference for electronic funds and payments.

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<sup>58</sup> See Feld, L., Frey, B. (2000).

<sup>59</sup> See Feld, L., Frey, B. (2007).





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