

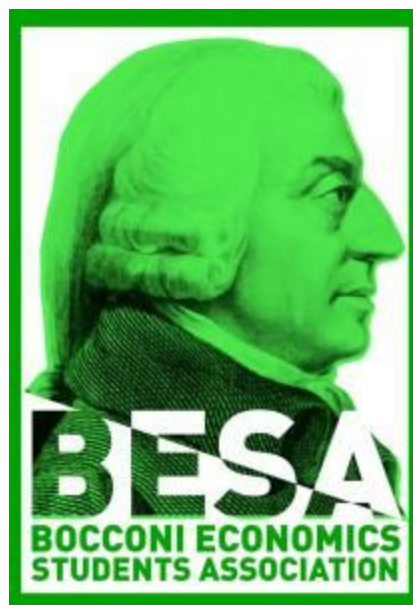
BESA RESEARCH PAPER SERIES

# CASHLESS FUTURE & THE RISE OF FINTECH

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## **Abstract**

*Coming up with an appropriate definition for the word “money” might seem obvious to many of us. However, this is not always the case and central bankers know it well. Formally, money may be defined as a stock of assets generally accepted in payments for goods or services and in the settlement of outstanding debt. In practice, the range of elements to which this definition applies may be somewhat troublesome to determine. This happens because of financial innovation, which leads to the creation of new products capable of acting as means of payment.*

## **Introduction**

It took a thousand years to evolve from a commodity form of money, such as gold, to a fiat type; i.e. without any intrinsic value. As a simple Kiyotaki-Wright model explains, the degree of acceptability of money does not depend on its physical properties, but it stems from the strategic interactions among agents trading goods. The main driver of this evolutionary process is the abatement of transaction costs. Individuals look for faster and safer transactions, which enable them to seize the largest level of utility they possibly can. In this regard, the physical aspect of money was partially abandoned thanks to the introduction of cheques, electronic payments and e-money. However, still a significant level of transaction costs (which include excessive expenses for setting up computers, providing card readers and organising telecommunication networks) prevented the latter from completely taking over. Yet what if we were finally on the verge of a cashless society? This article aims to cover the advantages and disadvantages of the digitalisation of payment systems, making reference not just to a mere economic scenario but also considering its impact on the financial services industry. Moreover, we attempt to draft our forecasts on the macroeconomic implications that a cashless future will bring about.

## **Advantages and Disadvantages**

So far entrepreneurs have introduced hundreds of private digital currencies, but now governments are about to step in. The People’s Bank of China announced its willingness to introduce a digital currency and other central banks in Ecuador, Philippines, the United Kingdom and Canada are seriously thinking over it. The crucial advantages of such a system, whether private or public, are mainly in terms of money movement. Digital payments would sort out many issues related to otherwise incompatible payment networks. In addition, this could constitute a significant advantage for the poor by enabling them to carry out faster online payments and remittances or settling their bills without the need to open a bank account. The topic has recently been debated by the World Economic Forum. As payments by mobiles and other novel devices become more automated, customer experience would be enhanced. Financial institutions will have to deal with a larger amount of data, which could enable them to leverage on consumer spending data and target more specific segments. Moreover, it will be crucial to develop close relationships with merchants. Becoming merchants’ preferred digital payment provider could lead to precious advantages for financial companies, since customers will lose visibility of their payment choices.

Yet citizens will not be the only ones to benefit. Thanks to the issuance of a digital currency, governments would save the costs arising from printing bills and minting coins. Relevant statistical indicators, such as the level of inflation and the gross domestic product would be measured more precisely. The complete traceability of transactions would hinder money laundering, fraud, tax evasion, corruption and act as a strong deterrent to terrorism financing.

On the other hand, there are also several delicate and risky aspects in the implementation of a digital system that need to be dealt with. Dragging down the value of paper money might generate strong political resistance, especially if governments do not clearly communicate to the public why they are undertaking such a policy. Additionally, there is evidence on the fact that digital payments tend to exacerbate overspending among individuals. The transition to an entirely digital system might be harmful for those individuals whose perception of the real value of money will be altered. Moreover, electronic means of payment collect a significant amount of personal data on buying habits. If citizens do not fully trust their governments, they might be tempted to think that public officers are encroaching on their privacy. Last but not least, security would become a huge concern for regulatory authorities. Online hacking is not an uncommon occurrence, so the fear that unscrupulous persons might be capable of accessing bank accounts and stealing funds is well-founded.

