

## **Remarks by Vice Chairman Roger W. Ferguson, Jr.**

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### **E-Commerce: Lessons Learned to Date**

I am pleased to be here with you today at Vanderbilt University. Your e-Lab and e-commerce programs make this a particularly appropriate place to talk about the lessons that can be drawn from developments in electronic commerce over the past several years. Governor Daane, thank you for inviting me to speak.

The recent past has provided an excellent opportunity to observe how businesses and individuals respond to significant technological changes. But we should also be mindful that Internet-based commerce, in particular, is still young and unquestionably evolving. Hence, I must emphasize that these are only preliminary observations.

Today I will touch on three main topics. First, I will explore a few early observations about the economics of electronic commerce based on the experiences of the past few years. Second, I will talk about payments, a key part of the country's economic infrastructure, and whether the current payment instruments can effectively support future electronic commerce. Finally, I will briefly review some activities that the Federal Reserve is pursuing to remove barriers to innovations in electronic payments and commerce.

### **A Few Early Lessons of E-Commerce**

The terms "electronic commerce" and "e-commerce" generally refer to commercial activity involving the Internet, although they can also describe any commerce that relies primarily on electronic exchange of information. For many entrepreneurs, e-commerce is an entirely new market opportunity, while others see it as a versatile new channel offering opportunities to enhance existing markets. Whatever the business case for an application of new technology, generally successful applications have the potential to improve the lives of ultimate consumers by reducing transaction costs. Reduced transaction costs, in turn, can broaden the array of choices, expand the size of markets, and ultimately, through competition, improve the quality of existing goods and services.

An initial observation is that, despite the novelty of the Internet applications we see today, electronics have been used for commercial purposes for well over a century. In the nineteenth and twentieth centuries, installation of telegraph wires and then telephone networks created a revolution in business communications not unlike the current e-commerce revolution, broadening markets by easing communications between distant trading partners and reducing risks associated with slow physical communication and transportation. In the extreme, telephone networks enabled two distant parties to communicate interactively and in real time. Of course, there are limits to the uses of voice communications. The advent of computers and new communications technology introduced

the opportunity to transmit vast quantities of data, as well as voice, over existing telephone networks.

The commercial prospects of combining new and existing communications technology with new information management technology, both software and hardware, spawned the investment boom that underpins, in part, the most recent revolution in e-commerce. But we must be careful to recognize that the rapid evolution of modern e-commerce does not repeal the laws of economics. In fact, we see now that economies with significant investments in information and communications technology remain subject to occasional capital goods overhangs, which may influence macroeconomic conditions. Over the last few months, data on orders and shipments of nondefense capital goods have provided hard evidence of a slowdown in business spending on high-tech capital goods. Our economy is clearly undergoing a stock adjustment to bring the supply of and demand for capital goods in some sectors into better alignment. Importantly, measures of growth of output per hour in the second half of 2000 were sufficiently strong to suggest that the growth rate of structural productivity remains robust. This in turn suggests that the rate of return on capital should be sufficiently attractive to foster new investment once this stock adjustment is complete.

There are two key questions. First, when will the stock adjustment in high tech capital run its course, and the supply and demand for capital goods return to balance? Second, when balance is restored, what pace of investment in high tech capital goods will ensue?

Unfortunately, neither question is answerable with certainty at this stage. With respect to the duration of the stock adjustment, those who think that the process will be protracted point to both the length of the current investment boom and the historical experience with lengthy stock adjustments in capital goods to suggest that the period of retrenchment will be a long one. Those who are optimistic that this phase of rebalancing will be relatively short highlight two facts. The adjustment in capital goods ordering and production has been relatively rapid in this cycle and modern high tech capital goods are relatively short-lived--being depreciated in many cases in three years or less as opposed to the seven years or more that characterizes many types of traditional capital equipment. Which of these sets of factors predominates will determine, in part, the shape of the recovery from this period of slowing.

Similarly, we cannot know with certainty the pace of investment in capital goods going forward. As I will discuss below, it is certain that the pace of future demand for capital goods will depend in part on the ability of providers of capital--banks, creditors in fixed income markets, and purchasers of equity--to recognize the risks inherent in high tech capital investment plans and to price the risk appropriately.

