Literature Review of *Risks and Returns of Cryptocurrency* by Liu and Tsyvinski, 2018

Jiawen Yan, 2018211671, yanjw.18@sem.tsinghua.edu.cn

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This paper mainly discusses the risk and return tradeoffs of cryptocurrencies. By using data from CoinDesk.com spanning over 2011 for Bitcoin, 2013 for Ripple and 2015 for Ethereum, to May 2018, the authors broadly answers three questions:

1. Can traditional equity market factors still have significant loadings in cryptocurrency market?;
2. If not, what unique factor loadings can be used to price cryptocurrencies and is there significant arbitrage opportunities?
3. What industry risk exposures could be used to price cryptocurrencies?

1 Return & Factor Loadings

1.1 Returns Characteristics

In the very first section, the author establish the differences between the three cryptocurrencies and traditional stock market. By illustrating the summary statistics of different assets in Table 1 - 3, the authors lists two features that are unique in crypto market: (1) cryptocurrencies are positively skewed at all frequencies and have high kurtosis; (2) and cryptocurrencies have high possibilities of exceptional positive or negative returns.

1.2 Factor Loadings

Overall, all three cryptocurrencies do not exhibit significant factor loadings that are found significant in equity market. Factors such as $MKTRF$, SMB, HML, MOM, RMW and CMA are used to price cryptocurrencies. Yet they fail to display statistically significant relationship with price movement, except for 5% significance level of HML for Ethereum.

Currency exposures are also discussed. Relationships between cryptocurrencies price and major global currencies are exhibited in Table 8 - 10 with AUD,

CAD, EURO, SGD and GBP. Similarly, the authors do not find consistent evidence of systematic currency exposures in cryptocurrencies.

155 Factors from Feng, Giglio, and Xiu (2017) and Chen and Velikov (2017) are tested while only 4 out of factor zoo are significant. Macroeconomics factors also do not show significant factor loadings.

2 Unique Characteristics of Cryptocurrencies

2.1 Cryptocurrency Momentum

Strong evidence of time series, both daily and weekly, momentum at various time horizons are found. For Bitcoin daily returns, the current return positively and statistically significantly predicts 1-day, 3-day, 5-day, and 6-day ahead returns. (See Table 14 in original paper). Arbitrage opportunities exist by forming long high and short low of current return sorted portfolios.

2.2 Attention of Investors

The role of investor attention for the cryptocurrency returns also cannot be dismissed. Two investor attention proxies are used: Google Search Volume and Post Mentions in Twitter. For Google search volume: in Table 19 and 20, the authors document the significant relationship positive between GSV, Google Search Volume, and Bitcoin price returns. By forming long-short trading strategy by quintile, Top minus Bottom can yield 11.60% abnormal returns. And the effects hold from t+1 to t+4 for Bitcoin, shorter for other two analyzed cryptocurrencies. For Twitter, similar results are found - Twitter posts with highest "Bitcoin" mentions can significantly predict one-day and three-day ahead return. Negative attentions are also discussed. If something bad, such as $BitcoinHack$ happens and more people pay attention (search), then future cryptocurrency prices will significantly decease by over 2%.

2.3 Price-to-"Dividend" and Volatility

What is dividend for cryptocurrencies? Basicly, it is a measure of the gap between the market value and the fundamental value of an asset. Market Price of cryptocurrency is just the observed price. The number of bitcoin wallet users is the proxy for the fundamental values. Overall, there is very weak relation between future cryptocurrency returns and P/D ratio. Realized return volatility is also not predictive, as shown in Table 31.

2.4 Supply Factors

Supply factors have three parts: (1) Electricity, which is proxied by stock returns of the U.S. electricity industries; stock returns of the China-listed electricity industries; and Sinopec stock returns. (2) Computing Power, which is proxied

by chip manufacturers, NVIDIA, AMD, Taiwan Semiconductor Manufacturing Company, and Advanced Semiconductor Engineering, Inc. Nevertheless, the authors find no support for this hypothesis. (See Table 32)

3 Industry Exposures

To estimate industry exposure of cryptocurrencies, the authors use FF-30 industry groups and finer 354 SIC industries in the US and 137 CIC industries in China for further analysis. The Consumer Goods and Healthcare industries are positively and statistically significantly affected while the Fabricated Products (FabPr) and Metal Mining (Mines) industries are negatively and statistically significantly affected. And, the often mentioned Finance, Retail, and Wholesale industries have no statistically significant exposure. (See Table 34)

4 *Some Quick Thoughts and Comments

- As cryptocurrency markets are known to be speculative, which is very different from traditional equity market, it is unsurprising to find that common used factors fail to explain.
- Momentum factor loading can be dominated by extreme periods when the Bitcoin price was rocketing. A robustness check excluding such periods is needed.
- Attention measured by related posts from Google and Twitter are great proxies. Yet, they are ex post proxies (After you find a trend from Google or find many posts on Twitter, the arbitrage opportunities may have already past). And, "we know what they are talking but we don't know they they are talking.". If attention plus sentiment is combined, higher return is expected.
- The final section about industry risk exposure analysis seems to be redundant and unnecessary. If equity market factors do not help in cryptocurrency pricing, the explaining power of risk exposure from a particular industry could be minimal.