### **Macroeconomic Implications and The Issue of Seigniorage**

Perhaps, the most significant effects are in terms of monetary policy. The so-called “zero lower bound” (i.e. the inability to impose negative interest rates during normal times) may be an obstacle during extraordinary times. For instance, the European Union is currently in need of keeping interbank rates below zero. Ideally, by controlling deposit rates at its standing facilities, the European Central Bank might influence individuals to consume and invest more. Eventually, this leads to higher aggregate demand and will, according to economic theory, increase inflation up to the targeted level. However, there are several frictions to this transmission channel. Individuals might prefer to withdraw their money from bank accounts and save it in the form of currency. Although notes are considered to be a suboptimal store of value because of fluctuations in their purchasing power, they might still constitute a considerable threat, especially when people are pessimistic about other forms of investment offered in the economy. Yet suppose that the central bank could be able to set an exchange rate between paper and digital money. This could be achieved by imposing a fee on banks for accepting paper money and would enable the central bank to depreciate it by raising the fee. Consequently, the incentive to hold money in the form of paper currency would decrease even further. Provided that investment opportunities are present in the market, consumption might be triggered to ultimately spur growth.

Another point, which is currently debated by economists, is the seigniorage revenue that central banks will forego in the complete absence of paper money. Seigniorage is the difference between the principle of outstanding money and its cost of production. A more economic definition equates seigniorage to the change in outstanding money, since the central bank does not need to pay its loan back. However, we will stick to the accounting-based definition, which is the one used by central banks. Paper money is one of the liabilities of central banks, thus the bigger the margin becomes, the higher the level of assets may be. Hence, inflation plays a key role in determining the portion of seigniorage that central banks account for. In periods of high inflation, the real value of cash holdings decreases significantly and thus seigniorage constitutes a fundamental source of revenue. On the other hand, in periods of considerably low and negative interest rates, this contribution becomes negligible. It is crucial to understand that money is seen as a non-interest bearing loan by the holder, aimed at financing interest-bearing assets owned by central banks. The main source of variation in the estimation of seigniorage revenues is the effective yield earned on central banks’ assets. Obviously, the profit generated by central banks is given back to governments after having recouped their expenses. The mere ability to do so constitutes an important determinant of central banks’ independence.

If paper currency disappears and electronic forms of money take over, the level of banks' reserves held at the central bank will increase significantly. Considering interest payments on reserves, this will lead to a decrease in seignorage revenues. The effective yield on central banks' assets will have to be adjusted for the interest paid on reserves, which will jeopardise the previously exploited gain. In an extreme scenario, the central bank might no longer be able to sustain itself. If there is no possibility to cover operating expenses, a central bank will have to be backed by the government. This might undermine its price stability goal because of government's short-term incentives, as well as opposing independence theories now prevailing in monetary policy. However, this scenario appears unlikely at the moment. In 2003, Johannes M. Groeneveld and Ad Visser investigated the potential loss of seignorage revenues in the advent of electronic money. In their analysis, they had to deal with the difficulty of establishing which portion of assets is effectively financed by seignorage. A substantial part of central banks' holdings are in fact backed by non-base monetary liabilities, such as liquidity paper or share capital. Hence, they selected the 10-year government bond as a proxy for seignorage revenues. From a historical analysis, it can be seen that seignorage was at its highest in the early 1980s, while at the present time, because of low interest rates in the market, it does not account for a considerable portion of central banks' revenues. This entirely dismisses the previously-raised argument concerning the loss of independence. In addition, we may think of several options for central banks in order to prevent losses from becoming too burdensome. Firstly, central banks may impose capital requirements upon issuance. Secondly, fees may be imposed on banks with the purpose of covering surveillance and supervision costs. Most importantly, central banks may themselves take on the issuance of e-money, thus utterly excluding private entrepreneurs from this business.

### **Sweden: A Case Study**

Sweden provides us with an appropriate case study to analyse the effects of going cashless. At the moment, bills and coins represent only 2% of the Swedish economy. In 2015, only 20% of consumers payments were made in cash according to Euromonitor International. This figure is striking compared to the average 75% in the rest of the world. Credit cards still play a central role in the financial services industry, but a fast growing number of citizens use apps for daily transactions. More than half of the country's biggest banks, such as SEB, Swedbank and Nordea bank, neither keep cash on hand nor accept cash deposits. They believe they are lowering the incentive for bank robberies. "It might be trendy... But there are all sorts of risks when a society starts to go cashless", claimed Bjorn Eriksson, a former director of the Swedish police force and former president of Interpol. The government benefited a lot thanks to more efficient tax collection. Electronic transactions leave a trail and this helps detect tax evasion attempts. Yet during the last year, the number of electronic frauds more than doubled with respect to the amount of ten years ago. Young people using apps for payments or taking out loans are at risk of falling into debt. Mr. Eriksson, currently heading the Association of Swedish Private Security Companies, a lobbying group for firms providing security for cash transfers, believes that banks and credit card companies are trying to "price cash out of the market" in order to generate fee income from electronic payments. Obviously, cash is not completely dead and the Riskbank predicts it will still be circulating for the next 20 years. However, especially among younger generations, cash is no longer a habit.

