

Legal Aspects and Regulatory Issues of Cryptocurrencies – EU Perspective

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Contents

- Swiss Law
- Liechtenstein Law
- EU Law
- Alternative Investment Fund Directive (AIFD)-regulated cryptocurrency funds
- Paper: What cryptocurrency investment strategy maximizes return for a given level of risk?
 - How should a cryptocurrency's risk-return profile be measured?

Swiss Law

- FINMA has released two guidelines on cryptocurrencies:
 - Sept. 2017
 - Feb. 2018
- FINMA will address initial coin offerings on a case-by-case basis.
- Three broad categories of coins have been defined:
 - Payment tokens
 - Utility tokens
 - Asset tokens

“FINMA regards asset tokens as securities, which means that there are securities law requirements for trading in such tokens, as well as civil law requirements under the Swiss Code of Obligations.”

<https://www.finma.ch/en/news/2018/02/20180216-mm-ico-wegleitung/>

Liechtenstein Law

- Liechtenstein's Ministry of Finance (Finanzministerium) released the first draft of the "Blockchain Law (*Gesetz*)" in June, 2018.
 - Expected to be fully implemented within one year
- Banks will be allowed to "tokenize" tangible and intangible assets for clients including:
 - Raw materials, metals
 - Real estate
 - Art
 - Cars
 - Securities
 - Intellectual property
- Legal certainty is defined for cryptoasset investors including bankruptcy law.

<https://vimeo.com/276259921>

- 5th Anti-Money Laundering Directive applies existing KYC/AML laws to cryptocurrencies by targeting two categories of cryptocurrency companies:
 - “providers engaged in exchange services between virtual currencies and fiat currencies”, i. e. cryptocurrency exchanges
 - “custodian wallet providers”, i. e. cryptocurrency wallet services (where the service holds its users’ private keys)
- Each of the EU’s 28 member states now have 18 months to “transpose” the 5th AML Directive and make it law in their respective countries. EU-wide adoption should therefore be achieved by the end of 2019.
- Expected to impact the price difference between “clean” and “dirty” cryptocurrencies.

<http://www.europarl.europa.eu/news/en/press-room/20180411IPRO1527/anti-money-laundering-meps-vote-to-shed-light-on-the-true-owners-of-companies>

Regulated Cryptocurrency Funds in Europe

- European Securities and Markets Authority (ESMA) introduced the Directive on Undertakings for Collective Investment in Transferable Securities (UCITS) in 1985 and the Alternative Investment Fund Managers Directive (AIFMD) in 2014:
 - For professional investors
 - More regulated than hedge funds
- Due to the nature of cryptocurrencies, AIF is the correct structure for direct investment in cryptocurrencies.
- Three distinct roles:
 - Custodian bank: Swissquote, Falcon, Frick, Fidor
 - Asset manager
 - Administrator
- Currently, three AIF cryptocurrency funds exist in the German-speaking countries.

Which Investment Strategy Should You Use?

1. How to maximize return for investors given a certain level of risk?
 - Various strategies from traditional finance:
 - market cap weighted
 - liquidity weighted
 - mean-variance/min-variance optimization
 - Proposed by Markowitz (1952)
 - 1/N
 - Proposed by Brown (1976)
 - The naïve 1/N diversification strategy ignores data completely and does not involve any optimization or estimation (DeMiguel et al., 2009).

2. How to maximize return for investors given a certain level of risk?
 - Sharpe Ratio, Omega Ratio, VaR, CVaR, Drawdown...

