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Portfolios, returns and Bitcoin

Efficient frontier of an international diversified portfolio with BTC

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November 23rd , 2017

Bitcoin as an *asset class*

In our opinion, the world of digital currency is changing in a way that it is expected to revolutionize the decision making of financial market participants, in the same extent that investments in commodities and emerging markets, did a few decades ago. For those who remember the traditional balanced portfolios, they were composed by 60/40 between stocks and bonds. Nevertheless, when commodities emerged as an asset class , their low correlation with other assets , increased their weight within the portfolio. Subsequently, the later happened with emerging markets. We believe that Bitcoin shows a similar pattern.

Our main observation is based on the evidence of a negative or low correlation between Bitcoin and the rest of traditional assets that constitute a portfolio, therefore the inclusion of this asset in a diversified portfolio tends to reduce the economic uncertainty, increasing the overall performance.
In order to proof this thesis, we made a research from June 2014 to September 2017, using weekly data (195 observations), where we built an efficient frontier applying Harry Markowitz's methodology for traditional balanced portfolios, which allowed us to measure risks, returns and the Sharpe index as a proxy of overall performance.

We made estimates for a portfolio with and without digital currency, in order to appreciate their true added value.

Table 1: Correlation Matrix

	SPY	GLD	BTC	EEM	LQD
SPY	1,000	-0,246	0,010	0,681	-0,081
GLD	-0,246	1,000	-0,067	0,033	0,388
BTC	0,010	-0,067	1,000	-0,108	-0,080
EEM	0,681	0,033	-0,108	1,000	0,112
LQD	-0,081	0,388	-0,080	0,112	1,000

Some of the research findings are listed bellow:

Portfolio Assets: developed world stocks (SPY), emerging markets stocks (EEM), gold (GLD), Investment Grade Corporate Bond (LQD) and Bitcoin (BTC).

BTC correlation with others:
As it's shown in Table 1, the correlation is clear. There is no linear pattern between the BTC and the rest of the market assets. Its correlation with gold, emerging stocks and corporate bonds is negative. The correlation with SPY is not very significant, which makes it an ideal candidate for diversification.

Understanding the efficient frontier:

The efficient frontier is constituted by different combinations of assets within the portfolio which maximize returns with the least volatility (risk) level. The frontier has two key points. First one, is the minimum variance point or minimum risk which is intended for conservative investors which are risk averse. Second one, is the optimum point or the tangential point, which represents the major difference between return and risk within the frontier. The later translates into maximizing Sharpe's index. Every point above the minimum variance point is efficient according to Markowitz's perspective, meaning that the investor can move along the frontier to increase return levels.

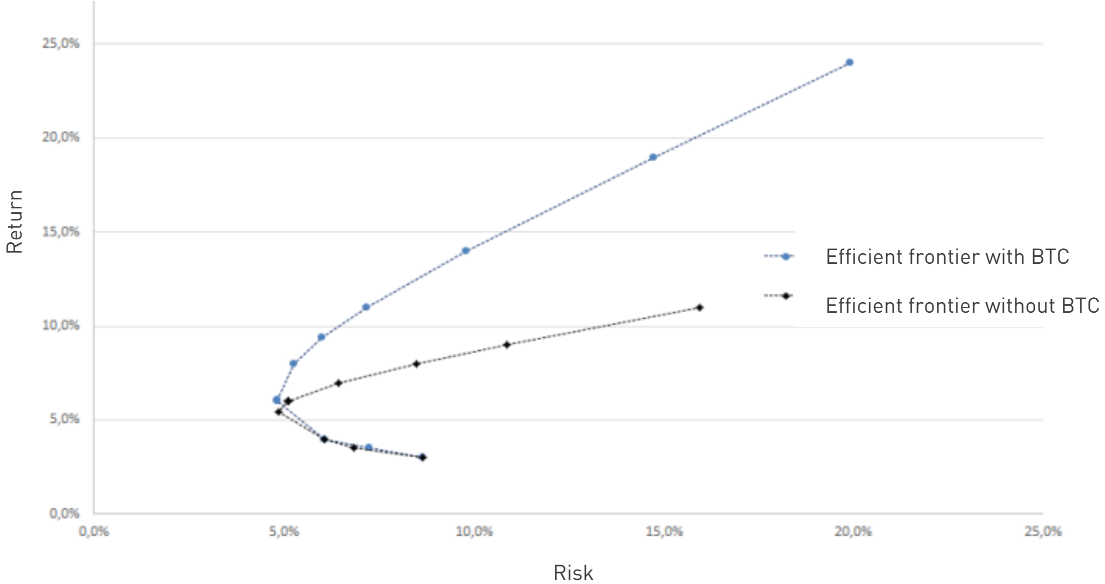
Table 2: Efficient frontier values with BTC

