October 1, 2007

Federal Reserve Bank of Cleveland

Are Consumers Cashing Out?

by Paul W. Bauer and Daniel Littman

Ever since "automated clearing house" technology was introduced in the 1970s—enabling transactions to be handled electronically (like direct deposit payroll checks)—the demise of paper-based payment instruments has been predicted many times. Over the past few decades, rapid technological change in computers and telecommunications has provided Americans with many new means of paying for things—and those means have been increasingly electronic. Credit card transactions used to require that companies process paper receipts; now they are a fully electronic payment instrument. The use of debit cards—always electronically based—has expanded rapidly since they were introduced. And while consumers still write checks, they have been writing fewer of them—and those that are written are increasingly being cleared and settled electronically.

But cash is still used often—for small-value transactions, that is. Large-value transactions are almost never conducted with cash; the convenience and cost savings of electronic payments had attracted virtually all of the volume for large-value transactions as far back as 20 years ago. Historically, cash has been less expensive to use than other payment instruments for low-value transactions, but this advantage has been eroding as advances in computing and telecommunications lower information storage and access costs. Consumers still choose to carry and use cash in spite of the alternatives because of some of its other qualities: Cash remains widely accepted, offers the user some anonymity, and does not depend on complex communications networks (in a blackout, for example, cash would be accepted by nearly anyone, anywhere, unlike electronic payment instruments). The biggest drawbacks of cash are that it can be risky to carry and, if lost or stolen, it is difficult to recover.

While people are using electronic payments more, are they using cash less? It's not an easy question to answer. Because using cash involves no third party, no one keeps records of its use and there is no way to directly count the total number or value of cash transactions. Unfortunately for people interested in payment trends, this fact also means they have to employ indirect measures to get an idea of how much cash people are using now and how this compares to the past.

Two indirect methods of measuring cash usage suggest that people are indeed switching from cash to more electronic forms of payment, but the process is happening slowly. Innovations in electronic payments may be gradually eroding the advantages of using cash, but cash is still preferred for many transactions.

Cash Usage

You could get an estimate of cash usage by surveying consumers and businesses, and this is occasionally done. Unfortunately, conducting such a survey periodically over time would be expensive, and the resulting data may not be that good. Reporting accurate figures would be time consuming and expensive for businesses. Most businesses deposit checks and cash together daily at their banks and therefore can only report the value of cash and checks combined. Some may have records that indicate the total value of cash received in a day, but not the actual number of cash transactions.

The information age has led to many new forms of payment, including credit cards, debit cards, and online banking. In many ways, these new mechanisms seem preferable to cash. While the disappearance of cash is a very long way off, it seems people are starting to use it less.

Another problem is that consumers are likely to have trouble recalling all of their cash transactions accurately. And consumers and businesses may not wish to acknowledge some cash transactions, either because of privacy concerns or because the transactions are associated with the underground economy—activities ranging from tax evasion to drug trafficking.

Indirect measures offer a less expensive alternative for estimating trends in cash usage. One is to analyze changes in the stock of currency. If we assume that the real value of the average cash transaction has remained roughly constant over the years, and if we assume that people do not spend the currency they hold more rapidly than in the past, then the total number of cash transactions would be proportional to the stock of currency people hold. Of the two assumptions, the latter is arguably the least likely to hold given that the introduction of ATMs in the early 1980s almost certainly altered how much cash consumers carry and how often they replenish those stocks. However, any change from ATMs is likely to have been a one-time effect. Since 1996, the number of ATM transactions has been relatively flat, sug-

ISSN 0428-1276

gesting that by that point it was a mature service. Consequently, the estimates of total transactions that we have made by working from the currency stock should be consistent over the past 10 years.

The real value of currency outstanding has increased nearly 3.3 percent on average per year since 1980, suggesting no slackening in the demand for Federal Reserve notes. However, much of this growth has come from an increase in the number of notes that foreigners hold. In 1970, only about 10 percent of the total value of Federal Reserve notes outstanding was held overseas, but more recent estimates put it at over 45 percent, mostly in the form of $50s and $100s. Looking at the stock of currency estimated to be held domestically, we find that it has increased much more slowly, just 1.5 percent per year since 1980.