## **The First Steps**

Clearly, the transition towards a cashless society is a significant and rapidly unfolding macro trend. But what shapes and forms will this transition take in its early stages? Several central banks around the world are currently considering or have already taken the first steps. The ECB is planning to scrap the €500 note and the Central Bank of Nigeria implemented the final phase of its cashless policy (which involves charging prohibitively high fees on daily withdrawals). Meanwhile, in the US several influential economists are spearheading the current debate. A particularly prominent advocate is Lawrence H. Summers, a former treasury secretary, who bases his arguments on a recent research paper published by Peter Sands, a senior fellow of Harvard's Mossavar-Rahmani Center for Business and Government, which Summers coincidentally directs. The paper, aptly titled "Making it Harder for the Bad Guys: The Case for Eliminating High Denomination Notes", identifies three key problems which the abolition of high denomination notes would ameliorate: tax evasion, financial crime and corruption.

Sands' policy recommendation is supported by the simple observation that it is almost exclusively the underground economy and very wealthy individuals who use high denomination notes. A plethora of revealing statistics supports this statement. For example, a survey held in the Eurozone reports that 56% of respondents have never possessed a 500 euro note and 75% state that they have neither used a €500 nor a €200 note during the last year (footnote). Further, a similar study carried out in the US revealed that only 5.2% of individuals surveyed kept a \$100 bill in their wallet (footnote). Hence, individuals' everyday use of cash comprises small transactions and therefore the phasing out of high denomination notes would not require the immediate, full-scale adoption of electronic payment systems. However, due to momentous advancements in the fintech sector, it might not be long until cashless societies become practically implementable.

## **The Rise of Fintech**

Notwithstanding the current privacy concerns regarding the digitalisation of currency, the case for the fintech industry is strong. In contrast to popular belief, fintech comprises much more than just payment systems. A report prepared by the World Economic Forum also discerned market provisioning, investment management, capital raising, deposit and lending, and insurance to fall under its scope. However, for the purposes of analysing how cashless society may evolve, we will direct our focus towards payment solutions offered by fintech companies and, in particular, two aspects: the modification of front-end processes and the decentralisation of payment schemes.

Front-end processes affect customers and merchants' interfaces but not the pre-existing payments infrastructure. Examples include mobile payment solutions and digital wallets such as Applepay, MasterPass and Google Wallet. In developed economies this phenomenon is at the forefront of the cashless movement. The combination of convenience and speed appeals to tech savvy societies and even makes small-denomination cash transactions superfluous. Its potential benefits are numerous and multifaceted. Since most electronic payment systems are characterised by scale economies and stem from an already established infrastructure, they will drive down costs. Moreover, the resulting transparency will allow financial institutions to better analyse businesses' transactions; thus, easing credit conditions in markets plagued by asymmetric information problems.

A possible spillover effect is that credit card providers will be rendered expendable. Currently, service charges on credit card-funded transactions exceed those of bank account-funded transactions. Therefore, merchants and payment solutions providers have a clear motive to switch. However, this hypothesis relies on the assumptions that bank account providers will cooperate and

accept credit risk, merchants and payment solutions providers will provide sufficient incentives to persuade customers to change funding methods, alternative financing providers will match credit cards in terms of efficiency and reliability, and, most importantly, transaction security will not be compromised.

On the other hand, decentralised payment schemes are an alternative to existing value transfer rails. Emerging market economies, which often suffer from poorly developed financial infrastructure, have benefited from these innovations because they do not require users to own a bank account. The rapid proliferation of M-Pesa (a mobile-phone payment and money transfer service that acts as a digital currency) in sub-Saharan Africa bears testimony to the viability of this trend. Another prominent example is bitcoin. Decentralised schemes have several advantages over current systems: they entail significantly lower transaction costs and mitigate the risk of conventional fraud, settlement is almost instantaneous and involves no counterparty risk, and the traceability of transactions greatly improves.

However, it is highly unlikely that alternative payment schemes will replace existing ones in developed markets. A more plausible scenario would involve traditional financial institutions implementing technologies that are linked with alternative schemes to address current weaknesses. For instance, JP Morgan Chase is working with Digital Asset Holdings to develop a blockchain initiative that would make trading cheaper and more efficient. In contrast, the possibilities for decentralised schemes in emerging economies are limitless. These markets are usually distinguished by either a lack of a well-functioning financial system or sluggish and immature development thereof. Take India for example: 50% of Indians do not own a bank account, 90% of small businesses are unlinked from financial institutions, but 80% of Indians own a mobile phone. It is evident that nimble, technology-oriented firms have a competitive advantage in this sector. The situation is similar in Nigeria. Since bank accounts entail prohibitive minimum opening balances, potential customers have switched to SMS-based payment companies such as Paga and Ready Cash. More profound changes are already taking place in Kenya. Currently, 75% of Kenyans use M-Pesa, and over half of Kenya's GDP is transacted in this digital currency.