Let me now offer a few observations on cost, demand, and the microeconomics of e-commerce. The cost structure of electronic networks tends to be characterized by high fixed costs and very low marginal operating costs. This also appears to be true of the cost structure of a number of firms engaged in e-commerce. Initially, purchasing or developing software to support a competitive commercial enterprise on the Internet can be costly. But once software that meets a market demand is built, it can be paired with scalable hardware to handle significant additional volume for very little extra cost.

It appears, however, that the basic cost structure of e-commerce has different applicability for different types of businesses in this sector. For example, the high fixed cost, low marginal cost model may fairly accurately characterize the cost structure of companies that provide on-line information services, such as information vendors, search engines, and electronic communications networks. Those that produce their own information content clearly pay

some production costs, but those costs appear to be small compared with the cost of building and operating a network. Interestingly, many information providers do not originate any content at all and rely instead on markets, commercial partners, or even subscribers to provide the content. For different reasons, information-based e-commerce companies seek high sales volumes. They all wish to take advantage of the economies of scale that are inherent in their cost structure, seeking large scale to reduce their average production costs as volumes grow. As with other businesses that have this cost profile, e-commerce businesses in this category often respond to their cost structure by charging a flat fee per user, such as a subscription fee, with the price structure often transitioning to some form of discounted fee for heavy volume accounts. Obviously for those information-based e-commerce businesses for which advertising is the major source of revenue, scale is important to keep advertisers happy. Overall, even with rapidly declining marginal costs, if pricing does not cover the marginal costs and revenues in the long run do not recoup fixed costs, this model of e-commerce can prove financially disappointing.

On the other hand, the cost structure for those e-commerce firms that use electronic means to distribute tangible goods, such as books, apparel, and toys, appears to mirror more conventional business models. The network costs for these firms reflect the well-understood high fixed cost and low marginal cost model of the electronic world. However, the economics of fulfillment--that is, providing and servicing the goods--still depend on these businesses' ability to achieve efficiencies and low unit costs for materials, storage, distribution, and after-sales service.

The story of the demise of one prominent Internet-only retailer may be instructive in this regard. News reports indicate that the company had to build and maintain a web site costing about \$40 million annually, the high fixed cost element of e-commerce, which it thought was required to achieve the desired revenue in the national market it hoped to serve. Besides this new economy cost, this retailer decided to build a proprietary distribution network, an old economy cost that, according to public sources, raised its investment in property and equipment to more than \$100 million, a fourfold increase in one year. Analysts indicate that this equaled around 100 percent of the firm's 1999 revenues. As a benchmark, for land-based retailers a comparable number would be 20 percent of annual revenue and for catalogue retailers, who often subcontract distribution, the comparable number would be 12 percent to 13 percent.

Finally, because of low barriers to entry to the Internet market and the low cost to customers of switching from one seller to another, Internet-only firms appear to face high costs to obtain and retain customers. Again, published reports indicate that the retailer increased its budget by 30 percent in one year as new competitors moved into its market.

Clearly, appropriately scaling the cost model to the market potential is another key lesson in the world of e-commerce.

On the demand side, the so-called network effect is extremely important for some e-commerce businesses because the value of some services increases as the number of customers using them increases. The most obvious example is an on-line auction site, in which the more buyers and sellers using an auction site, the deeper the liquidity--that is, the greater the number of opportunities to trade and the greater the likelihood that trades will occur. For these firms, which include those that support the "auction" of equities as well as collectibles, high volume is critical to their success, and volume expectations appear to influence investments in these firms. I have already referred to economies of scale. Auctions

and chat rooms provide an example of how network effects and scale economies can be mutually reinforcing, making high transaction volumes critical to both the supply and the demand sides of the market. Here let me also note that, for those for whom advertising is a key source of revenue, there is a virtuous cycle as a large customer base attracts more advertisers, which in turn finances more and better content and attracts even more users. The need for scale or volume appears to create an advantage for the first business to achieve critical mass in any market in which there are strong network effects. Understanding this dynamic and taking advantage of it appears to be another lesson from the early experience with e-commerce.

The evolution of investment in e-commerce firms, particularly web-only firms, continues to receive attention in the press. Needless to say, rational economic behavior suggests that investors would require a high return to invest in unproven but potentially profitable endeavors. After all, some innovations struggle but succeed, while others arrive too soon for the technology, arrive too soon for the market, or are not commercially successful for a wide variety of other reasons. The rapid reassessment of the business prospects of some e-commerce firms during the course of last year is a reflection of this reality.

