

A virtual currency is a means of payment in the form of a digital unit of value. Virtual currencies come in many different forms and are intended to be used for payments made on or via the Internet. They differ from national currencies, such as the Swedish krona. The national authorities do not regulate the issue of virtual currencies and there are therefore very little statistics available. This Economic Commentary explains what virtual currencies are and discusses the risks connected with them.

Have virtual currencies affected the retail payments market?

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The retail payments market has begun to change in recent years, due to various innovations and new participants. One example of this is virtual currencies. Virtual currencies come in many different forms and are often intended to be used for on-line payments. There has recently been considerable media attention paid to these, and in particular to Bitcoin. However, use of these currencies is very limited and they have not made any impact on the Swedish payment system.

What are virtual currencies?

A virtual currency is a means of payment in the form of a digital unit of value. It is intended for use in payments within a specific virtual community, such as a particular website or a network of users with special software to manage the virtual currency and make payments. This type of virtual community can be compared with a simple agreement to use a specific item as a means of payment. In a non-virtual world this could be bottle caps, shells, amber or something else.

The virtual currency has a different unit of account than national currencies, for instance the Linden dollar instead of the US dollar. The issuer of the virtual currency does not come under financial supervision and may be a non-financial company or even an individual. The issuing of virtual currency is thus not a regulated activity.¹ Together with a regulatory framework and some form of technical infrastructure in which payments are made, the virtual currency comprises a small payment system, hereinafter referred to as a *virtual currency system*. It is usually the issuer who controls the regulatory framework governing the virtual currency.

There are a large number of virtual currency schemes that have been built up, and function, in different ways. The European Central Bank (ECB) divides them up into three categories:²

1. *Closed virtual currency schemes*. These are usually intended for buying virtual goods and services within the actual virtual community and the user obtains the currency through some form of activity. Some of these are earned and used in certain on-line games, such as World-of-Warcraft Gold. Other closed virtual currency schemes are linked to the real economy and common examples are the bonus systems that airlines (air miles) or some credit cards offer.
2. *Virtual currency schemes with unidirectional flow*, where the virtual currency is bought for real money but cannot be converted back. The exchange rate is determined by the system owner. One example is Amazon Coins, which Kindle users can exchange real money for and then use to buy applications and so on. Another example is the now discontinued Facebook Credits, which could be used to buy virtual goods and services within Facebook.

1. The issuing of virtual currency must be separated from offering different forms of payment service in virtual currency. In Sweden, the main regulation of payment services is through the Payment Services Act (2010:751) which states the rights and obligations of both mediators of payments and users of payment services. This applies regardless of whether the operations are carried out in national or other currencies. The companies offering exchange of currencies are also regulated. Although the issuing of Bitcoin is not regulated, the Swedish companies that offer exchange services for Bitcoin are regulated.

2. See ECB (2012).

3. *Virtual currency schemes with bidirectional flow.* In these schemes, one can use money to buy the virtual currency and also convert it back into money at special exchange websites and/or the issuer. Here there may be both market-based exchange rates and predetermined, fixed exchange rates. Examples of currency schemes with bidirectional flows include Bitcoin, Ripple and Linden Dollar.

The categories sometimes overlap one another. For example, extra air miles can often be bought for national currency and extra Amazon Coins can be earned as a bonus on certain purchases at the Amazon Appstore. The categories should therefore be regarded as information on the overall construction of the scheme.

A further distinction in the categorisation above is whether the virtual currency is *centralised or decentralised*. As for banknotes and coins, payments with virtual currency units are made by means of them changing ownership. Ownership thus needs to be registered somewhere. A centralised virtual currency scheme, such as the Linden Dollar, has a centralised system for verifying and executing transactions, often with the issuer. In practice, this administrates all of the accounts through which the payments are made. In a decentralised virtual currency scheme, like Bitcoin, the transactions are verified and executed via the network of users that carry out some form of activity for this (see the box at the end of the commentary). The right to register activities is thus delegated to the network's participants. The decentralised virtual currency schemes are not uncommonly based on an exchange of encrypted messages and called *cryptocurrencies*. Also the categories of centralised and decentralised virtual currency schemes may overlap. The issuing of Ripple is centralised but the confirmation is decentralised.

The use of virtual currencies is limited

The national authorities do not regulate on virtual currencies and the issuers are not under their financial supervision. The issuers therefore do not have any obligation to report and there are thus very little statistics available. It is particularly difficult to obtain information on how much the different virtual currencies are used in different countries and one often has to be satisfied with data on the total issue value and global usage. The following section focuses solely on the virtual currency schemes with bidirectional flow, as these are the ones most similar to other means of payment and they have the greatest capacity for use in the real economy.

