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Buckle up and enjoy the ride - volatility analysis on common cryptos

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ABSTRACT: Volatility is one of the most commonly used indicators in quantitative research and portfolio construction. It offers insight on how stable the underlying is, how much risk is involved and how to combine the portfolio for optimal return on unit risk. We present in this article the annual volatility of top 50 cap cryptos as of February 2018, and analyzed the impact on investment decisions from rational investors.

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1 Introduction

An emerging market usually features high volatility. It is not uncommon that large price movements up to ten or hundred folds are observed in the crypto market, for it is still an infant and highly immature with ambiguous future in most people's eyes. The public has not reached consensus for the prospects of consensus based and cryptography backed universal equivalents.

Nevertheless, that does not compromise the importance of quantitative volatility analysis in any way, as it is a must for experienced quants to understand the market trend, control various sources of risk exposures and assess loss limits. Long story short, if the consolidation and concussion interval is within the volatility range of the last few years, there is not too much to worry about.

This article is intended for generic readers and crypto investors without a financial background. Section 2 introduces volatility as a popular tool for risk analysis. Section 3 presents the daily and annual volatility for the top 50 cryptos in cap as of February 2018, and briefly analyzed the implications for common investors, followed by conclusions in Section 4.

2 Defining daily and annual volatility

We presented and analyzed the drawdown frequencies and magnitudes for top 50 cap cryptos in Ref. [1], designed a stability score and ranked them as appropriate. Let's look further into volatility, another major dimension in risk management and portfolio optimization. Define the rate of return (RoR_t) on the daily close prices ($Close_t$ as of day t) as Eq. 2.1 and take the standard deviation on the time series, we obtain the volatility of the crypto over the course of the period involved. Note the length of the period (degrees of freedom) affects the value, a common treatment is to calculate the annual volatility for ease of comparison. A year for the crypto market is 365 days, and our last calculation was based on daily returns, so all we need along annualization is to multiply by $\sqrt{365}$.

$$RoR_t = (Close_t - Close_{t-1})/Close_{t-1} \quad (2.1)$$

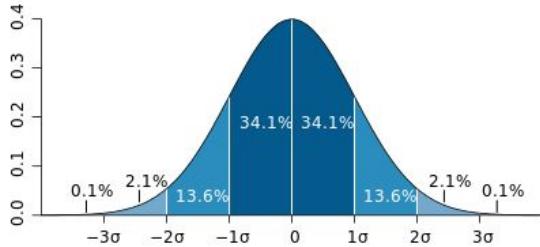


Figure 1. Probability density function for the standard normal distribution.

Why is the volatility important? Statistically, we would know how probable the crypto price movements stay in a certain range. That is because the time series of the rate of return loosely follow a normal distribution, though with fatter tails or more black swan events. Fig. 1 shows the probability density function (PDF) of a standard normal distribution. The x-axis is the rate of return, each segment is one standard deviation (σ) or volatility in width, and y-axis the density distribution. The shaded area is the integral of probability density over the return range, which amounts to the probability any return shows up in corresponding ranges. For instance, the chance an annual return sits between 0 and 1σ (or annual volatility) is 34.1%, in other words there is 68.2% chance the return amplitude lies within $(-\sigma, \sigma)$, as the PDF is symmetric about the y-axis and the probability of a price rise or fall is equal.

3 Volatilities on top 50 cap cryptos and implications

Now we are ready to assess the volatilities of top 50 cap cryptos as of February 2018. Starting mid 2013, we removed the prices for the first month upon inception, picked the cryptos with histories over half a year, and added one more anchor cryptocurrency DAI for analysis. The annual volatilities are shown in Table 1. Some readers may find it somewhat counter-intuitive as most cryptos carry a volatility greater than 100%, so we present the daily volatilities too in Table 2 for better interpretability. They are ranked and aligned from highest to lowest.

