*Federal Reserve Bank of Minneapolis Quarterly Review*
Vol. 20, No. 4, Fall 1996, pp. 2–12

# Are Checks Overused?

Kirstin E. Wells
Senior Analyst
Division of Reserve Bank Operations and Payment Systems
Board of Governors of the Federal Reserve System

**Abstract**
This study overturns the conclusion of a 1990 study by David Humphrey and Allen Berger, which found that check float is responsible for the popularity of checks despite their high resource cost compared to electronic payment instruments. The new study examines recent data on the costs of checks and automated clearinghouse (ACH) payments. It finds that the value of check float has decreased significantly since the 1990 study and is no longer large enough to make checks more attractive than ACH payments. The study also questions whether the idea that float could be responsible for the persistent use of checks is reasonable given standard assumptions about the behavior of economic agents. The study ends by speculating on why checks are used more than less-costly alternatives and by encouraging policymakers to wait for researchers to adequately answer that question before intervening in the market for payment instruments.

Despite the growing availability and acceptance of electronic payment instruments—such as credit cards, debit cards, and automated clearinghouse (ACH) payments—by far the most popular noncash payment instrument used in the United States is the paper check. In 1995, approximately 80 percent of all noncash transactions were made by check (Bank for International Settlements, forthcoming). Furthermore, although use of electronic instruments has grown in the past several years, check use has grown as well: between 1987 and 1993, the average annual number of payments per capita increased by 26 payments for electronic instruments, but by 31 payments for checks (Humphrey, Pulley, and Vesala, forthcoming). Clearly, individuals and businesses are not rapidly shifting away from checks to electronic instruments.[1]

The popularity of checks persists even though checks cost society more to produce and process than do electronic instruments. According to standard economic theory, that may be a sign that the market for payment instruments is not working properly. In general, in an efficient market, when competing goods are available and one costs society more, the prices of the goods will reflect the relative costs of the resources used to produce them, and the cheaper good will be substituted for the more expensive. In this way, society uses its resources to produce only the particular goods it wants in the particular amounts it wants. In other words, resources are used efficiently. When use does not shift to the cheaper good, either the goods are not close substitutes or the market has failed, and there is a potential role for a public authority to attempt to correct the failure.

Market failure is a commonly accepted view of what's happened in the market for payment instruments. According to this view, the users of checks are the check writers. And for those individuals and businesses, the private cost, or price, of using checks has been distorted by the value of *check float*, or the time between the writing and clearing of a check. During that time, of course, the funds can earn interest for the check writer rather than for the check receiver. The size of this benefit is thought to have reduced the price of check use below the cost to society of producing and processing checks. Since individuals and businesses don't face that higher social cost, they continue to use checks despite the existence of other means of payment that are less costly to society. In short, checks are overused.

This study questions that common view. Here I focus on the choice between paper checks and *ACH payments*, or automatic electronic payments made through selected financial institutions.[2] While credit and debit cards are electronic substitutes for checks, those instruments are used primarily by individuals for discretionary transactions. In contrast, the ACH network was designed to accommodate several types of fund transfers, including business payments to consumers and other businesses, consumer payments to businesses, and government payments to consumers and businesses. Therefore, ACH payments may be viewed as a close substitute for several types of check payments. Consumers commonly use ACH payments to pay recurring utility, mortgage, and insurance bills; businesses use them to make payroll and dividend payments and to facilitate cash concentration and disbursement. My examination of the cost data on ACH and check payments does not support the idea that the value of check float is large enough to create a significant difference between the private and social costs of check payments or to cause the overuse of checks. I also question whether, aside from the data, the notion that float is to blame for the persistent use of checks actually makes sense.

But if the common view is mistaken, why are checks still used more than electronic payment instruments despite their cost differences? Is there a role for the public authority in this arena, the central bank, to provide incentives in this market? Are checks overused or not? I don't have definitive answers to those questions, but I do have a few speculations.

One is that perhaps checks are not overused. This would be true, for example, if the cost data do not accurately reflect the costs of the competing payment instruments. If checks are actually not more costly to society than electronic instruments, then there should be little incentive, in an efficient market, for users to shift to a different means of payment. Checks would also not necessarily be overused if they and the other instruments are viewed not as close substitutes, but rather as different types of goods, not in direct competition. In either of these situations, there is no market problem for the central bank to solve.

Then again, perhaps checks are overused, not because of float, but because of another sort of market failure. ACH payments typically require significant fixed expenditures before they can be used by a business. For a single business, that cost may exceed the benefit of using such payments. Yet if many businesses used ACH payments, the benefits to all would increase and the use of checks would decrease, along with the cost of transactions to society as a whole. If this were true, then some sort of third-party intervention might be necessary to encourage businesses to become part of an ACH network.

But, again, this is mere speculation. Before the central bank acts to encourage or discourage the use of any particular payment instruments, further research needs to be done to determine what is really influencing payment instrument choice.[3]

## A Mistaken View

Past data on the private and social costs of various payment instruments supported the common view that the value of check float is to blame for the persistent use of checks. However, updated data contradict that view. And aside from the data, the view is hard to accept.