There only appear to be a few centralised schemes with bidirectional flow. At the end of 2011, there was Linden Dollar with an equivalent value of around USD 29 million in circulation. The corresponding value for Ripple was around USD 30 million in early June 2014.

The decentralised virtual currency schemes are relatively many and there are currently more than 250 of them, with Bitcoin, Litecoin, Peercoin and Dogecoin among the most well-known. Table 1 below shows the value of the "currency" issued and the turnover as at 5 June 2014. However, these values can vary substantially from one day to the next.

Table 1. Issued value and global turnover (24 hours) for decentralised virtual currency schemes
(selection: highest issued value)

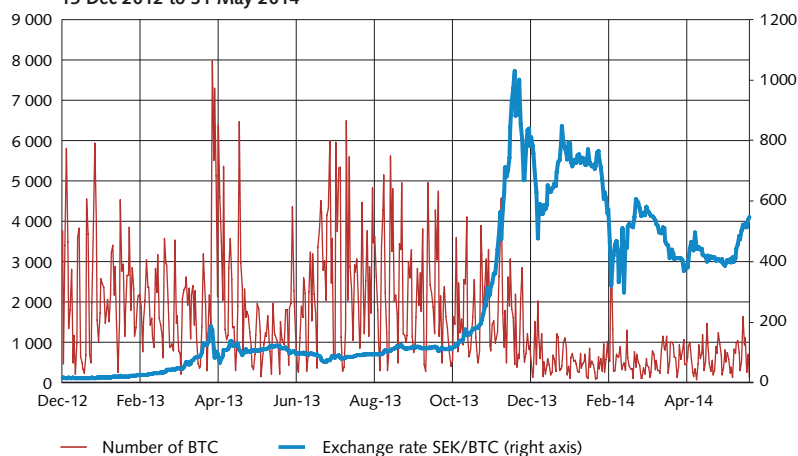
NAME	USD MILLIONS*	
	MARKET CAP	TURNOVER (24h)
Bitcoin	8 295	20.12
Litecoin	327	3.28
Darkcoin	52	1.50
Peercoin	37	0.19
Dogecoin	30	0.53
Others	80	1.55
Total	8 821	27.17

* Figures are based on exchange rates and turnover at 5 June 2014.
Source: <http://coinmarketcap.com>. Revision: The Riksbank.

These data refer to the currency scheme's global values and activities. It is thus not possible to draw any specific conclusions with regard to Sweden. However, the overall conclusion is that, from a payment system perspective, the amounts involved are very small. For example, there were dollar notes and coins in circulation to the value of around USD 1,159 billion, which can be compared with the nearly USD 9 billion in the table above.

For Bitcoin, which is the virtual currency used the most, there is some data, in addition to the value issued and daily turnover, on exchange transactions between SEK and Bitcoin, see Chart 1. However, these statistics are not complete, as the exchanges between private persons are not included and not all exchange sites keep statistics. It is also uncertain how well the exchange transactions reflect the actual use of Bitcoin. If Bitcoin is used without then being converted back into a national currency, the number of payments is underestimated, but if Bitcoin is bought and held for the purpose of speculation, its use is overestimated. On average, around 212 Bitcoins per day were converted to or from SEK during the period December 2012 to May 2014 at an average value of just over SEK 266,000. However, the daily value varied substantially, between SEK 2,500 and SEK 2.5 million, depending on the exchange rate and the number of Bitcoins exchanged.

Chart 1. Daily values for exchange between Bitcoin and SEK for the period 15 Dec 2012 to 31 May 2014



Sources: <http://bitcoincharts.com>, Safello and BTCX. Revision: The Riksbank.

Although the exchange statistics may underestimate the use of Bitcoin in Sweden, the values concerned are nevertheless small in relation to the values processed in the Swedish payment system. Households make daily payments using cards and cash totalling 8 million in volume and to a total value of over SEK 3 billion. Even if the use of Bitcoin in Sweden were to be much larger than the average exchange value of just over SEK 266,000, this is a relatively low value in relation to other types of payment. At present, there only seem to be around 25 Swedish companies accepting Bitcoin.³

Virtual currency fulfils a function

Virtual currency is one of many innovations on the Swedish payment market. It, like other innovations, is essentially positive, as it can contribute to meeting new payment needs and to making payments cheaper and more secure. Those who choose to use a particular payment service can be expected to do so because it gives them an added value in relation to other payment services. This also applies to virtual currencies, which can for instance make some cross-border payments simpler, faster and cheaper. Another advantage is if the payer does not need to share sensitive information, such as card number or bank account number, with the payee. Virtual currencies may also be better suited for small payments, so-called micro payments, on some websites.