Of course, the equity securities of these firms were revalued to reflect these changing assessments. Are stocks today overvalued, correctly valued, or undervalued? I certainly do not know, and I am not aware of anyone who does. As a result, I believe that it would be unwise--and indeed impossible--for the Federal Reserve to target specific levels of valuations in equity markets. However, valuation methods that are appropriately sensitive to the obvious business risks of e-commerce, as opposed to being driven by the assumption of the most optimistic outcomes for every concept, are key. In the long run such approaches should provide a healthy base for maintaining a reasonable and sustainable pattern of growth and investment in the e-commerce segment. Costs of capital that reflect risks accurately are critical to a well-functioning economy.

Therefore, with respect to observations and lessons, it appears that the basic rules of economics, commerce, and finance continue to apply. Though some macroeconomic conditions have changed importantly because of the technology investments that underpin e-commerce, the laws of economics have not been repealed. At the commercial level, any company considering a substantial investment needs to understand the business case and underlying market cost, competition, and demand structures. Companies and their investors still need to assess the potential risks and returns based on that commercial reality.

### **Payments and E-Commerce**

Now I would like to turn to the topic of payment systems and discuss whether the existing arrangements support electronic commerce. In many ways the rapid growth of some elements of e-commerce is built on the solid base of preexisting payment systems and protocols.

Even with the apparent ups and downs of specific electronic commerce providers, many purchases are being initiated through the Internet. The Census Bureau estimates that roughly \$20 billion worth of retail transactions flowed over the Internet during the year ending September 2000, excluding large-dollar business-to-business transactions at least partly initiated through the Internet. Some private calculations reach twice that amount. These purchases are being paid for predominantly with traditional payment instruments that predate the World Wide Web. Given the growing importance and apparent potential of e-commerce, it is important that the older protocols of the payment system evolve to support

this new element of our economy.

To explore recent payment developments, it may help to distinguish among the markets for different types of payment transactions. Although the consumer-to-business (C2B), person-to-person, and business-to-business (B2B) categories likely break down when pushed too far, they can provide a convenient organizing framework for identifying payment transactions with some common characteristics.

For some types of commerce, existing electronic payment instruments were easily adapted to the Internet. Most notably, small- to medium-sized C2B purchases are frequently made using credit cards. Because credit cards were already widely used for retail telephone transactions, these "card-not-present" transactions were easily accepted as part of commerce on the World Wide Web. Moreover, unlike many other payment instruments, credit cards could already support low-value international commerce, one of the historical barriers being challenged by the Internet. One card network estimates that 95 percent of retail purchases over the Internet in 1999 were made using debit, credit, and other payment cards.

Some entrepreneurs are adapting other payment instruments for C2B electronic commerce. For example, debit card networks are exploring ways to enhance security and inter-network arrangements so that PIN-based debit transactions will be widely accepted as an alternative to credit cards for Internet-based sales. Similarly, vendors have developed pre-paid cards for which value can be purchased in advance and used to pay for on-line purchases by individuals who do not have access to credit cards or who prefer not to use them. In addition, some service providers have begun to offer "electronic check" or "e-check" products in which customers enter the information shown on the bottom line of a check and authorize the electronic debit of their checking accounts through a mechanism called the automated clearinghouse, or ACH.

But existing and evolving payment instruments do not yet satisfy all of the needs of C2B e-commerce transactions. For instance, many firms provide bill payment services, and many are exploring ways to present bills electronically as well. Despite the growth of electronic bill payment applications, many of the bills for which payment instructions are initiated on-line are still paid by check. Similarly, there is not yet an easy way to pay for transactions such as on-line stock purchases, which have become popular. Instead, these purchases are generally charged against pre-funded brokerage accounts, although they could also be paid for by wire transfers through the purchaser's bank or by the prompt mailing of checks. Devising new ways to pay for securities trades is becoming increasingly important as the securities industry tries to reduce the time needed to settle trades from trade-date plus-three days to trade-date plus one day.