Clearly, fintech companies are encroaching on traditional financial institutions' functions, but will they be able to replace them entirely? So far the answer is no. First, banks manage transaction accounts, which entail heavy regulation, constituting an enormous exogenous entry barrier. Second, banks and other financial institutions have developed expertise and strong networks in local and international markets, which are hard to replicate in the short run. Last, some banks are already collaborating with fintech companies and therefore their services may even act as complements.

### **Investment Opportunities**

Opportunities for retail investors in fintech companies may seem far and few between. Currently, there is no exchange-traded fund (ETF) tracking the fintech industry and few companies have gone public. Thus, the landscape is dominated by private equity and venture capital firms who have the experience and know-how to navigate this nebulous environment. To guide individual investors seeking exposure to this sector, we decided to conduct an analysis on a subset of the largest, publicly-traded fintech firms. Our hypothetical portfolio is composed of First Data, Lending Club, OnDeck Capital, Square and Worldpay. After a brief introduction of the individual firms and their business models, we will continue with our portfolio analysis and draw on some simple econometric techniques to complement our recommendations.

First Data is a well-established global payment technology solutions company that serves approximately six million merchants, more than any other player in the industry. Moreover, its customers make 74 billion transactions a year, approximately 2,300 a second. First Data generates yearly revenues of \$11.6 billion and is thus comparable in size to Visa (which has \$12.7 billion in revenues), one of its competitors. Its IPO was conducted in October 2015, seven years after its leveraged buyout by private equity firm Kohlberg Kravis Roberts. Under the leadership of former JPMorgan Co-COO Frank Bisignano, First Data has transformed from a staid payment solutions firm into an innovative technology provider of big data services to small businesses.

Lending Club is the poster child of new, emerging fintech companies. It specialises in peer-to-peer lending (specifically targeting consumers and small businesses) and has become the world's largest player in this sector, even though it currently only serves the US market. Lending Club has been a boon to small businesses, which were struggling to obtain bank loans since the 2008 crisis. Higher regulatory costs and a lower risk appetite have made these smaller and riskier businesses unpalatable to banks in the post-recession environment. A recent report by the Federal Reserve revealed that 33% of small businesses do not obtain the amount they requested, while a striking 44% of requests are turned down entirely. Its business model is based on charging borrowers an origination fee and lenders a service fee. Moreover, Lending Club does not take on the risk of borrowers' default. Therefore, it is more appropriate to define it as an intermediary rather than a lender.

In contrast to Lending Club, OnDeck Capital is not a peer-to-peer lender (it offers true business loans) and entirely specialises in financing small businesses. But, just like Lending Club, it aims to streamline the loan approval process for entrepreneurs in order to provide faster and more efficient services. Borrowers are required to make daily mini payments against the outstanding amount and are thus typically businesses with small but frequent cash flows. By stipulating this condition, and relying on its proprietary algorithms to screen an amalgam of different sources of information (cash flow data, vendor payment history, legal history, business reviews on social media, etc.), it has created a robust ex ante and ex post risk mitigation mechanism. Even JP Morgan is convinced. In December last year, the banking giant announced a partnership with the startup that will see OnDeck help increase JP Morgan's market share in the small business loan segment.

Square, Inc. is a credit card processing and business solutions company founded by Jack Dorsey (co-founder and CEO of Twitter) and Jim McKelvey. Its first product was a square-shaped card reader that enables vendors to process credit card payments on their mobile phones. Square has expanded into financing by building on its pre-existing relationships with small business owners and, by the same token, it offers payroll processing services. Another feature, targeted to both businesses and consumers, allows for person-to-person money transfer. Square's valuation suffered an immense setback during its IPO in November last year, as its shares were priced at \$9, significantly lower than the proposed range of \$11-13. Excessive valuations in the private market and a preceding period of highly-priced IPOs explain this occurrence (the first eight months of 2015 were characterised by an average return of negative 8% on IPO investments).

Lastly, Worldpay is a UK payments processing company. It was the first to offer international multi-currency processing and internet payment services in 1992 and 1994 respectively. In 2002 it was acquired by The Royal Bank of Scotland Group and in the following years its business spread via a wave of mergers and acquisitions. By 2007 it was one of the largest world's largest merchant acquirers (i.e. an entity that handles merchants' payment card transactions). In the aftermath of the financial crisis, RBS was forced to sell Worldpay in order to receive state aid and to comply with the conditions imposed by the European Commission. Advent International and Bain Capital

became its majority shareholders and as of October 2015 its shares are listed on the London Stock Exchange. Worldpay's current strategy revolves around an ambitious plan of global expansion to become the leader in transaction processing, which involves facilitating the exchange of money for goods and services without utilising cash or cheques. To capture a larger market it is broadening its offer of payment types for consumers and merchants, and reinforcing its existing infrastructure with fraud prevention and identification systems. Worldpay is a major beneficiary of the transition towards a cashless society.