### *Float's to Blame*

One influential study of 1987 data supports the common view. Humphrey and Berger (1990) used these data to calculate, for nine types of payment instrument, the total *social cost*, the value of real resources consumed in the use of the instrument, and the *private cost*, the price faced by its user, which Humphrey and Berger saw as the payment originator, or *payor*. This study found that social costs were higher for checks than for most electronic instruments. Again, in an efficient market, that difference in social costs would imply that a large proportion of total payments would be made using low-cost electronic media.[4] Yet Humphrey and Berger found that the use of noncash instruments did not correspond with their cost; specifically, checks were used much more than electronic instruments. (See Humphrey and Berger 1990, p. 50, Table 2-1.)

According to Humphrey and Berger, the disparity between use and cost was the result of the high value of

check float. Indeed, they calculated that the float value for an average check effectively reduced the price for the check writer below the social cost: float was a wedge between a check's social and private cost. In the 1987 data, check float actually reversed the cost difference between check and ACH payments. [See the accompanying table, columns (1) and (2).] Humphrey and Berger concluded that the float wedge represented a failure in the market for payment instruments and caused an overuse of checks.[5]

Humphrey and Berger also separated check users into two major groups, businesses and consumers, and demonstrated that the float value was greater for an average business check than for an average consumer check. In fact, because the float value of an average consumer check was small, the private cost of checks for consumers was positive and still greater than the cost of ACH payments. Thus, Humphrey and Berger argued that the payment instrument market was failing primarily for business check payments. (See Humphrey and Berger 1990, p. 54, Table 2-2.)

### *No, It's Not*

#### ☐ *Updated Data*

Recent data overturn the major conclusion of Humphrey and Berger's (1990) study.[6] [See the accompanying table, columns (3) and (4).] Data on the costs of check and ACH payments in 1993 confirm that the total social cost is higher for an average check payment than for an average ACH payment. Yet in the 1993 data, the value of check float no longer reverses the cost difference between the two instruments: the private cost for an average check payment is also higher than that for an average ACH payment. This relationship holds when the value of float for an average business check is subtracted from the total social cost.

The main reason for this new conclusion is that the value of float for all checks has decreased significantly since the Humphrey and Berger (1990) study. I estimate that, in real terms, between 1987 and 1993, the value of float for an average check payment dropped from $1.04 to $0.09, or about 90 percent.

The reasons for this dramatic drop in the value of float are primarily greater efficiency in check processing and lower short-term interest rates. Both the labor and capital involved in check processing became more efficient between 1987 and 1993. During that time, for example, the Bank Administration Institute (1994) estimates that check encoding labor productivity at commercial banks, measured in items encoded per hour, increased about 24 percent. Over the same period, the productivity of reader-sorters (the high-speed equipment used to process checks), measured in items processed per hour, increased 18 percent. These productivity increases have expedited check clearing. At the same time, the amount of interest that float allows check users to earn shrank considerably. For example, between 1987 and 1993, the average three-month secondary market U.S. Treasury bill rate fell about 50 percent, from 5.78 to 3.00 percent (FR Board, various dates).

Despite the dramatic drop in the value of float, the use of checks has not decreased. In fact, estimates by the Board of Governors of the Federal Reserve System indicate that the annual number of checks written between 1987 and 1993 actually increased about 20 percent (Bank for International Settlements, various dates). Recent data, therefore, seem to contradict the commonly accepted view that the persistent use of checks is caused by the high value of check float.

#### ☐ *Beyond the Data*

That view is suspect even if the data still supported it, though. The view seems to assume that only the agent on one side of a transaction—the check writer—recognizes and takes advantage of the value of float. That assumption doesn't correspond with expected rational behavior. Since float is a transfer payment from the check receiver to the check writer, with no allocative effects overall, rational agents are likely to negotiate a mutually beneficial distribution of any significant value of float.[7] And, in fact, this type of negotiation is common for large payments between businesses, for which the value of float is potentially large. In practice, many business-to-business payments contractually stipulate payment transaction terms that internalize the effects of float.[8] (See Hollis 1990 and Knudson, Walton, and Young 1994.)

## Speculations

So the common view of failure in the market for payment instruments is mistaken. The value of check float is not large enough to create a significant difference between the social and private costs of check use. And even if that value were large, check writers and receivers would internalize its effect in their payment decision-making process. Why, then, are checks used more than less-costly alternatives? This question has yet to be satisfactorily answered. Here I offer a few answers that might be worth investigating.

### *Measurement Error?*

One possibility is that the cost data for the competing payment instruments are measured with error. If this is true, then check payments may not cost more that ACH payments; that is, in a well-functioning market, users of the different types of instruments may have little incentive to shift from paper to electronic instruments. I see three reasons to question the available measurements of costs.

One is that in the 1993 data the costs of check and ACH business payment processing have not been explicitly measured. These costs are represented instead by data provided by the Hackett Group, a management consulting firm (reported in Barr 1993). The Hackett Group produced these data in its attempt to measure cost efficiency in corporate finance transaction processing. It analyzed selected finance processing functions of its corporate clients, including customer billing, payroll, accounts payable, and accounts receivable. Based on this analysis, the Hackett Group estimated a labor cost per invoice, paycheck, or remittance; compared the results for each client to the results for all of them; and provided "best practice" unit costs. The Hackett Group also provided average unit costs for its clients and unit costs for those in the top quarter (those with the lowest unit costs). I used the Hackett Group's average unit costs to approximate check processing costs and its top quarter unit costs to approximate ACH processing costs. While these are the best available cost estimates for my purposes, they do not explicitly measure the costs of check and ACH processing. Therefore, they may have a large margin of error.

