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Money in a Digital World

Introduction

I am happy to be back here in Waterloo to speak with you today about money in a digital world. I am also honoured to be your first economist-in-residence for a day.

When I was a student at Wilfrid Laurier in the 1980s, I started every day with a coffee, and I bought that coffee with cash. That's when coffee cost less than a dollar and long before I had a credit card. And I picked up extra cash working as a waitress at Wilf's.

Many things haven't changed much since then—many of you must pick up a coffee on the way to class or catch up with friends at Wilf's. What has changed, though, is how we pay for things.

It's fascinating the way technology and consumer preferences are pushing the boundaries of how we define and use money. The Bank of Canada is paying close attention to e-money, given that our job is to issue currency, promote financial stability and oversee Canada's payment systems.

Today I'll cover three points. First, I'll start with a brief historical perspective. Money and associated means of payment have changed over the years, but it seems never as fast as they are changing today. Second, to get a sense of proportion, I'll talk about how e-money is currently being used relative to other payment options like cash or debit. Finally, I'll talk about the benefits and risks of these innovations. This matters to you because e-money is not just about how you pay for things. It's also about the financial risks you face if you use it. It matters to the Bank because of the potential over time for e-money to alter the fundamental payments architecture in Canada and around the world.

Money and Payments Have Come a Long Way



When you look at history, money and payment systems reflect the societies they serve—and like societies, they have been transformed by technology. The image you see above, is a painting by Canadian artist Blair Ferguson. It hangs in one of the Bank of Canada's meeting rooms. The reason I'm showing it to you is because it illustrates how money has changed throughout history. At one time, playing cards served as money, as well as cowrie shells, cocoa beans, gold and, eventually, bank notes and coins.

None of these objects, except for the gold and cocoa beans, has any meaningful inherent value. They are money because people accept them as money. For this to happen, money must do three things.

First, money must serve as a medium of exchange: you pay tuition; you receive an education in exchange. The alternative is bartering, but that is complicated and inefficient.

Second, money must serve as a store of value. When you work during the summer you need to be confident that every dollar you earn is still going to be worth a dollar when it comes time to pay your tuition.

Finally, money must serve as a unit of account, which you need in order to compare prices—like comparing the value of the new BlackBerry with other mobile devices on the market.

The form of money we know best is bank notes. They were issued primarily by commercial banks in Canada and the United States before those countries created central banks in the early 20th century. These privately-issued bank notes ultimately failed to provide what the economy needed and so central banks were

given this responsibility. The Bank of Canada has been issuing bank notes since 1935.¹ The cash you have in your wallets perfectly meets the three criteria of money. It is accepted almost everywhere, there's very little counterfeiting, and the issuer—the central bank—won't go bankrupt. We also target inflation, which means that the internal value of money is predictable.

Since we started issuing bank notes, there has been a parade of non-cash options introduced to our payments system. They've been driven by technology and consumer demand for efficient ways to pay for things. In the 1970s, credit cards were leading edge—around the same time that Pink Floyd and Led Zeppelin dominated the music scene. In the 1990s, debit cards were the new big hit. The next leap in innovation was e-transfers and online banking services. Payments are even quicker now with contactless credit and debit cards. Last month, Apple Pay became the latest player in this game.

So we've come a long way since cocoa beans. Yet all these payment innovations can be used only if you have a bank account. The vast majority of Canadians have access to banking services, but that's not the case in many developing countries. That's part of the reason why non-banks are coming up with innovative electronic payment methods that we generically call digital currency or e-money. E-money can be defined broadly as monetary value stored electronically, on a phone or a card, or in the cloud. It's a digital alternative to cash, and it's a stored value that is not linked to a bank account.

There are two types of e-money that I want to talk about today. The first type is denominated in a national currency, and it represents a claim on the issuer. In Canada, there are a number of examples. There are PayPal balances, and there are stored-value cards that use the Visa or MasterCard networks.² These types of e-money store value and can be used to buy a lot of things. The safety of this type of money really depends on the credibility of a trusted third party. This is because you're trusting Visa or PayPal to safeguard your balance and to validate and authenticate your transactions.