3. Source: bitcoin.se

Although innovation on the payment market is something positive, it can also entail various types of risk, either for the user or for the actual payment market. Each individual innovation must therefore be assessed on the basis of its advantages and disadvantages.

Lack of regulation entails risk for consumers

There are clear disadvantages with virtual currencies. Issuing these currencies is not subject to regulation and the issuers are not under financial supervision. This means that consumer protection is weak in certain aspects and that the users may be exposed to risks. For example, the allocation of responsibility between the payer and the payee may be unclear if anything were to go wrong with the payment.⁴ There is also the possibility of exchange rate risk arising in connection with the virtual currencies that can be converted if the exchange rate is volatile, that is, the holder of the virtual currency runs the risk that it will fall in value.⁵ There is also the risk of fraud and theft as virtual accounts can be “hacked” into. Some virtual currencies can also be used for money laundering and criminal activities. It is important that anyone wishing to use a virtual currency familiarises themselves with the risks linked to this particular virtual currency.

The impact of an innovation will depend on how much it is used. All available data indicate that the use of virtual currencies is very limited, in terms of the number of users, the number of transactions and also the value mediated. This means that both the positive and the negative effects are very minor. If the situation were to change, and virtual currencies were to be used to a much greater extent, the situation could well change.⁶

Bitcoin

Bitcoin is a decentralised virtual currency scheme with bidirectional flow, which was launched in 2009. Its stated purpose is to enable anonymous payments over the Internet independent of governments, banks and other institutions. The means of payment, Bitcoin, is a computer file that is stored on some medium, for instance, a hard drive, and managed using some form of software, such as a digital wallet. Bitcoin is based on technology similar to file sharing (BitTorrent), which is common for spreading/sharing films, music, etcetera on the Internet. The network of Bitcoin users thus share files with one another and this is how payment information is transferred and verified within the network.


Let us assume that A is to pay 1 Bitcoin to B. They each have a wallet on their computer or smartphone. The transaction begins with B sending his public encryption key to A, who uses it to encrypt/lock the file sent to B. B can then use a private key to unlock the Bitcoin file which is thus protected against being copied by a third party.

When A sends the locked Bitcoin file to B, information is at the same time sent to the Bitcoin network. One can say that the transaction between A's wallet and B's wallet is proposed to the network, which now has to confirm/verify the transaction for it to become valid. Every ten minutes the network gathers up the transactions proposed during the most recent ten-minute period. Some users in the network actively participate voluntarily in the verification process. They are called “miners” and contribute computation power to the verification process. The verification is based on a mathematical algorithm, where the proposed transactions are one component. Once the transactions have been verified, they are added to the official register of verified Bitcoin transactions known as the blockchain. The miner who first solved the algorithm receives a reward consisting of newly-created Bitcoins. However, the size of the reward declines gradually. The rate of decline is balanced in such a way that the number of Bitcoins will not be able to exceed 21 million. At the beginning of June 2014, there were almost 12.9 million Bitcoins.

4. The companies offering exchange or mediation of payments in virtual currency are under financial supervision and subject to the same regulatory framework as other payment intermediaries.

5. Correspondingly, there is also a chance that it will increase in value. However, on the assumption that a virtual currency is used as some form of means of payment and not as a financial asset for speculation, exchange rate risk is regarded as something negative.

6. See ECB (2012).



As Bitcoins are created within the framework of the verification process, there is no central issuer of Bitcoins. Their issue is not subject to regulation and not under financial supervision. Unlike cash or account balances in a bank, Bitcoin is not a monetary claim on another party. Instead, their value is based on an expectation of their future value and that they can be used in transactions in the future. The value is thus very sensitive to changes in these expectations, see Chart 1.

A Bitcoin transaction is not completely anonymous. As it is added to the blockchain, it is registered and easily accessible on the Internet. It is possible to identify which wallets a transaction has been made between. However, it is very difficult to link wallets to individual users, which means that the transaction is in practice anonymous. This quality can make Bitcoin attractive for use in criminal transactions and money laundering.

Users of Bitcoin may also be subjected to fraud or theft. The most extreme example is the fraud of the exchange site Mt Gox, in which several hundred thousand Bitcoins disappeared.

Literature

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