Another measurement concern is that business check receiver, or *payee*, costs are overstated. To estimate the business cost of receiving check payments from consumers, I

used the Hackett Group estimate of the average labor cost per accounts receivable invoice. Yet this estimate ignores the amount of consumer check payments that are processed by so-called lockbox operations. These operations are high-volume processing centers to which customer payments are sent and processed on high-speed equipment. They are presumably less costly to run than individual business accounts receivable operations. Anecdotal evidence suggests that the average per-item fee for lockbox processing, including the cost to process and deposit each item, is about $0.20–$0.25. If half of all consumer bill payments were processed and deposited by lockbox operations, at a cost of $0.20 each, then the total check payee cost should drop from $1.25 to $0.92.[9]

A third measurement concern is that business ACH payee costs are understated. I assumed that the cost to a business to receive an ACH credit payment is zero. Although no business processing cost is associated with the receipt of an ACH credit, a business must nonetheless reconcile individual credit payments with outstanding invoices. For some businesses, this process is automated; information from the ACH credit file is electronically matched with information in an accounts payable file. For other businesses, the process is manual; information on individual credit payments is sent from the processing financial institution to the business on paper. Either way, the labor costs associated with reconcilement are greater than zero, and for the manual process, they could be significant.

### *Different Goods?*

Another possible explanation for the persistent use of checks despite their relatively high social cost is that users see checks and electronic payment instruments not as close substitutes for each other, but rather as very different instruments. Checks may be used more, in other words, simply because users prefer them to other ways of making payments.

That notion is supported by anecdotal evidence. It suggests that consumers gain significant nonquantifiable benefits from using checks. These benefits may come from the control associated with having a physical instrument to originate or receive a payment. With an ACH payment, consumers don't get that control; payments are automatically debited from or credited to the consumer's account. Although some consumers consider this automatic feature a convenience, others don't like it. Indeed, the primary objection to ACH payments may be not that they are electronic, but rather that they are automatic.

Check payments provide certain benefits to businesses as well. For example, for most business-to-business payments, remittance information is attached to the payment. With checks, that information is easily attached as a paper invoice. But attaching remittance information to an ACH payment requires that businesses have particular software that lets them send and receive remittance information in the standard electronic format, a process known as *financial electronic data interchange*, or *EDI*. Financial EDI can be costly to implement, so some businesses may prefer to maintain a check processing system.[10]

### *Market Failure?*

There's at least one other possibility to consider. Maybe the persistent use of checks is a sign that the market for payment instruments has failed because of something other than a high value of check float distorting the price of check use. Maybe, for example, the problem is due to the high fixed costs that businesses face to adopt electronic payments.

In order to begin sending or receiving ACH payments, a business must buy and install computer software (and possibly hardware) and incur other startup expenses, such as manual processing of ACH enrollment forms. And the business must continue to maintain its check processing capability, since for some time ACH payments would displace only a fraction of its check payments. Depending on its payment volume, an individual business may not save enough at the margin to justify the extra ACH expenses. An individual business, that is, will choose to be part of an ACH network only if its cost of doing so is less than its private benefits. Yet as more and more users adopt ACH payments, benefits to all users, or social benefits, increase (Katz and Shapiro 1994). Without some outside intervention to encourage businesses to join ACH networks, these electronic payment instruments may be underused from a social efficiency viewpoint.

## Conclusion

Are checks overused? Recent data on the relative costs of checks and ACH payments seem to say, no, at least not for the reason commonly believed. The data clearly show that the value of check float is not responsible for the continued popularity of checks despite their high resource cost compared to electronic payment instruments. Checks might be overused for other reasons, however—but, then again, they might not be overused at all. More research is needed to determine whether or not they are—and if so, why—before policymakers decide to intervene in the market for payment instruments.

Body Notes

*For their comments and suggestions, the author is grateful to Gautam Gowrisankaran, Ed Green, Diana Hancock, Jim Schmitz, Dick Todd, and Florence Young. For their helpful comments on the cost estimates, the author also thanks Michele Braun, Jennifer Miller, Mitch Post, and Jack Walton. This article is based on work done in "The Social Costs of Paper and Electronic Payments," the author's M.A. thesis, Virginia Polytechnic Institute and State University, December 1994.

[1]The federal government is also an intensive check user, although for many years it has been actively migrating to electronic payments.

[2]An *ACH network* is a fully automated payment system that allows participating financial institutions to transfer funds between accounts automatically as directed by the transaction's payor or payee, as either debit or credit transfers. ACH networks are operated by the Federal Reserve and by private clearinghouses.

[3]Another possibility is that so far researchers have used too narrow a framework to adequately analyze payment instrument choice. That framework may need to include features much broader than the relative costs of the various instruments, such as how the demand for money and payment system characteristics affect instrument choice. A discussion of this possibility is beyond the scope of this article. See Berger, Hancock, and Marquardt, forthcoming.

[4]The social cost data represent an average cost to society for all resources allocated to check and ACH use. Given the heterogeneity of payment instrument users, we would not expect all users to find electronic payments cost effective.