But $50 and $100 notes are not typically used in retail transactions (rather, people hold them as a store of value), so even this measure overstates the stock of currency held for domestic retail transactions. A better measure for this purpose excludes these denominations. When we focus on $1s through $20s, we see that the real value of small-denomination notes has drifted down 0.5 percent since 1980, suggesting that the total number of cash transactions has fallen—if the assumptions listed above hold and the number of cash transactions is proportional to the stock of cash. Lately, the shift away from cash seems to be quickening: Since 2000 the real value of small denomination notes has fallen nearly 1 percent.

To get an estimate of how cash's share of total transactions has changed over time, we need an estimate of the total number of all transactions. We use real GDP (the total value of all transactions, adjusted for inflation) as an indirect measure of this number. We take the real value of cash outstanding and divide it by real GDP to give us an indirect measure of the proportion of total transactions that are conducted with cash. After netting out foreign holdings, what is clear from this method is that cash's share of total transactions has trended down (see figure 1). Whether we look at the real value of all domestic currency outstanding per dollar of GDP or only the corresponding series for small-denomination notes, the post–World War II trend is consistently downward.

Another indirect measure of currency usage, which complements our own and was proposed by Geoffrey Gerdes of the Federal Reserve Board, is taken from notes that are removed from circulation. Whenever banks deposit currency at Federal Reserve Banks, one thing the Reserve Banks do with it is examine every note and destroy all those that are unfit for use. As part of this process, they record how many unfit notes are destroyed and their value. These records can be analyzed to estimate how much cash people are using. If consumers and businesses have not altered the way they handle notes over time and if the durability of the paper has not changed significantly, both good first approximations, then the number of unfit notes destroyed by the Reserve Banks would be proportional to the number of currency transactions.

We have Federal Reserve data on note destruction by denomination going back to 1980. There are sharp spikes in the series that correspond to the introduction of new notes combined with a decision to cull the older designs as they were deposited at Reserve Banks, as happened with $100s in 1991 and 1996, $50s in 1997, and $20s in 2000. But after allowing for these events, it appears that the number of destroyed notes peaked in the mid 1990s, whether one looks at the total real value of notes destroyed or just the real value of small-denomination notes. Thus, the destruction measure suggests that the number of cash transactions peaked in the mid-1990s, about the same time that the number of paper checks peaked, which is roughly consistent with the signal given by the stock of small-denomination currency. As with our first indirect measure, the real value of notes destroyed per dollar of real GDP (figure 2) also implies that cash's share of total transactions has been falling.

The declining use of cash is not confined to the United States. One study found that in 10 of the 16 developed countries investigated, the most recent trend in real total home currency outstanding was flat or down. For the same set of countries, the trend for small-denomination notes was flat or down for 13 of these 16 countries (large denominations, as in the United States, are more likely to be held as a store of value than for transaction purposes). Another study found evidence that, although cash usage remains significant, electronic substitutes are lowering the demand for cash in 13 developed countries. A research study on the use of cash in Norway employed an econometric model to estimate the share of consumers' cash transactions. It showed that cash's share had fallen from 81 percent in 1990 to just 54 percent in 2000 and forecast that cash's share would fall to 25 percent by 2010.

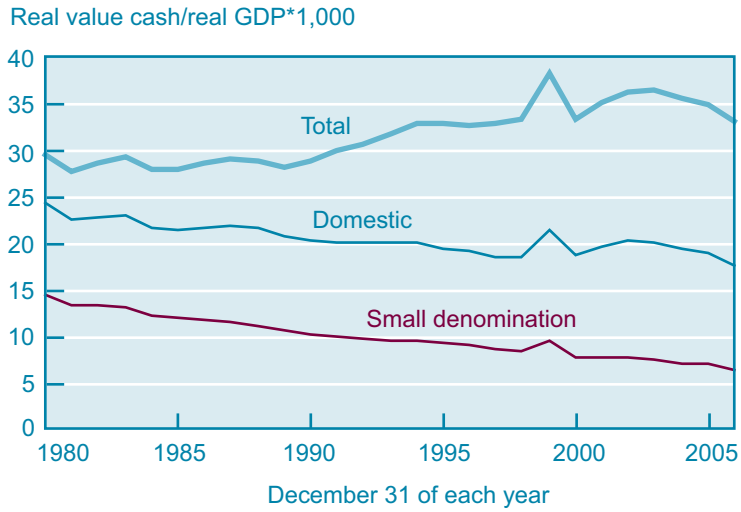
A by-product of that Norwegian analysis raises an important question for central banks and their provision of cash. The study estimated that in 2000 over 60 percent of Norway's outstanding cash was associated with the underground economy—everything from tax evasion to drug trafficking. The magnitude of these activities was estimated to be about 7.5 percent of Norway's GDP, a figure consistent with more conventional estimates of the size of its underground economy. Norwegian payment data are more detailed than in most other countries, so similar estimates are more difficult to obtain for them, but it is likely that cash plays a similarly outsized role in other countries' underground economies. As the legitimate use of cash declines, central banks will face the question of whether to continue to supply cash in the same manner or whether to make changes to impede the attractiveness of cash for illegal transactions.