### **Portfolio Performance**

In constructing our portfolio we decided to use each firm's current market capitalisation as a proxy for its weight. Accordingly, First Data occupies 45% our portfolio, Worldpay 23%, Square 16%, Lending Club 14% and OnDeck 2%. Portfolio calculations using linear returns are computationally more expedient than using log returns; consequently, we decided to opt for the former. Unfortunately, our analysis is constrained by the fact that the majority of the selected companies have only recently gone public. Thus, the analysis only comprises a four-month period. Based on this consideration, we advise our readers to interpret our results with reservations. The remaining analysis was conducted using EViews.

First, we analyse the distribution of returns by referring to Figure 1. The Jarque-Bera test leads us to reject the null hypothesis that our data follows a normal distribution. Moreover, returns are slightly left-skewed but relatively symmetric. Our data is leptokurtic, which is evident from the high peak and fatter tails. The average return is close to zero but negative. From Figure 2 we can tell that we are missing some data. This can be explained by the market closing for holidays (Thanksgiving from 26-27 November, New Year's Eve on the 31 December, etc.). As expected the majority of returns oscillate randomly around – but not too far from – zero. However, there are a few notable exceptions. On 8 February our portfolio lost 9.8% of its value. This is attributable to OnDeck, First Data and Worldpay suffering 8%, 14% and 8% declines respectively. At the other end of the returns' spectrum, our portfolio witnessed outsized returns on 12 February and again after a long weekend (markets were closed in the US on 15 February for President's Day) on 16 February. The rally on 16 February was a result of strong returns across the board. This apparent comovement is not surprising because the companies operate in similar industries and are susceptible to the same shocks.

Figure 3 reports the regression output of the Capital Asset Pricing Model applied to our portfolio. We used the US 10-year bond yield as the risk-free rate, because we assume a medium-run investment horizon. As is industry standard, the S&P 500 index is our proxy for the market. Figure 4 provides a graphical representation of our CAPM. The CAPM equation relates excess portfolio returns to excess market returns thereby giving us 2 important indicators: our portfolio's alpha and beta. Alpha is a measure of outperformance relative to the market, while beta reveals sensitivity to the market. Our portfolio's alpha is not statistically different from zero, but its beta is greater than one and highly statistically significant. The final consideration is the R-squared, which tells us that 36.6% of our portfolio's returns are explained by the market. This is a relatively low R-squared and could indicate that our model needs to be augmented with other factors to explain more of its variability. Moreover, it also casts doubts on the overall relevance of our model.

The last – and most important – question remains: how much would we have made or lost from our investment? Assuming that we invested \$1 on 19 November, 2015, we would be left with \$0.84 today. Figure 5 tracks the value of our portfolio over this period. In terms of returns, it generated a miserable annualised return of roughly -40% (compared to the S&P 500's -6%). What can explain



this tremendous fall in value? Based on our economic and firm analysis, should it not be obvious that these fintech companies have a bright future ahead of them and will benefit tremendously from the transition towards a cashless society?

First, if we decompose our portfolio into the companies that it consists of, as we have done in Figure 6, we can discern that a general downtrend commenced in the end of December and unfolded throughout January. January was a particularly bad month for investors as concerns over the turmoil in China and sliding oil prices gripped markets. But why did our portfolio do so much worse than the market during this period? Generally, investors liquidate their holdings in stocks that are perceived to be risky – such as fintech companies – and flock to safer options such as long-term bonds, defensive stocks (e.g. utility, consumer staples, etc.) and gold. Therefore, it does not come as a surprise that our portfolio, which solely comprises stocks deemed to be risky and are inherently more volatile, lost more than the S&P 500 in a month that saw the CBOE Volatility Index (VIX) steadily increase to a peak of 27.6 on January 20 (from 15.6 on December 23).

It should also be emphasised that some of these companies had relatively successful IPOs (as in the case of Lending Club and OnDeck) since they were initially perceived as game changers. In one of its white papers, Morgan Stanley forecasted a 51% compounded annual growth rate between 2016 and 2020 for the fintech sector. However, this overconfident prediction led initial valuations to be excessive and in January these companies ended up trading at 50% of their IPO prices. Thus, accounting for the market conditions at the time, the stigma attached to being a “unicorn” had a negative impact. We firmly believe that investors, already worried about the ensuing market turmoil, were afraid of losing further money in what could have turned out to be a “fintech bubble”. Moreover, it is worth mentioning a couple of internal factors that led to the demise of certain companies. For instance, on 9 February First Data reported a loss for the last quarter of the year due to a debt settlement and IPO-related expenses. Further, besides Worldpay (which is a huge player), the other companies in our portfolio might have struggled with CAPEX and OPEX. According to ResearchAndMarkets’ Global Financial Technology Market Outlook and Forecasts for the period spanning 2016 and 2021, inability to cover operational and capital expenses are a prominent reason for the various merger attempts between fintech startups and bigger companies.