The second type of e-money is cryptocurrency—such as Bitcoin. This type of e-money is not denominated in any national currency and so has its own unit of account. It is also completely decentralized and does not represent a claim on the issuer. This is the revolutionary part of cryptocurrencies—transactions can be validated without a trusted third party. The way they achieve this is by using cryptography to ensure that each transaction is valid and secure. Trusted third parties are needed for other functions, however. You may want help to keep track of your virtual wallet and these currencies are not redeemable for national currencies. People generally trade them through an online exchange at the market rate.

¹ There was a gradual phase out of commercially-issued bank notes that lasted over a decade. Rich discussions of this period are available in Powell (2005) and Bordo and Redish (1986).

² Gift cards and store-specific cards are not considered e-money because they are not accepted by businesses other than those that issued them.

Bitcoin was introduced in 2009. Five years later, there are more than 500 other cryptocurrencies—Ripple and Litecoin and I could go on.³ Even though only a few of them ever really do any trading, they continue to develop and innovate.

E-Money Still a Wallflower in Canada

E-money is still a wallflower in developed countries where many people have bank accounts, although this could change quickly. Today it is more popular in countries where relatively fewer people have access to banking services.⁴ An example of this is Kenya, where many people use e-money called M-Pesa. M-Pesa is backed by the issuer and redeemable in the Kenyan shilling. It gives people a low-cost way to transfer money using their mobile phones. M-Pesa is used in some 2 million transactions each day, worth about \$5 billion annually. That's nearly 20 per cent of Kenya's GDP.

Limited access to banks is not always the main motivator for the adoption of e-money. The Octopus card, in Hong Kong, was originally designed to pay for public transit. It proved so convenient that it is now used for over 13 million transactions each day—from transit to coffee to a pair of jeans.

Canadians seem to be less enthusiastic about e-money, and there appears to be little demand for something like the Octopus card. We are nonetheless big users of e-payment *methods* that give us access to credit or our bank accounts. Almost all Canadian adults have debit cards, and more than 80 per cent have at least one credit card.⁵

Over half of all transactions in Canada use debit or credit cards. At the same time, we still use a lot of cash, even if the proportion is falling over time. The total value of cash holdings in Canada as a share of GDP has been relatively stable for the past 30 years. There are good reasons for this. Cash is fast, convenient and costs virtually nothing to use. It is anonymous, so you don't have to worry about exposing personal information to potential criminals, although for this reason cash is also used in the underground economy. People also hold onto cash as savings for a rainy day. Bank of Canada research suggests that changes in cash management practices could also help explain the constant demand for cash.⁶

So let's talk now about cryptocurrencies. Some Canadians appear intrigued by Bitcoin—the very first Bitcoin ATM in the world was installed in Vancouver just over a year ago. And as of last July, a quarter of the world's Bitcoin ATMs were found in Canada. There's one here, in Kitchener-Waterloo. There are also about 340 Canadian merchants who say they accept Bitcoin, and about 76,000 merchants accepting Bitcoin in other parts of the world.

Some merchants may be accepting it, but it has yet to gain much traction with people making purchases. There aren't a lot of data on this, but what we do have indicate that last year there were around 70,000 Bitcoin transactions per day

³ While Bitcoin is the dominant cryptocurrency, there are many others: Dogecoin, Ethereum, Peercoin, and Darkcoin to name just a few.

⁴ The World Bank estimates that about 2.5 billion people do not have access to banking services.

⁵ Henry, Huynh, and Shen (2014)

⁶ Jiang and Shao (2014)

across the globe. This pales in comparison with the more than 21 million debit and credit card transactions that occur each day in Canada alone.

Things can change fast when it comes to adoption of new technology. At the Bank of Canada we've done some experiments in behavioural economics to look at what elements determine the success or failure of e-money.⁷ What we find is that adoption of e-money is exactly like the tango—it takes two. Buyers need to decide whether to use the new payment method while sellers need to decide whether they'll accept it. It turns out that it's the seller's side that leads the dance; if there is a large enough fraction of sellers accepting new payment methods, more and more buyers are prompted to use them, eventually leading to complete adoption on both sides.