For person-to-person commerce over the Internet, typically conducted through auction and similar web sites, there are very few electronic payment alternatives that can be easily transferred from physical commerce. Over the past few years, however, several service providers have created Internet-based person-to-person transfer mechanisms based on the credit card clearing mechanism but requiring transfer of funds through an intermediary. Other service providers enable individuals to accept credit card payments, a function previously available only to businesses.

Finally, a number of service providers are also trying to address the market for electronic B2B transactions. Thus far, some companies have adopted corporate purchasing cards, issued by traditional card-issuing companies, for their low- and medium-value on-line

purchases. The demand for improved payment instruments for B2B transactions, however, may be even greater than for the C2B and person-to-person markets. Improving speed, reducing risk, and ensuring appropriate levels of privacy are important in all three markets. Also, to attract users, B2B payment mechanisms may need to provide additional features--for example, tools that reduce credit and timing risks in domestic and international markets. Other desirable features might enable data to flow seamlessly through the internal systems of the purchaser, the seller, and perhaps intermediaries--all at a low cost, of course. Because the products or services, scale, and complexity of business-to-business transactions vary widely, satisfying the needs of this diverse market may be more difficult than satisfying those of the other markets. I have heard reports, however, that many banks and other organizations are aggressively seeking ways to provide services for this market.

### **The Federal Reserve in the Payment System**

Now, turning to the role of the Federal Reserve, recall that one reason that the Congress established the Federal Reserve was to improve the nation's payment system; the Federal Reserve Act of 1913 provides the foundation for the Federal Reserve to establish a national check-clearing system. Today, the Reserve Banks distribute cash, clear checks, and provide electronic payment services to banks. In addition, the Federal Reserve System has had a long-standing role in helping to formulate public policies that improve the overall efficiency of the nation's payment system and reduce risks.

Recently, evolving technology and growth in alternatives to cash and check payments have raised questions about the Federal Reserve's role in the payment system. In 1996 and 1997, a committee headed by Alice Rivlin, then the Federal Reserve Vice Chair, studied the Federal Reserve's operational role in the payment system. Ultimately, the study concluded that the Federal Reserve should continue to provide all its existing payment services with the explicit goal of enhancing efficiency, effectiveness, and convenience, while ensuring access for all banks. The study also recommended that the Federal Reserve work actively, closely, and collaboratively with providers and users of the payment system, both to enhance the efficiency of check and ACH services and to help develop strategies for moving to the next generation of payment instruments.

To follow up on the recommendations of that study, the Federal Reserve created the Payments System Development Committee, which I co-chair with Cathy Minehan, President of the Federal Reserve Bank of Boston. The Payments System Development Committee has an explicit mission. In addition to identifying strategies for enhancing the long-term efficiency of the retail payment systems, it also identifies barriers to innovation and works to address those barriers where possible. The committee is active in monitoring developments in payment markets and has sponsored workshops and forums that encourage focused discussions with the private sector. Our current activities include efforts to reduce legal and regulatory barriers to payment innovation, examine future clearing and settlement systems to support electronic commerce, assess our role in helping to set standards, and find ways to use new technologies to collect checks more efficiently.

### **Conclusion**

The technological developments that enable us to engage in electronic commerce today have created tremendous opportunities to improve the ways in which we do business. Even as some businesses fail, they are contributing to our store of knowledge about what will and will not work in e-commerce. But beyond just the success or failure of specific businesses, electronic commerce has challenged the thinking of entrepreneurs and of those who lead traditional businesses. The developments in e-commerce have reminded us that change, even

rapid change, is part of the normal evolution that we expect from market economies. They have also shown, however, that no matter what delivery mechanism is used, successful businesses must still follow good business practices, pay attention to basic economic principles, and sell products and services that buyers want.

I believe this to be true for business generally and certainly for payments. A market-oriented approach to payment system innovation promises to provide long-lasting benefits to the consumers and businesses that use the U.S. payment system. We need to approach payment system innovations with an open mind and a willingness to learn. This is particularly true in the world of electronic commerce, where payments are being adapted to new technologies, products, and methods of doing business. These innovations are important in themselves. But they are also important because successful innovations to support electronic commerce may, over the long term, have a broad influence on the payment systems we use throughout our economy.

I commend Vanderbilt University and its Owen Graduate School of Management for moving so forcefully to train the next generation of leaders in the e-commerce world. Not only are you serving your students; you are serving the global economy.

Thank you for your attention.

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