To sum up, we can attribute this drastic fall in our fintech portfolio to several reasons, such as investors’ negative sentiment in capital markets, excessive initial valuations and even the IPO puzzle (i.e. listed companies tend to do worse in the medium to long run than their peers). However, this does not rule out that fintech startups can be extremely profitable in the near future. The initial slowdown may be due to the market still weighing the advantages and disadvantages of a transition to a cashless society. As long as substantial measures in this direction are not taken, it will not be possible to gain solid momentum. However, many companies that have not gone public yet are eyeing IPOs in 2016. Therefore, we believe that fintech still constitutes one of the most promising sectors, which is surely bound to boom in the near future. It should also be noted that there is a significant difference between the United States and Europe regarding funding. In the former, it is easier for companies to obtain financing. However, European startup accelerators are playing a key role in closing this gap. We believe that once the fintech industry will be based on a more solid ground and investors’ confidence is restored, private companies similar to ours will get their slice of the capital market’s cake.

Our recommendation for individual investors is to incrementally accumulate exposure to large fintech companies. By adding a few established firms with sound business models (e.g. First Data and Worldpay) to a well-diversified portfolio, investors will be able to capitalise on a significant macro trend while sustaining minimal risk. Moreover, it is essential not to be swayed by occasional

turbulences. The market is fickle and participants are often irrational. This applies especially to the so-called disruptors in our portfolio (e.g. Lending Club, OnDeck and Square). A larger portion of their current valuation is based on future expectations of growth (i.e. potential), which is never a precise measure and often a subjective measure. Therefore, they are prone to larger swings both upwards and downwards. Even though our portfolio underperformed the S&P 500 over the past four months, we are confident that in the medium to long run (5-10 years) outsized returns will follow. From a contrarian perspective, the recent dip might even prove to be a perfect market timing opportunity.