In the case of Bitcoin, not many people want to dance. This is because it has serious flaws when it comes to satisfying the three main characteristics of money. While a number of merchants may be accepting Bitcoin, there is still a big risk that if you acquire bitcoins you won't be able to find someone to accept them later when you want to spend them.

There's also no getting around the fact that cryptocurrencies are very volatile and therefore unreliable as a store of value. Bitcoin's value relative to the U.S. dollar has gone from pennies to over \$1,100 and then back down to \$300 in just four years. It is not surprising then that Bitcoin and other cryptocurrencies are not acting as a unit of account. Businesses are still pricing products in national currencies and converting to a cryptocurrency at the checkout.

For these reasons, the Bank of Canada views Bitcoin and other cryptocurrencies as investment products rather than money.⁸ And we are not alone. The Canada Revenue Agency considers digital currencies as a commodity that can be bought and sold. That is why any resulting gains or losses could be taxable income that must be reported.⁹

Bank of Canada Has Its Eye on Developments

E-money is not big enough to pose material risk to financial stability in Canada at this time. That said, money and payments technology is progressing in leaps and bounds, and so the Bank of Canada is watching developments closely. The federal government also is undertaking a review of payment systems in Canada to ensure that the degree of regulation of payment systems and methods is appropriate. This review has resulted in the Bank of Canada having increased responsibility to oversee payment systems of economic and systemic importance.

There is little doubt that these innovations have some benefits. They give us more choice about how we make purchases, and can reduce the cost of certain transactions. Think about online purchases of pictures or songs. The transaction costs of traditional payment methods, such as credit cards, make these small-value purchases expensive. A \$1 transaction could be done for no fee using Bitcoin while it could cost over 30 cents in fees using some merchant credit

⁷ Arifovic, Duffy, and Jiang (2014)

⁸ Gandal and Halaburda (2014)

⁹ <http://www.cra-arc.gc.ca/nwsrm/fctshts/2013/m11/fs131105-eng.html>

cards. E-money is also useful for sending money across borders. Traditional financial institutions offer these services, called remittances, but the fees can be as much as 10-12 per cent for small transactions. So, e-money has some benefits in certain economies, especially when cash is not a viable option.¹⁰

Those who use cryptocurrencies may also like the privacy they offer. These transactions require little or no exchange of personal information. However, people often overestimate how anonymous Bitcoin really is. It is not as anonymous as cash, and all Bitcoin transactions are public in the open source ledger, and so they can be linked to a specific IP address.¹¹ This means that the user could be identified eventually.

There are risks to using e-money. People need to be aware of the risk of putting their trust in an e-money scheme that is lightly regulated with limited or no user protection. For example, debit cards are linked to deposit accounts that are insured by the government and held in banks that are closely regulated. Balances stored with PayPal or other e-money providers do not have those protections. Aside from posing risk to individual users, it is also a level playing field issue for Canadian banks.

Users of cryptocurrencies are even more vulnerable. While cryptocurrencies do not require a trusted third party to authenticate and validate transactions, they still require users to put their trust in numerous private businesses, such as exchanges and Bitcoin wallets. This leaves them exposed to theft, fraud and loss. The biggest example is the failure of Mt. Gox, which resulted in hundreds of millions of dollars in losses. And while these problems could happen with other forms of e-money, cryptocurrencies offer little recourse because the legal status of the players is still quite ambiguous.

The list of issues doesn't end there. Cryptocurrencies can be used for money laundering, terrorist financing, and other criminal activities.¹² That is why governments around the world are building a new legal framework for cryptocurrencies.

For example, Canada has introduced legislation to require cryptocurrency exchanges to register and to report suspicious transactions that may be linked to money laundering and terrorist financing. Regulators in the state of New York are proposing to issue a "BitLicense" to protect consumers, prevent money laundering and enforce cyber security. Some countries, like China, have ruled that financial institutions cannot handle any Bitcoin transactions.

