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A Reexamination of the Illiquidity Premium in Cryptocurrencies

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by

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Abstract

In this study, I examine the illiquidity premium amongst the 372 most actively traded cryptocurrencies from September 2014 to May 2021. I find that the average returns on the most illiquid cryptocurrencies are larger than those on the most liquid cryptocurrencies. My results are robust to different weighting mechanisms for the market index and to various asset pricing model specifications. These results suggest that an investor might be able to go long a portfolio of illiquid cryptocurrencies while simultaneously shorting a portfolio of liquid cryptocurrencies to effectively generate a positive risk-adjusted return.

I. Introduction

A cryptocurrency is a digital form of money where the currency is transacted without a centralized intermediary. Some cryptocurrencies are even source where the public has the ability to see the code and work together to make efficiency changes to the network. Cryptocurrencies are managed in online ledgers called blockchains (Ashford, 2020). Transactions are recorded on different blocks which are then linked together by a chain of previous cryptocurrency transactions (Ashford, 2020). These blockchains are spread across many computers across the world. This allows for the decentralization as these computers work to solve complex algorithms to maintain the integrity of the system. On the contrary, the current system has banks or other centralized authorities that control the monetary system. The importance of decentralization is that it does not allow for a single entity to manipulate the value of a currency through monetary policy.

Different cryptocurrencies serve different functions. Some serve the purpose of trying to become a decentralized and efficient transfer of money amongst individuals or companies. Banks move billions of dollars each day so cryptocurrencies such as XRP aim to find a more affordable and efficient way of accomplishing that transfer of funds. Others serve to allow developers to build decentralized applications. The cryptocurrencies that are used to build these decentralized applications are essentially like the Apple "app store" (Sofi, 2021). Unlike the app store, which is controlled by Apple, these apps are decentralized and are worked on by creators without central authority. The applications of cryptocurrencies continue to expand as technologies improve and individual cryptocurrencies compete to solve some of the world's financial issues.

The difficulty in valuing cryptocurrencies is that they lack underlying cash flows like other assets, such as stocks. The values of these currencies are based largely off future potential with technology. This leads cryptocurrencies to be speculative and volatile. There are valuation models based on supply and demand that will need to be studied when it comes to evaluating the worth of these cryptocurrencies (Gore, 2021). It is likely that many, if not most, individual cryptocurrencies fade away. However, the blockchain technology that operates these currencies is likely here to stay with many different potential future applications.

Cryptocurrency has been evolving to play an important role in the financial aspects of society. Individual cryptocurrencies compete for dominance in the space similar to how different companies compete. There has been growing support amongst institutional investors in buying crypto assets, primarily bitcoin. There has also been more real-world application with some of the larger altcoins (cryptocurrencies other than bitcoin). This has led to public perception shifting on cryptocurrencies despite there sill being a large amount of skepticism in the space. As of July 24, 2021, the value of the entire cryptocurrency market is $1.4 trillion with bitcoin having a market capitalization of $640 billion (CoinMarketCap, 2021). These values should be taken seriously as it takes widespread interest to amass such values.

The illiquidity premium refers to the return investors require for the additional risk that they take with investing in more illiquid assets (see e.g., Eleswarapu and Reinganum, 1993; Amihud, 2002; Acharya and Pedersen, 2005; Rephael, Kadan, and Wohl, 2015). With cryptocurrencies, the more illiquid assets are typically those that have smaller market caps and are newer in the space. This is important because I can look at the additional returns that these illiquid cryptocurrencies have relative to the more liquid cryptocurrencies. With this information, I can attempt to replicate a risk-adjusted portfolio strategy where I short the more liquid cryptocurrencies and long the more illiquid cryptocurrencies.

My results show that illiquid cryptocurrencies have a statistically and economically significant larger return than liquid cryptocurrencies. This supports the idea that there is a positive liquidity premium in the cryptocurrency market. This is an important contribution to the literature, as Wei (2018) documents no signs of an illiquidity premium in the cryptocurrency market. I believe that the difference lies with the modeling approach, where illiquidity portfolios are formed in the month prior to observing the returns. Thus, I can sort cryptocurrencies into portfolios based on illiquidity as of time period *t* and expect to generate a positive risk-adjusted return in time period *t*+1.

II. Data Description

The data come from coinmarketcap.com and include the 372 most actively traded cryptocurrencies in the U.S. from September 9, 2014 to May 7, 2021.[1] Over this timeframe, the market capitalization of the entire crypto market went from $550.48 million to $1.322 trillion. I have several different variables that I use to examine the cryptocurrencies. All of the variables are computed on a weekly basis. *Price* refers to the price of the cryptocurrency in USD. $*Vol* refers to the volume, or coins traded in USD, for a given cryptocurrency during the week. *Rvolt* refers to the range-based volatility (Alizadeh, Brandt, and Diebold, 2002) of the cryptocurrency, or the natural log of the weekly high price minus the natural log of the weekly low price. *Illiq* refers to the illiquidity of the cryptocurrency (Amihud, 2002), measured as the absolute value of the weekly continuously compounded return divided by weekly dollar volume.

	Price in USD	$Volume in USD	Rvolt	Illiq
Mean	$135.64	$485,087,494.00	0.1371	0.6381
Std. Dev.	$1,955.17	$4,950,147,056.00	0.1603	3.8077
p25	$0.03	$78,729.00	0.0597	0.0001
Median	$0.29	$1,117,190.00	0.0986	0.0007
p75	$2.37	$11,957,400.00	0.1613	0.0112

[1] A complete list of the cryptocurrencies is available by the author upon request.