These percentages are the annual volatilities when you start investing with 100% capital from mid 2013 to February 2018. They can be greater than 100%, since your asset may appreciate multi-fold and fluctuate drastically onward. Not surprisingly, US dollar anchored currencies USDT and DAI ranked in top two. DAI features a stable and decentralized margin system, whereas USDT has long been criticized as an overly centralized crypto in lack of transparent issuance mechanism. However, DAI launched just a month ago at the time of writing and lack degrees of freedom. It is yet to see if it really boasts the potential to outperform USDT in stability. DigixDao, a crypto gold hybrid is the anchor cryptocurrency for gold, whose price is expected to highly correlate with gold in the long run. It is not really a typical crypto project.

crypto	volatility	crypto	volatility	crypto	volatility
USDT	11.6%	OmiseGo	177%	Siacoin	233%
Dai	30.0%	Decred	184%	Qtum	237%
Bitcoin	86.1%	Stellar	185%	Binance coin	242%
Ethereum	138%	Augur	193%	Lisk	252%
Litecoin	147%	0x	195%	NEO	254%
Dogecoin	148%	Veritaseum	200%	Status	269%
Monero	149%	Ardor	203%	WTC	280%
Waves	151%	Stratis	204%	Steem	284%
Dash	157%	Populous	208%	Vechain	286%
ZCash	157%	NEM	209%	Aeternity	298%
ETC	158%	EOS	209%	Bytecoin	308%
Digixdao	163%	Bitcoin Cash	214%	Raiblocks	320%
Bitshares	165%	HShare	217%	Verge	508%
Ripple	174%	IOTA	219%	Komodo	629%

Table 1. Annual volatilities on top 50 cap cryptos.

crypto	volatility	crypto	volatility	crypto	volatility
USDT	0.607%	OmiseGo	9.26%	Siacoin	12.2%
Dai	1.57%	Decred	9.63%	Qtum	12.4%
Bitcoin	4.51%	Stellar	9.68%	Binance coin	12.7%
Ethereum	7.22%	Augur	10.1%	Lisk	13.2%
Litecoin	7.69%	0x	10.2%	NEO	13.3%
Dogecoin	7.75%	Veritaseum	10.5%	Status	14.1%
Monero	7.80%	Ardor	10.6%	WTC	14.7%
Waves	7.90%	Stratis	10.7%	Steem	14.9%
Dash	8.22%	Populous	10.9%	Vechain	15.0%
ZCash	8.22%	NEM	10.9%	Aeternity	15.6%
ETC	8.27%	EOS	10.9%	Bytecoin	16.1%
Digixdao	8.53%	Bitcoin Cash	11.2%	Raiblocks	16.7%
Bitshares	8.64%	HShare	11.4%	Verge	26.6%
Ripple	9.11%	IOTA	11.5%	Komodo	32.9%

Table 2. Daily volatilities on top 50 cap cryptos.

Aside from the anchor currencies, tokens aimed for transfer and store of value (e.g. the public chains) tend to carry lower volatility, including Bitcoin, Litecoin, Ethereum, Monero and Ripple. In particular, Bitcoin carries only half or less volatility of any other cryptos and ranked high in our stability analysis [1] as well, since it is the origin and the most senior in the market. Older exchange coins serve as the base currencies for large trade volume and tend to be stabler too, such as Bitshares, Waves, whereas 0x, BNB (Binance coin) are newer and more volatile. Among the public chains, Bitcoin Cash, NEO, Qtum, EOS, Vechain, Lisk, AE (Aeternity) are still rapidly growing and quite volatile. In the zero-transaction

fee sector, IOTA turns out stabler than Raiblocks (Nano). As for the private payment coins, Monero, Dash, ZCash, Verge, Komodo rank in that order of stability. The former three are similarly volatile, but the last two are newer and much more so. Verge showed up again and took the last spot, and we knew it has a reputation of being unstable from the drawdown perspective [1], indicating drastic turnover and high risks over all. Note the volatility ranking is quite correlated with the stability ranking in general, yet somewhat different and complementary. Both of them serve as appropriate metrics for evaluations of portfolio risks.

4 Conclusion

In summary, the top 50 cap cryptos, the best representatives of the entire market mostly carry annual volatility greater than 150% or daily volatility greater than 7.9%. In other words, your crypto assets in these underlyings have a 31.8% probability to fluctuate beyond $\pm 150\%$ per year or $\pm 7.9\%$ daily, north or south. This is the risk level crypto investors must all endure - your initial capital could indeed regress to 0 before hitting a new high, and this is fully expected within the volatility range! We see again the importance to invest with spare cash, as with greater return comes higher risk, which was discussed at length in Ref. [2]. Never, ever invest the capital you cannot afford to lose, or you would not hold on to it comfortably and long enough until the tail wind blows.

References

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