[5]Humphrey and Berger (1990) also argued that although float is a transfer payment (between the check payor and payee) that does not use real resources, actions taken by check users to generate or reduce float do use real resources, so the costs of those actions were included in the social cost calculations.

[6]A detailed discussion of the construction of the recent data and a comparison of my method with Humphrey and Berger's (1990) are in the Appendix.

[7]For further discussion of efficiency and the interaction of agents in a microeconomic context, see Coase 1960.

[8]For small payments by consumers, for which the value of float is minimal, negotiation between payor and payee is typically not observed.

[9]Not all businesses have sufficient payment volume to contract for lockbox operations, however. So $0.20 does not represent a ceiling on payee processing cost.

[10]For a thorough discussion of business-to-business payments, including cost issues and other barriers to the adoption of financial EDI, see Knudson, Walton, and Young 1994.

# Appendix
# Data Construction: 1987 vs. 1993

Here I describe how I constructed the 1993 check and ACH cost data discussed in the preceding paper. I also compare my method with Humphrey and Berger's (1990) construction of the 1987 data.

## In General

Humphrey and Berger estimated the total social costs of each type of payment instrument by summing the costs associated with *production* (costs to manufacture payment instruments), *use* (costs to originate and receive payments), and *processing* (costs to clear and settle the payments, incurred by banks and other financial institutions). (For a detailed description of their calculations, see Humphrey and Berger 1990, Table 2-A2, notes e, f, and k.) For each type of instrument, they divided the total social cost by the estimated annual volume of items to calculate an average per-item social cost. I replicated this method of summing the three cost components for check and ACH payments. However, I used an alternative data set as well as an alternative approach to calculate some of the components.

The differences between my approach and Humphrey and Berger's are most significant for the use and processing cost estimates. For example, Humphrey and Berger relied on a single data source for an estimate of payor cost. I assumed instead that different types of payments have different costs. So my total payor cost is constructed of various cost estimates for each instrument type weighted by each payment type's percentage of total payment volume. Also, Humphrey and Berger did not provide a separate estimate of payee cost, whereas I constructed check and ACH payee costs using the same weighting method I used for payor costs. Finally, Humphrey and Berger used a single data source for bank processing costs that may not represent the population of bank processors. Instead of using a single data source, I calculated a range of estimates for bank processing costs based on various data sources.

Before beginning a detailed discussion of the cost data, I should highlight two assumptions. First, since marginal cost is the relevant measure in questions of microeconomic choice, I assumed for each component of the social cost calculations that average cost approximates marginal cost. To the extent that ACH processing is characterized by a cost structure in which marginal costs are below average costs—that is, by increasing returns to scale—this assumption is problematic. Bauer and Hancock (1995) demonstrated that economies of scale exist for Federal Reserve System ACH processing. Similar empirical evidence, however, does not currently exist for commercial bank or business ACH processing. For the bank and business cost components of total ACH social cost, therefore, the assumption of average cost equal to marginal cost is an open empirical question.

Second, the 1987 and 1993 check cost calculations rely extensively on a relatively old commercial check usage study published by the Federal Reserve Bank of Atlanta in 1983. This study estimated that 55 percent of all commercial checks were written by consumers (7 percent to obtain cash, 18 percent for retail transactions, and 30 percent for bills and other payments), 40 percent of all checks were written by businesses (10 percent for payrolls, 10 percent to consumers, and 20 percent to other businesses), and 5 percent of all checks were written by state and local governments. Checks written by the federal government were not included in the Atlanta Fed study: in 1993 these checks constituted less than 1 percent of total checks (FR Board 1993, p. 297; Bank for International Settlements 1994, p. 110). Because of payment innovations and changes in payment practices, the composition of check payment activity is likely to have changed since 1983. If so, a bias is built into the 1987 and 1993 cost calculations. More recent data, however, are not available. An updated usage study of this type would be extremely useful.

## In Detail

Now I describe my data construction method in detail and compare my method with that of Humphrey and Berger (1990).

### *Production Cost*

Like Humphrey and Berger, I used prices from a check printing company as an estimate of check production costs. My printing estimate is a range that represents the prices of printing consumer checks ($0.02) and business checks ($0.04). The range is conservative because it does not include the prices of printing nonstandard checks, which cost more to produce. The range is also conservative because the prices of printing do not necessarily reflect the costs of printing; costs could be lower. Unlike Humphrey and Berger, I also estimated the cost to distribute checks to users. This is based on the 1993 cost to mail a box of checks at third-class bulk rate ($0.004–$0.005). Although this cost is small on a per-item basis, it is appropriate to include in the estimate of production costs.

I assumed, as did Humphrey and Berger, that because no tangible instrument is associated with an ACH payment, ACH production costs are zero. This assumption is not completely accurate, of course, because there is a data transmission cost associated with sending an ACH file from a business to a bank. However, since one ACH file typically contains many individual payments, the data transmission cost per payment is negligible.

### *Processing Cost: Users*

#### □ *Payors*

For both check and ACH payments, Humphrey and Berger used data from a 1983 study of payment transaction costs for the U.S. Treasury's direct deposit program as an estimate of business and government payor cost (Dudley 1983). (The study compared the cost of government payments made by checks and ACH.) Using these estimates has two problems. One is that the study's cost data are from fiscal year 1981 and are not adjusted to 1987 levels. The other problem is that using just one estimate to represent a heterogeneous population of payors is rather limiting.

