



Contents lists available at ScienceDirect

Finance Research Letters

journal homepage: www.elsevier.com/locate/frl

On the transaction cost of Bitcoin

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ARTICLE INFO

Article history:

Received 6 April 2017

Accepted 31 July 2017

Available online xxx

JEL classification:

F31

G15

E42

Keywords:

Bitcoin

Foreign exchange

Transaction cost

Digital currency

International fund transfer

ABSTRACT

Using a unique data on Bitcoin quotes in 16 different currencies, this paper examines the empirical transaction costs of Bitcoin in international transactions. We find that the transaction cost of Bitcoin is lower than that of retail foreign exchange markets. Bitcoin markets have, on average, 2% narrower bid-ask spreads than retail foreign exchange markets and, when the U.S. dollar is converted to other currencies via Bitcoin, the resulting exchange rates are, on average, 5% better than the retail foreign exchange rate. We find that Bitcoin's simpler infrastructure is a source of the cost advantage.

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1. Introduction

As of 2015, Bitcoin is the most popular electronic currency in the world. Bitcoin is traded with at least 16 different real currencies and its average trading volume in U.S. dollars is more than \$17 million per day.¹ While Bitcoin supporters argue that electronic currency will play a significant role in the economy (Bernanke, 2013; Harvey, 2015), its critics note that the majority of this popularity is related to speculative trades (Krugman, 2013; Yermack, 2013; Glaser et al., 2014).

Recent research on Bitcoin focuses on providing a better understanding about this new asset or currency.² Major works include estimating Bitcoin's impact on the existing monetary system (Böhme et al., 2015; Dwyer 2015; Harvey 2015) and examining Bitcoin's price movements (Yermack 2013; Brandvold et al., 2015; Cheah and Fry 2015; Dyhrberg 2016; Kim 2015). Yet, few papers look at a major issue related to the long term potential of Bitcoin – whether this new currency can generate some economic benefits. While Bitcoin supporters argue that the decentralized and deregulated feature of Bitcoin will provide lower transaction costs to its users, this claim has not been empirically tested thus far (Böhme et al., 2015). Further, the fact that it is deregulated is often thought of regarding its potential to save transaction costs only in illegal transactions. In order to be widely accepted as a method of payment, Bitcoin must provide lower transaction costs in above board and legal transactions.

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¹ See Table 1 for an overview of Bitcoin transaction cost.

² There are debates on whether Bitcoin is a currency or an asset. See Glaser et al. (2014) for example. This paper views Bitcoin as a method of transaction, which is closer to a definition of a currency. Whether Bitcoin satisfies three main characteristics of a currency – method of transaction, unit of account, and store of value – is beyond the scope of this paper.

We have access to a unique dataset that contains daily Bitcoin quotes and price in 16 different currencies. While most of existing datasets on Bitcoin provides only price and volume information in USD (United States Dollars), our dataset can reveal the actual transaction costs of a Bitcoin trader executing international transactions. According to the large literature of market microstructure, market quotes and prices should reflect all the real, information, and inventory cost of trading an asset.³ See [Stoll \(2000\)](#) for a detailed discussion of the literature. The basic idea is that value maximizing traders adjust market prices and quotes such that they are compensated for any risk or costs of transactions. Even if some traders may not be completely rational, those less efficient traders will lose money to more efficient traders and get wiped out from the market. Thus, transaction costs measured using market quotes and prices would be inclusive of all the difficulties in using Bitcoin in international transactions.⁴

Using the quotes and prices data, we calculate the volume and bid-ask spread of Bitcoin in 16 different currencies. We also examine whether Bitcoin can be used in foreign exchange transactions. As Bitcoin is traded in multiple different currencies, we examine the transaction cost of buying and selling Bitcoin simultaneously in different currencies. The result of such transaction is converting one currency to the other using Bitcoin as the intermediary.

We find that Bitcoin markets have bid-ask spreads about 2% lower than that of the retail foreign exchange rates applied to ATM (Automated Teller Machine) transactions, which is the best rate available for foreign exchange transactions that are less than \$1 million. Transactions that convert USD to other currencies via Bitcoin exhibit a 0.4%–9.8% cost advantage over the best foreign exchange rates applied to retail-level traders. The results demonstrate that Bitcoin can be used as a cost-effective alternative to current foreign exchange markets.