Such a question is not unprecedented. Already governments limit the value of the highest note in circulation to make it difficult to conduct high-value transactions with cash. As a result, the volume of currency involved in illegal drug trafficking is larger than that of the drugs themselves, and is thus a bigger logistical problem. And as part of their anti-money-laundering laws, some governments require that cash transactions above a certain level be reported.

■ Payment Innovations

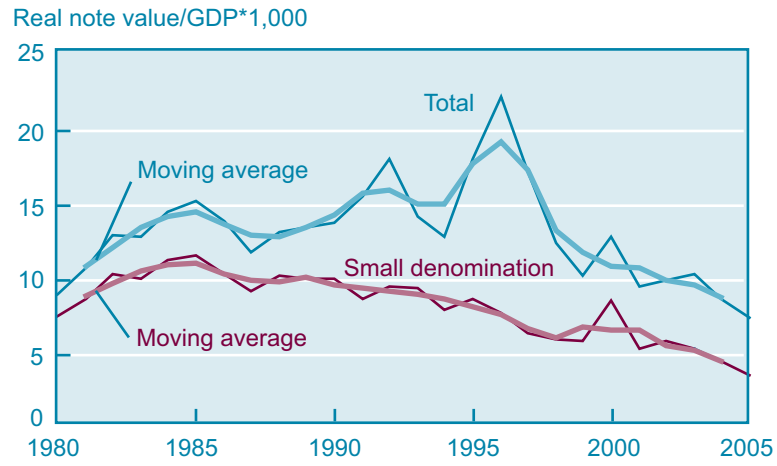
Cash faces increasing competition from new and improved alternative payment instruments. From 2000 to 2003, credit card transactions grew 6.7 percent, automated clearing house

FIGURE 1 REAL VALUE OF CURRENCY PER REAL GDP



Sources: Bureau of Economic Analysis; Board of Governors of the Federal Reserve System; and authors' calculations.

FIGURE 2 REAL VALUE OF NOTES DESTROYED PER DOLLAR OF REAL GDP



Sources: Bureau of Economic Analysis; Board of Governors of the Federal Reserve System; and authors' calculations.

transactions grew 13.4 percent, debit card transactions grew 20 percent, and electronic benefit transfers grew 15.4 percent. Meanwhile, the number of paper checks, an old payment stalwart, declined 4.3 percent.

If the pressure from existing payment instruments is not enough, other innovations are on the horizon. To discuss just one example, cell phones overseas increasingly include near-field communication (NFC) chips that allow them to perform contactless payments. In the United States, the early use of contactless payments has focused on cards rather than on cell phones: Mastercard's PayPass and Visa's payWave. Costing only a few cents, NFC chips can contain more information than the magnetic stripe on a credit or debit card. What makes cell phones such a potent potential competitor to cash is that the average American is twice as likely to carry his cell phone as cash, with 18–34-year olds four times more likely. Cell phones can also be used to access online accounts. And if they are lost or stolen, they can be deactivated. Such an innovation erodes or eliminates cash's advantage on every dimension except anonymity and robustness to infrastructure failure.

Electronic payment innovations can also lower the total cost to society of making payments. One study estimates that 12 European countries had saved the equivalent of about 0.38 percent of their GDPs by increasing the share of noncash transactions made with electronic payments from 43 percent to 79 percent from 1987 to 1999. Future innovations promise even more savings, but adoption is often hindered—as it is for all types of new goods—by startup costs and consumer inertia. Payment innovations face an additional hurdle because of network economies (where the value of a good to any one consumer depends on how many other consumers have adopted it). A payment instrument is only useful to the extent that consumers possess it and merchants accept it, but there may be uncertainty over which innovation will be widely adopted. In such cases, the government may be able to facilitate the "coordination problem" associated with the adoption of innovations (see "The Fate of One-Dollar Coins in the U.S." in the Recommended Reading). Fortunately, most payment innovations do not require a new network and can be piggy-backed to existing ones.