Paper: Limits of Cryptocurrency Diversification

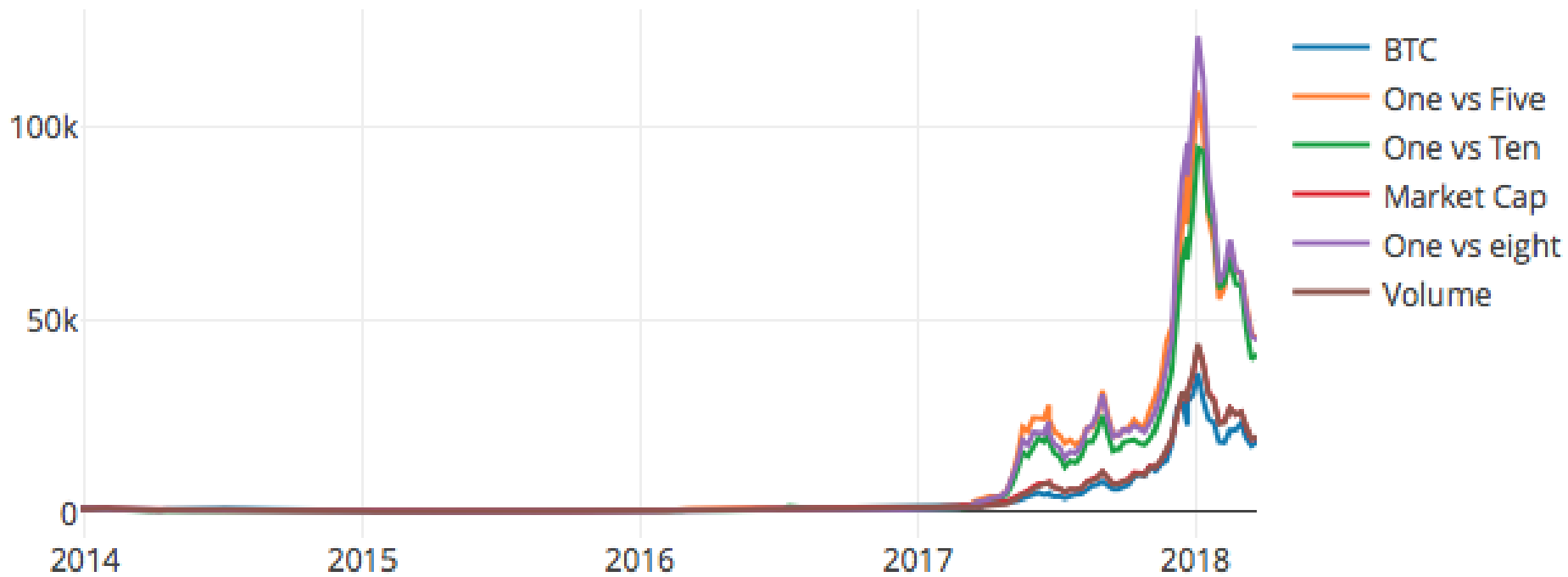
- Data: price time series in terms of USD of 41 different cryptocurrencies from May 5, 2013 until March 8, 2018. The data for this paper comes from coinmarketcap.com.
- This paper compares the performance of four strategies:
 - Bitcoin only
 - Naïve 1/N
 - Market capitalization weighted portfolio
 - Liquidity weighted
- Each portfolio starts with an initial investment of \$1,000 USD on May 5, 2013.
- The Bitcoin portfolio is not rebalanced because there is only one asset; however, the three other portfolios are rebalanced on a quarterly basis.
- The value of all four portfolios is tracked on a weekly basis. Therefore, each of the four portfolios has 262 observations over the five year period from 2013 through 2018.

Which cryptocurrency strategy do you think performed the best historically?

- 1/N
 - Brauneis and Mestel (2018) optimize the weights for several different cryptocurrency portfolios using the mean-variance framework and compare the results to the 1/N portfolio proposed and the CRIX market capitalization weighed index for cryptocurrencies.¹ The authors find that a naïve strategy does outperform a mean-variance strategy for various time spans for holding the same set of cryptocurrencies. 1/N had a higher average return and a higher risk-return profile, measured using the Sharpe ratio, compared to the optimized portfolios and the CRIX benchmark.
 - This matches the traditional literature on portfolio management:
 - The naïve strategy may outperform the mean-variance strategy because mean-variance involves estimation errors and assumptions that produce unreliable results (Fabozzi et al., 2007).