We examine the sources of Bitcoin cost advantage. One factor can be the structure of Bitcoin. The currency exists in cyber space only and its users do not need to be equipped with complicated trading systems. On the other hand, interbank transactions in the foreign exchange markets require each bank to have a considerable amount of infrastructure, such as trading systems and employee salaries. Another factor related to Bitcoin's cost advantage can be insufficient competition in foreign exchange markets. The infrastructure to execute foreign exchange transactions may act as a barrier to entry and a few large banks could be charging higher transaction costs in the retail foreign exchange markets. Bitcoin may have the cost advantage because Bitcoin transactions bypass banks' market power.

We find that the cost advantage of Bitcoin is statistically significantly correlated with the transaction costs of the Bitcoin markets, while uncorrelated with the transaction costs of the foreign exchange markets. The results show that the evasion of existing foreign exchange markets is not a significant source of the Bitcoin's cost advantage. Another implication is that Bitcoin's economic benefits do not necessarily come from operating in grey areas.

2. Data

Daily Bitcoin transaction data from April 2014–April 2015 is acquired from [Quandl.com](#).⁵ There are other data sources for Bitcoin prices, with longer time series, but our data is unique because it contains Bitcoin quotes in 16 different currencies. As there are no official holidays or weekends in Bitcoin transactions, daily transaction data can exist for every seven days of a week. The transaction data summarizes daily last prices, bid and ask quotes, and volume collected from multiple Bitcoin exchanges. A Bitcoin exchange is a website that trades Bitcoin with a real currency, such as USD. The prices, quotes, and volume in the data are the averages by currency. For example, transaction data in USD is the average of Bitcoin exchanges that trade Bitcoin using USD.

Note that our data does not include all of the Bitcoin exchanges in operation. Such a limit would under estimate the actual liquidity of Bitcoin. This paper uses 16 different currencies traded with Bitcoin, but our data does not include several currencies that have Bitcoin exchanges. Some of these omitted currencies include Japanese Yen, Swiss Francs, and South Korean Won. Also, a trader does not have to use a Bitcoin exchange to trade Bitcoin if he can find a counter party on his own.⁶ Overall, actual transaction costs could be lower than what is measured from this data.

Foreign exchange rates data is acquired from [Oanda.com](#) and [Bloomberg](#). The [Oanda.com](#) data has weekly prices and bid-ask quotes. [Bloomberg](#) has daily bid-ask quotes data, but the daily data is limited to a few major currencies such as EUR. Therefore, we use the [Oanda.com](#) quotes as the main source and supplement the data with the [Bloomberg](#) quotes.

There are several versions of the quotes in the foreign exchange markets. The quote with the narrowest spread is called the inter-bank rate and applies to transactions between large financial institutions. The minimum unit of trade to obtain an inter-bank exchange rate is over \$1 million. Retail exchange rates that apply to smaller customers have 2%–5% wider spreads than the inter-bank rate. According to [Oanda.com](#), ATM transactions have a 2% wider spread, foreign credit card transactions have a 3% wider spread, and cash exchanges at an exchange kiosk have a 5% wider spread. We use the ATM rate as the

³ Real cost means real economic resources – labor and capital – required to exchange assets. Information cost include compensation for the possibility of trading at a worse price due to lack of information about the asset. Inventory cost is compensation for the possibility of asset price fluctuation while the asset is held in the middle of a transaction.

⁴ Recent empirical studies such as [Glaser et al. \(2014\)](#) or [Cheah and Fry \(2015\)](#) have shown that Bitcoin has a long-term fundamental value of zero and is suffering from speculative bubbles. Significant negative events such as the closure of Mt. Gox Bitcoin exchange harmed confidence in Bitcoin. Transaction costs derived from prices and quotes will reflect the magnitude of these obstacles.

⁵ [Quandl.com](#) stopped distributing this data after April 2015.

⁶ Bitcoin exchanges only facilitates Bitcoin trading; they are not necessary to transfer Bitcoin from one trader to the other.

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