To account for variation in payor type, I constructed weighted payor cost estimates for both check and ACH payments. The estimates are based on data that represent costs associated with various types of payment transactions. The cost of each type of payment transaction is multiplied by a weight that represents the proportion of total payments accounted for by each transaction type.

For checks, these payment transactions and weights follow the Atlanta Fed (1983) study's check payment categories: consumer payments, business payments, and state and local government payments. Consumer check payments, whether to obtain cash, to make retail transactions, or to pay bills, involve an opportunity cost of time spent writing a check. Quantifiable estimates of opportunity cost for these activities, however, are not available and are difficult to construct. Since the per-item opportunity cost is probably small, I assumed it is zero. This assumption is different from Humphrey and Berger's; they assumed that consumer payor cost is zero because consumers do not have the opportunity to get paid for the time saved if they did not write checks.

For business payment costs, I used data estimated by the Hackett Group, a management consulting firm that analyzes cost efficiency in corporate transaction processing (Barr 1993). For business payroll payments, I used the Hackett Group's estimate

of the average labor cost per payroll payment ($2.56). For business payments to consumers and to other businesses, I used the Hackett Group's estimate of the average labor cost per accounts receivable invoice ($3.00). The weights associated with these transactions are 10, 10, and 20 percent, respectively.

Finally, for state and local government check costs, I used U.S. Treasury data from fiscal year 1993 that include all direct and support costs (including printing and postage) for checks written by the federal government benefit disbursement programs ($0.32). Because the scale of federal government payment processing is large and thereby potentially characterized by scale economies, using Treasury data to approximate state and local government check processing costs may bias the government estimate downward. Yet bias in the total payor estimate is not large, because government checks are weighted at 5 percent of total commercial checks. My total check payor cost estimate is $1.18 per check.

This payor estimate is sensitive to the assumed weight given to each type of check payor and each type of payment. For example, if I use a different weighting in which business checks constitute 50 rather than 40 percent of all checks written, the payor estimate is $1.56 rather than $1.18. By contrast, if consumer checks are assumed to constitute 70 rather than 55 percent of all checks written, the payor estimate is only $0.88.

For ACH payments, I also constructed the payor estimate based on the weighted cost of various ACH payment transactions. These transactions are credit originations by the federal government for benefit payments (26 percent of total), credit originations by businesses to consumers (32 percent) and to other businesses (6 percent), and debit originations by businesses to collect payments from consumers (29 percent) and from other businesses (6 percent). (These data are based on my calculations from internal Federal Reserve ACH processing data.)

For government ACH credits, I used U.S. Treasury data from fiscal year 1993 that includes all direct and support costs for ACH benefit payments ($0.057). Data for businesses sending payroll payments by ACH ($2.01) and sending ACH payments to other businesses ($2.29) are average labor costs from the Hackett Group (Barr 1993). Costs associated with originating ACH debit transactions are in the payee cost estimate because the payee incurs the cost of originating the payment. My total ACH payor estimate is $0.80 per ACH payment.

The business payor costs based on the Hackett Group data may be overstated. The Hackett Group estimates are labor costs associated with transaction processing, which may be somewhat higher than the incremental cost of making or receiving a payment. For example, in order to make a vendor payment, a business reviews the vendor invoice, ensures that the good or service has been delivered, and updates its accounts payable data base. The payment process up to this point is standard regardless of how the payment was eventually made. On the due date, the business either generates a check for the invoice amount or includes the payable information in an ACH file that it gives to its bank. An accurate measure of the payment-related cost of this process, therefore, would capture the cost of writing a check or originating an ACH file. Unfortunately, such detailed estimates are not readily available. Since corporate payment processing involves a close link between accounting and payment systems, however, perhaps the Hackett Group's estimates are a more inclusive measure of payor costs.

#### □ *Postage*

As an estimate of total postage costs associated with check payments, Humphrey and Berger multiplied annual pieces of payment-related mail by the cost of first-class postage ($0.22) and an envelope ($0.02) at the time of their study; in 1993 dollars, this totals $0.41. To estimate payment-related mail, they used data from 1978 and 1980 University of Michigan studies on mail classification. They defined *payment-related mail* as bills sent by businesses to consumers and bill payments sent by consumers to businesses or both. In my approach, I multiplied the 1993 cost of first-class postage ($0.29) and an envelope ($0.01) by the weights for consumer checks written to pay bills (30 percent) and business checks written to pay other than payrolls (30 percent). My total postage estimate is $0.18 per check.

Humphrey and Berger calculated a postage cost for ACH payments as well. They defined this as the cost to businesses to mail invoices that are paid by consumers using ACH. I assumed that businesses usually mail invoices to consumers regardless of the consumer's form of payment. Thus, including this cost in the total postage cost for either check or ACH payments is not appropriate. In other words, invoice postage is a general cost of doing business rather than a payment cost.

#### □ *Payees*

Humphrey and Berger did not calculate a separate payee cost for either check or ACH payments. The cost to receive and process a check or an ACH payment, however, can be significant and should be included in the total social cost. I calculated payee cost for check and ACH payments using the same weighted method I used for payor cost.