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## Exhibits

Figure 1: Distribution of Portfolio Returns

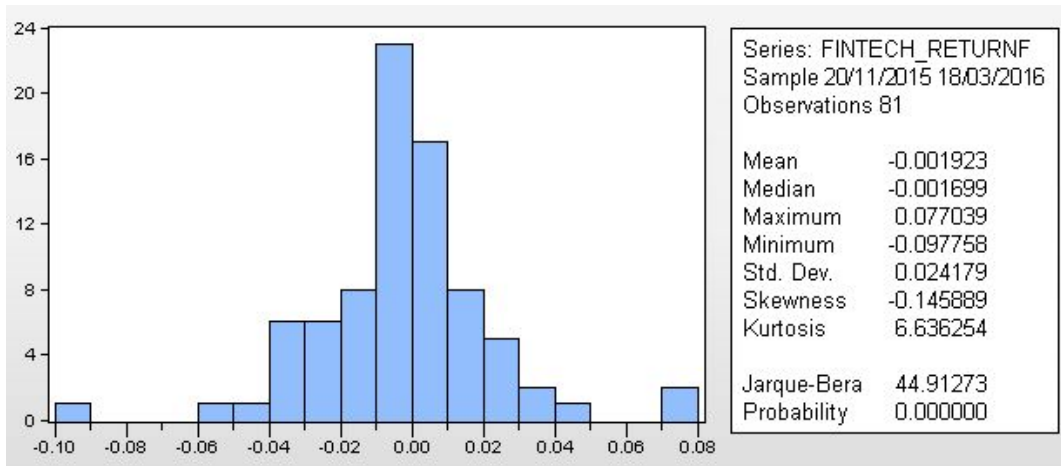


Figure 2: Daily Linear Returns

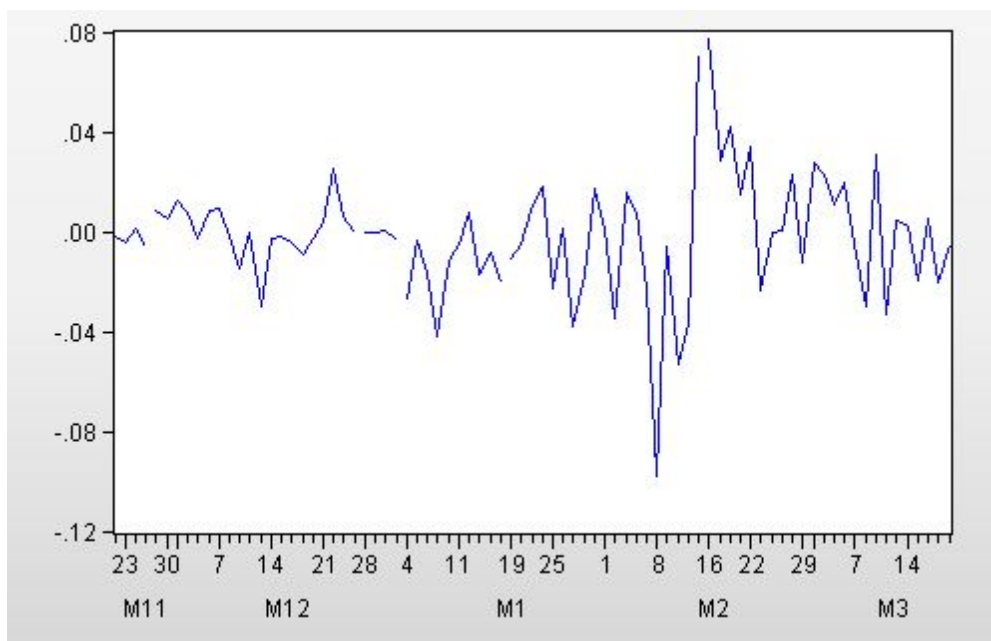


Figure 3: CAPM Regression Analysis

| Sample (adjusted): 20/11/2015 17/03/2016    |             |                       |             |        |
|---|-------------|-----------------------|-------------|--------|
| Included observations: 80 after adjustments |             |                       |             |        |
| Variable                                    | Coefficient | Std. Error            | t-Statistic | Prob.  |
| C   | 0.004280    | 0.005212              | 0.821028    | 0.4141 |
| ER_MKT                                      | 1.232261    | 0.183576              | 6.712556    | 0.0000 |
| R-squared                                   | 0.366155    | Mean dependent var    | -0.027475   |        |
| Adjusted R-squared                          | 0.358028    | S.D. dependent var    | 0.024434    |        |
| S.E. of regression                          | 0.019577    | Akaike info criterion | -5.004249   |        |
| Sum squared resid                           | 0.029894    | Schwarz criterion     | -4.944698   |        |
| Log likelihood                              | 202.1700    | Hannan-Quinn criter.  | -4.980373   |        |
| F-statistic                                 | 45.05841    | Durbin-Watson stat    | 1.665221    |        |
| Prob(F-statistic)                           | 0.000000    |                       |             |        |

CAPM equation:  $r^{fintech} - r^{risk-free} = \alpha + \beta(r^{market} - r^{risk-free})$

ER\_MKT: excess market returns

ER\_FINTECH: excess portfolio returns

C: constant (alpha)