	Min Variance		Optimum					
Portfolio Deviation	4,8%	5,2%	6,0%	7,2%	9,8%	14,7%	19,9%	24,1%
Portfolio Return	6,1%	8,0%	9,4%	11,0%	14,0%	19,0%	24,0%	28,0%
Sharpe Ratio	1,259	1,524	1,565	1,535	1,428	1,290	1,206	1,162
SPY	10,8%	14,8%	17,8%	21,2%	27,6%	38,3%	48,9%	57,4%
GLD	0,3%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
BTC	1,0%	3,8%	5,8%	8,2%	12,6%	19,9%	27,2%	33,0%
EEM	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
LQD	87,9%	81,3%	76,4%	70,5%	59,8%	41,9%	23,9%	9,6%

As shown in Table 2, the point of minimum variance of the respective frontier has an insignificant position in BTC (1%). This is completely rational given the high volatility of the asset. With the portfolio of minimum variance the annual return is 6% and the annual volatility is of 4,8%. Now, the optimal portfolio increases Bitcoin allocation to 6% moving the Sharpe Ratio up to 1,565, the best risk-reward of the sample. An investor who wishes a higher level of risk can move along the frontier and increase his/her positions in BTC. For instance, an expected return of 14% and a volatility of 9,8% are obtained by having a 12,6% weight of BTC in the portfolio

The same exercise was repeated, but this time, we built a frontier for a portfolio without BTC in order to compare results. We identified the same key points, such as minimum variance and optimum point. When we compare both frontiers in Figure 1, the improvement in the risk-adjusted returns is evident in the portfolio that includes BTC.
This portfolio offers, along its curve, better return levels for the same levels of risk.

Figure 1: Efficient frontier with and without BTC



Key numbers of both frontiers

Contrasting the numbers of both portfolios, the differences are evident. First, for the minimum variance portfolio, we evidenced that by including 1% in BTC, the performance Sharpe index increases up to 1,25.
On the other hand, the optimum portfolio is constituted by 6% BTC, 18% SPY, 76% LQD. By comparing this portfolio with the one that does not include the BTC, it shows an improvement of more than three percentage points in the annual return while maintaining the risk level at almost the same. The later translates into a Sharpe index that goes from 1,18 (without BTC) to 1,56 (including BTC).
Undoubtedly, the inclusion of digital currency within the portfolio context, achieves a higher performance.

Table 3: Key numbers of both frontiers

Risks and Returns of Portfolios (with and without BTC)

Variables	Min Variance with BTC	Min Variance without BTC	Optimal with BTC	Optimal without BTC
Risks	4.82%	4.87%	5.99%	5.12%
Returns	6.07%	5.47%	9.37%	6.04%
Sharpe	1.259	1.123	1.565	1.181

Weights per asset (with and without BTC)

Variables	Min Variance with BTC	Min Variance without BTC	Optimal with BTC	Optimal without BTC
SPY	10.77%	11.00%	17.77%	20.21%
GLD	0.29%	0.08%	0.00%	0.00%
BTC	1.04%	0.00%	5.84%	0.00%
EEM	0.00%	0.00%	0.00%	0.00%
LQD	87.90%	88.92%	76.39%	79.79%

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Bottom-line

The negative or not very significant correlation between Bitcoin and other assets such as stocks, bonds and commodities, makes it an attractive asset to diversify a portfolio, as suggested by the traditional balanced portfolio theory

Digital assets like Bitcoin, certainly improve the risk-adjusted returns of diversified international portfolios using the Sharpe index as a performance measurement.

For investors whose risk aversion is high and look forward to build minimum variance portfolios, the weight of digital assets such as BTC shall be maintained close to 0%. This is completely reasonable given the volatility nature of this type of assets. However, the inclusion of only 1% in BTC within the minimum variance portfolio enhances the portfolio performance considerably.

Investors that are willing to assume higher risks may include 6% of their portfolios in digital assets like Bitcoin. This little weight, increases in a substantial way, the Sharpe index of a diversified portfolio.

If the investor is willing to assume higher risks and is looking for better returns he/she may move along the frontier increasing his/her positions in BTC.

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