For check payments, the relevant payees are retailers, businesses receiving consumer bill payments, and businesses receiving payments from other businesses. To estimate retailer costs, I used data from a Food Marketing Institute (1994) study on the cost of processing a consumer check less bank charges ($0.37). This study provided comprehensive cost data on supermarket check transaction costs; I assumed that costs associated with the payment process at supermarkets could be generalized to represent costs for other types of retailers. For business costs to receive consumer and business checks, I used the Hackett Group's data on the average labor cost to process an accounts receivable payment ($2.35) (Barr 1993). The weights for these transactions are 18 percent, 30 percent, and 20 percent, respectively. My total check payee estimate is $1.25 per check.[1]

For ACH payments, the relevant payees are businesses originating ACH debits and consumers and businesses receiving ACH credits. For business costs to originate an ACH debit item, I used the Hackett Group's data on accounts receivable payment processing ($0.66) (Barr 1993). The weight for this transaction is 35 percent. Consumers and businesses incur no opportunity cost when receiving an ACH credit; therefore, it was set to zero. My estimate of the total ACH payee cost is $0.23 per ACH payment.

### *Processing Cost: Banks*

#### □ *Checks*

To estimate bank check processing costs, Humphrey and Berger used Functional Cost Analysis (FCA) data. FCA is a service, administered by the Federal Reserve System, that calculates cost and profitability measures of various bank functions or operations. Participants in the FCA sample typically are smaller financial institutions that do not have resources to perform internal cost analysis. Therefore, cost data from this sample are mainly for small banks, which have atypically high costs.

Since the cost of check processing operations at commercial banks can vary greatly depending on a bank's size and scale of operation, I calculated a range of estimates based on bank cost data from several sources.

First, to represent banks with smaller-scale check processing, I replicated Humphrey and Berger's approach. They constructed their estimate by summing the costs of processing a check deposit, a transit deposit, an on-us debit, and a return item and the cost of returning checks to customers. Using this approach with 1993 FCA data (FR Board 1994), I calculated an estimate of $0.41 per check.

As a second calculation of bank check processing costs, I used data from the 1993 Bank Administration Institute's (1994) survey, which was not available to Humphrey and Berger. Included in this sample are banks of four asset sizes. The survey

provides unit cost estimates based on statistical medians for processing transit and on-us check deposits ($0.05), paid checks ($0.067), and returned items ($0.03). Summing these three components gives an estimate of total bank processing costs of $0.15 per check.

While the Bank Administration Institute's survey is one of the few banking industry sources for check processing cost data, the unit cost data are not estimated using statistical techniques. Unit costs are reported by the survey respondents rather than calculated from the cost and volume data provided by them. So each respondent likely uses a different method to estimate unit costs for various check processing operations. For example, some of the respondents are likely to include corporate overhead allocations in their estimates while others do not.

Therefore, as a third calculation of bank check processing costs, I used data from two other sources. One is the Federal Reserve System. I used internal cost and revenue data for the check processing operations of Federal Reserve Banks. I assumed that a Federal Reserve Bank's commercial check processing costs approximate those of a commercial bank with a larger-scale operation. While the Federal Reserve Banks obviously differ from commercial banks, many check processing operations of the Federal Reserve and commercial banks are similar. Both receive and sort deposits, handle adjustments and return items, and send checks for presentment at paying banks. The greatest advantage of using Federal Reserve cost data is that the data are nearly all-inclusive; they capture direct, support, and overhead costs; the cost of float; the cost of reserves; the cost of federal deposit insurance; and the cost of sales taxes.[2]

One aspect of commercial bank check processing for which Federal Reserve services are not a close substitute is processing at the paying bank.[3] Costs to the paying bank include sorting paid checks, returning checks to customers, and providing statements to customers. For an estimate of paying bank costs, therefore, I turned to another source: a Payment Systems, Inc. (1994) study on the average cost of a check drawn on a bank. This paying bank cost estimate is based on cost data collected from a sample of 100 banks stratified by asset size. Costs included in the estimate are fees, data processing, personnel, hardware, software, overhead, and exception item costs. Adding the deposit costs ($0.027) to paying bank costs ($0.105) gives a total bank processing cost of $0.13 per check.

Finally, to each of the three alternatives for bank check processing costs, I added the cost to banks of losses from check fraud ($0.014) and the cost of capital ($0.002). These components were excluded by Humphrey and Berger. Data on check fraud losses are from an American Bankers Association (1994b) survey, and the cost of capital is based on the capital cost model of the Federal Reserve Banks (*Federal Register* 1993). The total per-item cost of these two components is $0.016. Adding $0.016 to the three alternatives for bank check processing costs gives a range of from $0.15 to $0.43 per item.

### *ACH Payments*

I also used several data sources to estimate ACH processing costs. These costs include the costs of ACH network operators as well as those of commercial banks. To calculate ACH operator costs, I used internal Federal Reserve ACH processing cost data ($0.038) for 1993. These data include all direct, support, and overhead costs as well as the imputed cost of sales taxes. I assumed that Federal Reserve operator costs approximate those of the three private-sector operators, who clear about 15 percent of all ACH items.