Figure 4: Scatterplot with CAPM Regression Line

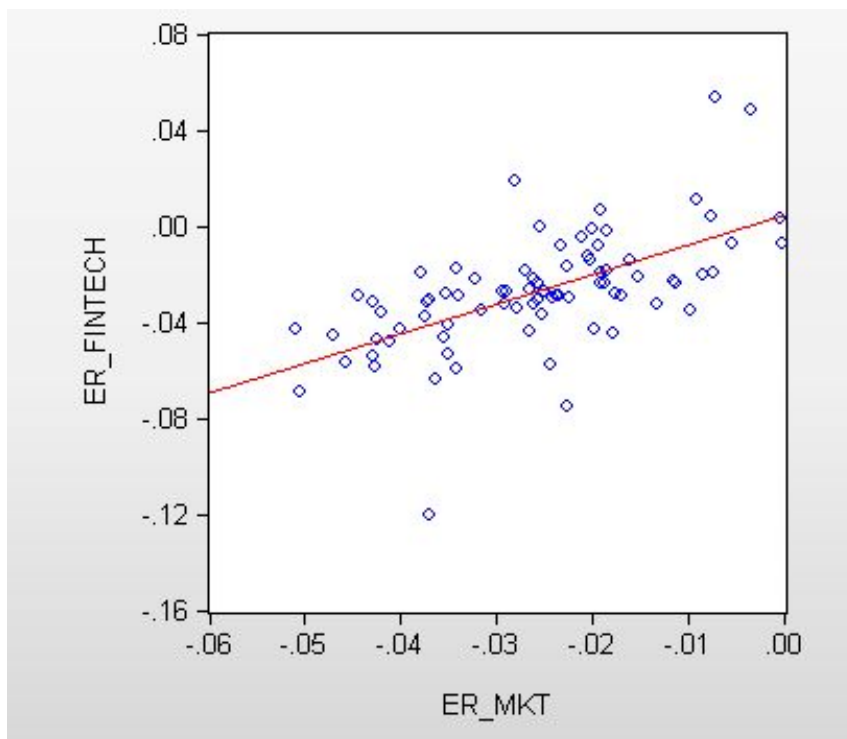


Figure 5: \$1 Investment in Fintech Portfolio vs. S&P 500

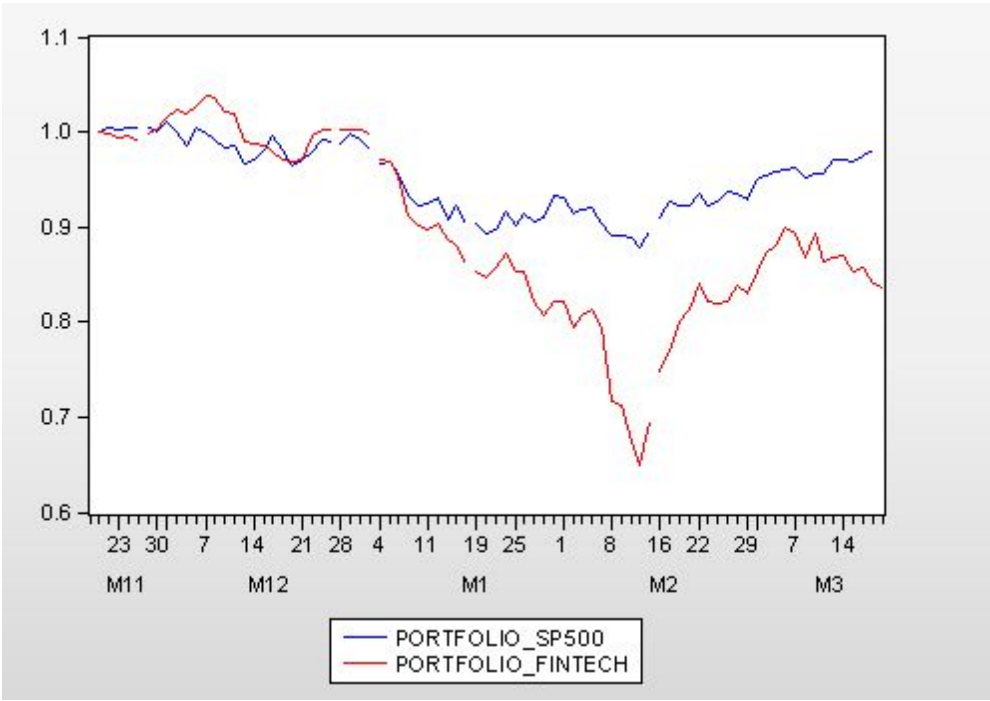
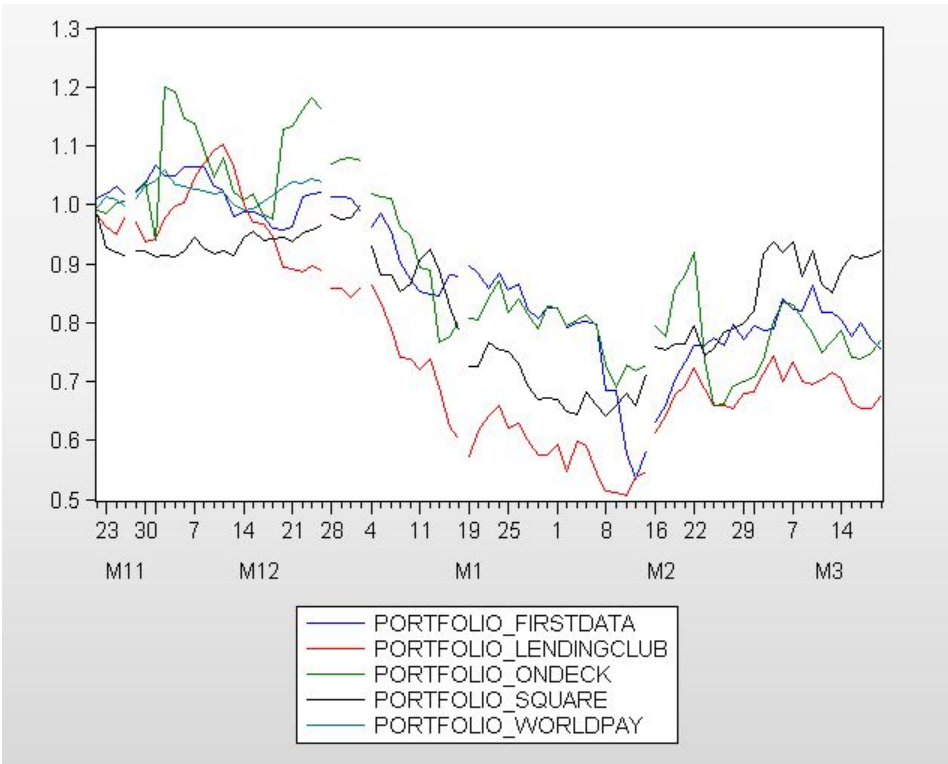


Figure 6: \$1 Investment in Individual Companies



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