Going forward, because of the added convenience and cost savings that future innovations will undoubtedly provide, new payment instruments will reduce the use of cash. But such innovations will likely compete more with existing alternatives to cash until they can match cash's anonymity and versatility in small-value transactions.

Consumers will continue to adopt new payment instruments and technologies, but cash will certainly not vanish from the economy anytime soon. Cash's unique advantages should ensure that people will continue to hold at least some cash and use it for the foreseeable future, even though the proportion of payments they make with cash will continue to decline, as will the absolute number of cash transactions. Furthermore, demand for large-denomination notes as a store of value appears likely to remain strong for the foreseeable future.

■ Recommended Readings

"Against the Tide—Currency Use among Latin American Immigrants in Chicago," by Carrie Jankowski, Richard D. Porter, and Tara Rice. 2007. Federal Reserve Bank of Chicago, *Economic Perspectives*.

Federal Reserve Bank of Cleveland
Research Department
P.O. Box 6387
Cleveland, OH 44101

Return Service Requested:
Please send corrected mailing label to the above address.

PRSRT STD
U.S. Postage Paid
Cleveland, OH
Permit No. 385

On cash's use in large-value transactions:

"Market Failure and Resource Use: Economic Incentives to Use Different Payment Instruments," by David Humphrey and Allen Berger. 1990. In *The U.S. Payments System: Efficiency, Risk, and the Role of the Federal Reserve*, edited by David Humphrey. Boston, Kluwer Academic Publishers.

On network economies:

"Network Economies: The Catch-22 of Retail Payment Innovations," by William Osterberg and James B. Thomson. 1998. Federal Reserve Bank of Cleveland, *Economic Commentary* (February 15).

On coordination problems:

"The Fate of One-Dollar Coins in the U.S.," by Sébastien Lotz, and Guillaume Rocheteau. 2004. Federal Reserve Bank of Cleveland, *Economic Commentary* (October 15).

On estimating cash used overseas:

"The Location of U.S. Currency: How Much is Abroad?" by Richard Porter, and Ruth Judson. 1996. Federal Reserve Bulletin, Board of Governors of the Federal Reserve System.

"Some Tables of Historical U.S. Currency and MonetaryAggregates Data," by Richard G. Anderson. 2003. Federal Reserve Bank of St. Louis, working paper, no 2003-006A.

"Challenges to Currency: Will Cash Resist the e-Money Challenge?" by Mathias Drehmann, Charles Goodhardt, and Malte Krueger. 2002. *Economic Policy* (April).

"Debit Card and Cash Usage: A Cross-Country Analysis," by Gene Amromin, and Sujit Chakravorti. 2007. Federal Reserve Bank of Chicago, Working Paper No. 2007-04.

And on cash use in illegal activities

"The Future of Cash: Falling Legal Use and Implications for Government Policy," by David Humphrey, Aris Kaloudis, and Grete Öwre. 2004. *Journal of International Financial Markets, Institutions, and Money*, vol. 14.

On government savings of using cash

"Benefits from a Changing Payment Technology in European Banking," by David Humphrey, Magnus Willesson, Göran Bergendahl, and Ted Linblom. 2006. *Journal of Banking and Finance*, vol. 30.

On electronics infrastructure:

"How Effective Were the Financial Safety Nets in the Aftermath of Katrina?" by Julia S. Cheney, and Sherrie L.W. Rhine. 2006. Discussion Paper, Payment Cards Center, Federal Reserve Bank of Philadelphia.

Paul W. Bauer is an economic advisor at the Federal Reserve Bank of Cleveland, and Daniel Littman is a senior payments consultant at the Bank.

Economic Commentary *is published by the Research Department of the Federal Reserve Bank of Cleveland. To receive copies or be placed on the mailing list, e-mail your request to* 4d.subscriptions@clev.frb.org *or fax it to* 216.579.3050. Economic Commentary *is also available on the Cleveland Fed's Web site at* www.clevelandfed.org/research.

We invite comments, questions, and suggestions. E-mail us at editor@clev.frb.org.