For commercial bank costs of processing ACH payments, I used three estimates. The first is based on a study prepared by the Payment Systems Network (1994). In that study, banks stated that ACH operator fees constitute 10 to 25 percent of their total ACH processing costs. Applying these percentages to average Federal Reserve Bank ACH fees for 1993 gives estimates of from $0.15 to $0.38 per ACH item.

As a second estimate of bank costs of processing ACH payments, I used data from another American Bankers Association (1994a) survey. This survey provided estimates of banks' ACH processing costs that range from $0.14 to $0.33. These estimates are based on bank asset size and represent only direct costs. Also, data from this survey are somewhat problematic because, like the Bank Administration Institute's data, they are provided by respondents rather than calculated from actual cost and payment volume data.

For a third estimate of banks' ACH processing costs, I used data from the Payment Systems, Inc. (1994) study on the cost to a bank to process an ACH debit ($0.057).

Finally, to each of these three estimates, I added the per-item cost of capital ($0.004) and the cost to process government items multiplied by the proportion of ACH items that are government ($0.013). Humphrey and Berger excluded these components. The per-unit capital cost is also based on the Federal Reserve model (*Federal Register* 1993). The cost to process government items is based on Federal Reserve cost data because the Federal Reserve processes all government ACH items. The total per-item cost of these two components is $0.017. Adding $0.017 to the three estimates of bank ACH processing costs and to ACH operator costs gives a range of from $0.12 to $0.44 per ACH payment.

### *Float Cost*

I calculated the average value of float per check using Humphrey and Berger's (1990) algorithm: the average value of a check multiplied by the average number of float days per check and the effective daily three-month U.S. Treasury bill rate (the short-term money market rate at which available funds are assumed to be invested). Based on Federal Reserve estimates of the dollar value and the number of checks processed in 1993, the average value of a check is $1,150 ($68.3 trillion divided by 59.4 billion checks) (Bank for International Settlements, various dates). I assumed that the average number of float days is one since the Bank Administration Institute (1994) estimated that in 1993 items in an average cash letter cleared in one day, including items presented to the Federal Reserve, to private clearinghouses, and directly to correspondents. The average three-month secondary market Treasury bill rate in 1993 was 3 percent (FR Board, various dates). Based on these data, the float value of an average check is $0.09.

I estimate that the float value of an average business check is $0.21. This is calculated as a residual of the formula for the overall average value of a check: (The average dollar value of a consumer check × The proportion of all checks written by consumers) + (The average dollar value of a government check × The proportion of all checks written by governments) + (The average dollar value of a business check × The proportion of all checks written by businesses). The proportions here are, respectively, 55 percent, 40 percent, and 5 percent (Federal Reserve Bank of Atlanta 1983). In 1993, the overall average value of a check was $1,150 (according to Federal Reserve estimates), the average value of a consumer check was $140 (according to my calculations based on U.S. Department of Labor 1994), and the average value of a government check (using federal government statistics to approximate the size of state and local government checks) was $1,113 (480 million checks valued at $534.2 billion). Thus, the average value of a business check was $2,543. Multiplying $2,543 by the average number of float days (1) and the short-term interest rate (0.03/365) results in the float value of an average business check: $0.21.

Unlike Humphrey and Berger (1990), however, I did not include mail float in the average number of float days. (Mail float constitutes 37 percent of their float estimate).[4] To measure float, the relevant time gap is between the date payment is due (or for retail purchases, the date payment is tendered) and the date funds are debited from the payor's account.[5] For the average business-to-business or consumer-to-business check, this gap is

one day: assuming that a check is forwarded by a business payee to its financial institution on the payment day and that its financial institution forwards the item to the Federal Reserve, clearinghouse, or correspondent by midnight of that day, the payor's account would be debited the following day. The payor would have to fund its account on the day of the debiting, either because of a contract with its financial institution (using a controlled disbursement service) or because of the need to have sufficient funds in its account when the financial institution updated its demand deposit system on that day. For checks drawn on institutions outside the payee's geographic area, the process may take two days. Because of the lack of readily available data on the percentage of check clearings that are not local, I assumed that the majority of checks are local and thus take one day to clear.[6]

Appendix Notes

[1]My caveat on the sensitivity of the check payor estimate to the assumed weight on each type of transaction applies to the payee estimate as well.

[2]The costs of federal deposit insurance and sales taxes are imputed costs based on what the Federal Reserve would have paid if it were a private firm. These costs are imputed from a model based on data from the 50 largest bank holding companies (*Federal Register* 1993).

[3]Federal Reserve Banks provide services to paying banks. However, not all of the services provided by the Federal Reserve Banks are comparable to payor processing at commercial banks.

[4]If mail float is excluded from Humphrey and Berger's calculation of float for an average check, the private cost of a check becomes positive, but it does not exceed the private cost of an ACH payment.

[5]Consumer-to-consumer check payments, such as gift payments, have no payment due date. Float days for these checks can vary greatly, since some consumers delay in depositing them. Because consumer-to-consumer checks likely constitute a small portion of total check payments, the variation in float days for these checks does not greatly bias the assumption of one float day per average check.

[6]The private cost results of the 1993 data are sufficiently robust so as not to be dependent on the assumption of one float day. If the number of float days is doubled from one to two, average float value becomes $0.18 and the range of private cost of checks becomes $2.60–$2.91. That range is still greater than the range of private costs of ACH payments.