<https://crix.hu-berlin.de/>

Historical Performance of Traditional Investment Strategies

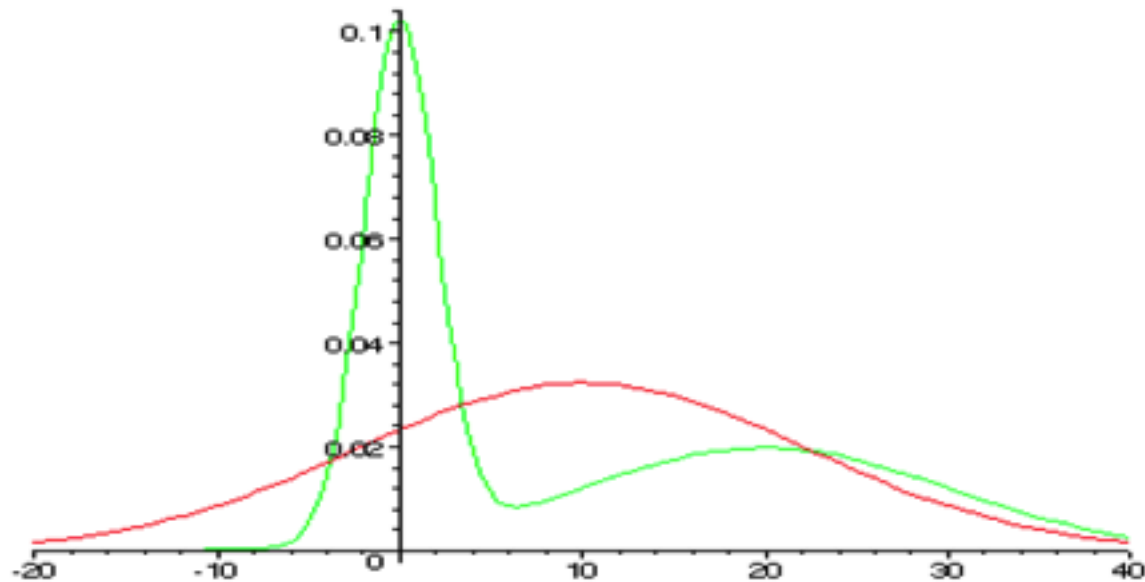


Conclusion?

- Since $1/N$ provided the highest returns empirically, then the best allocation for maximizing return would have been to define your cryptocurrency investment universe (i. e. how many cryptocurrencies will you invest in), invest equally amongst the investment universe, and hold long positions.
- Is the presentation over?
- Wait, no – what about risk?

How should cryptocurrency risk be measured?

- These distributions have the same mean and variance (Keating and Shadwick, 2002).