If e-money were to gain widespread acceptance in an economy, there would be implications for the central bank. The Bank of Canada earns money by issuing currency. This profit is called seigniorage. The bank notes that we issue cost very little to print, and we invest the balance of their value in Government of Canada securities that earn interest. With this profit, the Bank can fully fund its operations

¹⁰ Chiu and Wong (2014).

¹¹ The ledger and the protocol that enables it can be applied widely. For example, a peer-to-peer messaging system—Bitmessage—has been built that could be a secure replacement for email.

¹² A recent paper by the European Banking Authority listed some 70 risks inherent in cryptocurrencies.

and still remit a surplus to the federal treasury that amounts to about \$1 billion each year.

But it's not just about seigniorage. Some people have wondered whether widespread use of e-money could impair the ability of the central bank to conduct monetary policy. This is very unlikely because Canadian interest rates would still matter.¹³ Whether they use e-money or cash, as long as people and businesses pay bills and borrow in Canadian dollars, the Bank of Canada would still be able to achieve its monetary policy objective. When it comes to cryptocurrencies, however, the situation is different. In the unlikely situation in which cryptocurrencies were used broadly, a significant proportion of economic transactions would not be denominated in Canadian dollars. This would reduce the Bank's ability to influence macroeconomic activity through Canadian interest rates. Let me be clear, we are nowhere near this point today. But if we were, it would be even more important to determine whether issuing e-money is a role that should be done by the central bank.

If e-money denominated in Canadian dollars were to significantly replace bank notes, there are some options that the central bank could take so as to be in a position to intervene in markets or be the lender of last resort.

Another important issue is the potential for e-money to fundamentally change the financial architecture in ways that we don't yet understand but that could pose risks to financial stability. Think about a crash in a cryptocurrency as an example. If the cryptocurrency were widely-used, the economic and financial implications of such a crash would be significant because they would result in a dramatic reduction in household wealth.¹⁴

A crash or failure of one type of e-money can be a concern even if the e-money is not widely used. This is because the failure of one issuer could result in a loss of confidence in other issuers and in the payments system more generally. That is why the Bank of Canada sees risks to the economy in a structure that would allow the benefits of money issuance to accrue to the private sector while any losses would be borne by the government and taxpayers. Let's remember, these issuers are getting the equivalent of seigniorage but have limited or no oversight at this time.

The history I mentioned earlier also gives us an important lesson. There was a period that we refer to as the "free banking era" in the United States—when private banks were issuing bank notes and trying to ensure their value. The notes of some banks faced steep discounts, outright runs and there were a string of crises in the banking system.¹⁵

These crises prompted governments to step in to insure bank notes issued by private banks. It ushered in the national banking era with a lot of regulation,

¹³ Fung, Molico, and Stuber (2014). See also Friedman (2000) and Woodford (2000, 2003) for a broader discussion.

¹⁴ Ali, Barrdear, Clews, and Southgate (2014).

¹⁵ Weber (2014a).

supervision and government intervention.¹⁶ It came as no surprise then, that central banks were eventually given the sole responsibility for issuing bank notes.

Conclusion

Money and means of payment have come a long way since then. E-money and the technology that enables it are circumventing our old models of payment and fast creating new efficiencies and new risks. This matters because it affects the risks faced by people who use e-money and it has the potential to affect risks to the Canadian financial system as a whole. That is why the federal government, with the Bank's help, is modernizing our oversight frameworks for payments. The Bank is also undertaking research on the potential merits of issuing e-money.

Individuals need to be aware of the risks of using e-money that is not subject to minimum oversight and consumer protection standards. We also need to be aware that cryptocurrencies can be used for money laundering and terrorist financing, which is why governments around the world, including Canada, are finding ways to monitor their use.

Money and payments are at the core of central banking. The Bank of Canada is working through the tough issues today so that we can support the benefits of innovation, while safeguarding the integrity of Canada's money and payment systems and, ultimately, financial stability.

¹⁶ Weber (2014b). The U.S. experience with private bank notes was worse than the Canadian experience, mainly because the U.S. banking system was more fragmented.

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