# References


American Bankers Association. 1994a. *Check processing/wholesale operations survey report.* Washington, D.C.: American Bankers Association.

_____. 1994b. *Check fraud survey report*. Washington, D.C.: American Bankers Association.

Bank Administration Institute. 1994. *1993 check processing survey.* Chicago: Bank Administration Institute.

Bank for International Settlements. Various dates. *Statistics on payment systems in the Group of Ten countries.* Basle, Switzerland: Bank for International Settlements.

Barr, Stephen. 1993. The new blueprint for finance. *CFO, The Magazine for Senior Financial Executives* 9 (June): 15–33.

Bauer, Paul W., and Hancock, Diana. 1995. Scale economies and technological change in Federal Reserve ACH payment processing. *Economic Review* 31 (Quarter 3): 14–29. Federal Reserve Bank of Cleveland.

Berger, Allen N.; Hancock, Diana; and Marquardt, Jeffrey C. Forthcoming. A framework for analyzing efficiency, risks, costs, and innovations in the payments system. *Journal of Money, Credit and Banking.*

Coase, R. H. 1960. The problem of social cost. *Journal of Law and Economics* 3 (October): 1–44.

Dudley, William. 1983. *A comparison of direct deposit and check payment costs.* 2nd ed. Washington, D.C.: Board of Governors of the Federal Reserve System.

*Federal Register.* 1993. Federal Reserve System notice: The 1994 fee schedule for priced services. Vol. 58, No. 220, November 17, Docket R-0813, p. 60648. Washington, D.C.: U.S. Government Printing Office.

Federal Reserve Bank of Atlanta. 1983. Special issue: Displacing the check. *Economic Review* 68 (August).

Federal Reserve Board of Governors (FR Board). 1993. *80th annual report.* Washington, D.C.: Board of Governors of the Federal Reserve System.

_____. 1994. *FCA: Functional cost and profit analysis: National average report, commercial banks.* Washington, D.C.: Board of Governors of the Federal Reserve System.

_____. Various dates. *Federal Reserve Bulletin.*

Food Marketing Institute. 1994. *Benchmarking comparative payment methods: Costs and case studies*. Washington, D.C.: Food Marketing Institute.

Hollis, Donald R. 1990. Commentary. In *The U.S. payment system: Efficiency, risk and the role of the Federal Reserve: Proceedings of a symposium on the U.S. payment system sponsored by the Federal Reserve Bank of Richmond,* ed. David B. Humphrey, pp. 87–92. Boston: Kluwer Academic Publishers.

Humphrey, David B., and Berger, Allen N. 1990. Market failure and resource use: Economic incentives to use different payment instruments. In *The U.S. payment system: Efficiency, risk and the role of the Federal Reserve: Proceedings of a symposium on the U.S. payment system sponsored by the Federal Reserve Bank of Richmond,* ed. David B. Humphrey, pp. 45–86. Boston: Kluwer Academic Publishers.

Humphrey, David B.; Pulley, Lawrence B.; and Vesala, Jukka M. Forthcoming. Cash, paper, and electronic payments: A cross-country analysis. *Journal of Money, Credit and Banking.*

Katz, Michael L., and Shapiro, Carl. 1994. Systems competition and network effects. *Journal of Economic Perspectives* 8 (Spring): 93–115.

Knudson, Scott E.; Walton, Jack K. II; and Young, Florence M. 1994. Business-to-business payments and the role of financial electronic data interchange. *Federal Reserve Bulletin* 80 (April): 269–78.

Payment Systems, Inc. 1994. *Direct payment market analysis.* Herndon, Va.: National Automated Clearinghouse Association.

Payment Systems Network, Inc. 1994. *Private sector processing.* Maitland, Fla.: Payment Systems Network.

U.S. Department of Labor. 1994. Bureau of Labor Statistics. *Consumer expenditure survey, 1992–93.* Washington, D.C.: U.S. Government Printing Office.

## Why Use Checks?

Unit Social and Private Costs of Check and ACH Payments in 1987 and 1993, in 1993 Dollars*

| | 1987 Data* | | 1993 Data | |
|---|---|---|---|---|
| | (1) Checks | (2) ACH | (3) Checks | (4) ACH |
| **Production Cost** | | | | |
| Printing | .045 | .00 | .02–.04 | .00 |
| Distributing | — | .00 | .004–.005 | .00 |
| **Processing Cost** | | | | |
| Users: Payors | .14 | .23 | 1.18 | .80 |
| Postage | .41 | .03 | .18 | .00 |
| Payees | — | — | 1.25 | .23 |
| Financial Institutions: Clearing and Settlement | .40 | .11 | .15–.43 | .12–.44 |
| **Total Social Cost** | 1.00 | .37 | 2.78–3.09 | 1.15–1.47 |
| Float Cost | 1.04 | .00 | .09 | .00 |
| **Total Private Cost** | –.04 | .37 | 2.69–3.00 | 1.15–1.47 |
| **ACH/Check Ratio** | | | | |
| Social Cost | .37 | | .41–.48 | |
| Private Cost | –9.25 | | .43–.49 | |

*The 1987 data are Humphrey and Berger's (1990) data, but converted to 1993 dollars using the annual-weighted chain-type price index used with the national income and product accounts.

Sources: See the Appendix.