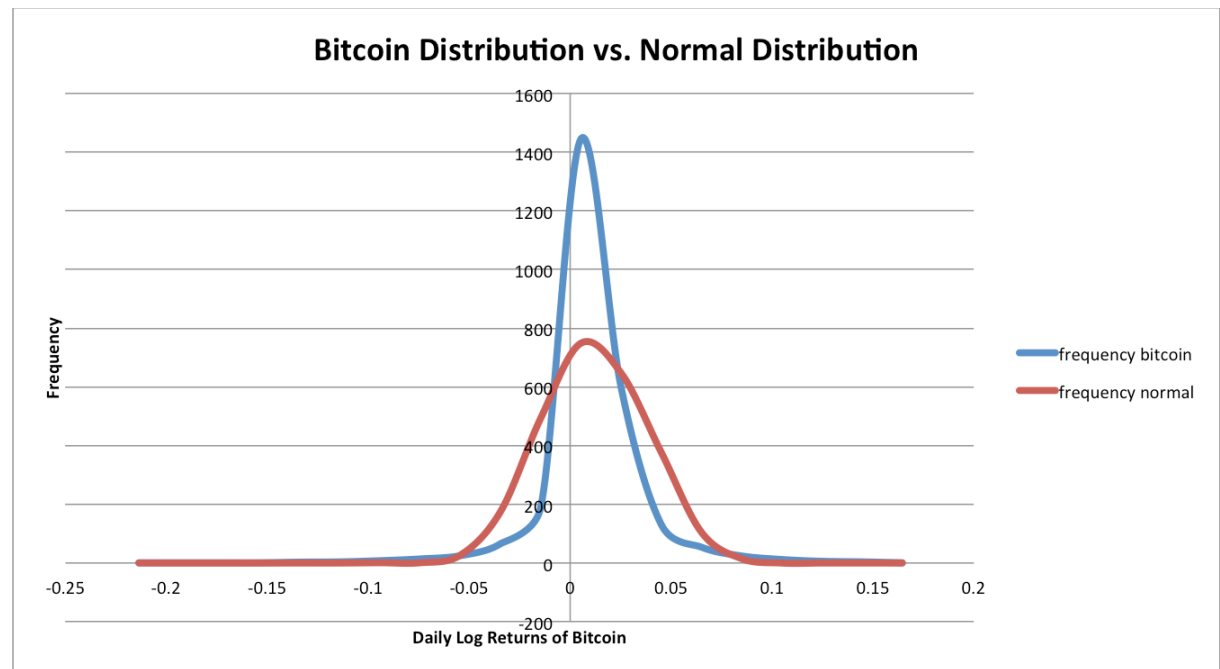


Problem: First and second moments do not capture all information

- Performance measurement traditionally relies on tools which are based on mean and variance, i. e. Sharpe ratio.
- For two normal distributions with the same mean, the Sharpe ratio favors the one with the lower variance, as this minimizes the potential for losses because the Sharpe ratio considers return above the mean and a return below the mean as equally 'risky' (Keating and Shadwick, 2002).
- Mean and variance cannot capture all of the risk and reward features in a financial return distribution, except in the case where returns are normally distributed.

Do historical returns of cryptocurrencies follow a normal distribution?

- Answer: no (Wu et al., 2014; Chan et al., 2017).
- Data: 2,593 daily observations of log returns from Bitcoin.
- Result: skewed and leptokurtic distribution (fat tails with higher peak).
- Practical implication: risk measurement that captures third and fourth moments is relevant for measuring cryptocurrency risk.



Solution: Omega Ratio

- Omega agrees with Sharpe for jointly elliptic distributed returns while avoiding the need to estimate means or variances, but when asymmetric returns are considered, the Omega measure and Sharpe ratio lead to different optimal portfolios (Metel et al., 2017).
- Omega takes the value 1 when r is the mean return. Different levels of returns, or market conditions, result in different allocations among assets (Keating and Shadwick, 2002).
- An asset with a higher value of Omega is preferable to one with a lower value.

Sharpe Ratios of Various Cryptocurrency Portfolios

- The Sharpe ratio is the highest for the market capitalization portfolio and is lowest for the most diversified portfolio.

Table 1: Sharpe Ratios of Portfolios

Portfolio	Avg. Return	St. Dev.	Ann. Sharpe	Cumulative Return
Bitcoin	1.70%	12.61%	0.950748876	\$17,514
Market Cap.	1.79%	12.38%	1.019909399	\$19,448
1/5	1.88%	16.64%	0.799713003	\$46,466
1/10	1.67%	16.75%	0.704607809	\$39,962

Omega Ratios of Various Cryptocurrency Portfolios

- The Omega ratio is the highest for the buy-and-hold strategy for a portfolio invested entirely in Bitcoin when the target return is 1%.
- However, the performance of the Bitcoin portfolio decreases as the target return is increased. The market capitalization portfolio has the highest Omega ratio for target returns of 5%, 10%, and 20%.

Table 2: Omega Ratios of Portfolios

Target Return	Bitcoin	Market Cap.	1/5	1/10
1%	1.32	1.31	1.26	1.22
5%	0.95	0.99	0.95	0.97
10%	0.71	0.75	0.73	0.71
20%	0.47	0.51	0.50	0.46

Conclusion

- Since cryptocurrencies are extremely volatile and the market has experienced an unprecedented bull market, traditional finance theory suggests that diversification will increase return for a given level of risk.
- In contrast, this paper finds that the Sharpe and Omega ratios are higher for cryptocurrency portfolios that are Bitcoin-concentrated.
- Since the Omega ratio considers higher moments of the distribution, it may be more appropriate for measuring the performance of cryptocurrency portfolios.

The Crypto Research Report at www.cryptoresearch.report



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Appendix

Table 3: Correlation of Cryptocurrencies

	Bitcoin	Litecoin	Ethereum	Ripple	Dash
Bitcoin	1				
Litecoin	57%	1			
Ethereum	32%	30%	1		
Ripple	25%	31%	16%	1	
Dash	41%	38%	30%	18%	1