Table 1 shows the summary statistics for the data. The mean price of the cryptocurrencies analyzed is $135.64. The mean volume traded is $485,087,493.96 dollars per week. This shows that the overall market is active as nearly half a billion dollars of cryptocurrency is traded every week. I find that the mean *Rvolt* is 0.1371. This means that the average difference between the high and low prices during the week is roughly 13.71 percent. The mean value of the *Illiq* variable is 0.6381. The standard deviation of price is $1955.17 and the standard deviation of volume is $4,950,147,056.00. These numbers show how volatile the market is with the price and volume varying drastically. The standard deviation for *Rvolt* and *Illiq* are 0.1603 and 3.8077, respectively. The median of price and volume are $0.29 and $1,117,190.00 respectively. This implies there is a large skew to the right as the medians are drastically lower than the means of the data.

	Price in USD	$Volume in USD	Rvolt	Illiq
Price in USD	1.0000			
$Volume in USD	0.3153	1.0000		
	[<.0001]			
Rvolt	-0.0287	-0.0454	1.0000	
	[<.0001]	[<.0001]		
Illiq	-0.0115	-0.0165	0.1438	1.0000
	[0.0328]	[0.0023]	[<.0001]	

The table shows the correlation coefficients for the variables along with their respective p-values. All the variables are significant at the 0.05 significance level. However, most of the correlation coefficients are economically insignificant as they are close to zero. The correlation between the variables are as follows: *Illiq* and *Price* is -0.01154, *Rvolt* and *Price* is -0.02867, *$Vol* and *Price* is 0.31528, *Rvolt* and *$Vol* is -0.04539, *Illiq* and *Rvolt* is 0.14375, and *Illiq* and *$Vol* is -0.01645. Not surprisingly, the highest correlating variables are *Price* and *$Vol*. This is only a moderate amount of correlation and does not display anything economically significant.

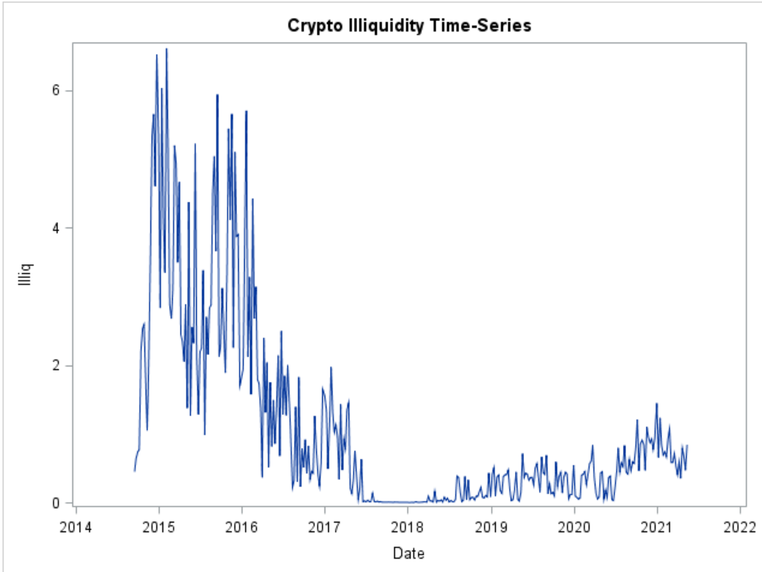

Figure 1 shows the average weekly *Illiq* across the 372 cryptocurrencies over the sample period. Market-wide illiquidity is relatively high early in the sample period. This is likely due to the difficulty at this time in acquiring these currencies. There was a limited number of exchanges, and it can be technologically difficult to acquire cryptocurrencies without an exchange. As they became more popular later in the sample, more companies began to create exchanges to trade cryptocurrencies, which made it easier for many people to trade and made them more liquid as more people entered the space. Since 2016 the illiquidity level has been relatively flat with a slight increase.

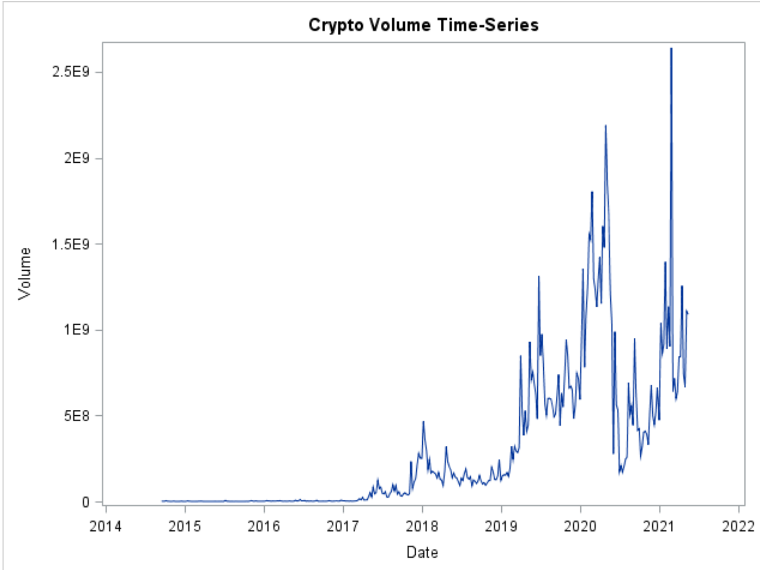

Figure 2 shows the average weekly *$Vol* of the 372 cryptocurrencies over the sample period. This graph is essentially an inverse of the previous graph displaying illiquidity. That is, the volume starts low and drastically increases in later years. The increase in volume over time is correlated with the increase in interest in the crypto sector. This relates to the illiquidity as more and more people are getting interested and buying these cryptocurrencies. This leads to an overall increase in volume as well as an increase in the illiquidity as there are more people in this marketplace.

Although unreported, I also plot the average prices of the cryptocurrencies over the sample timeframe. The average price of all the cryptocurrencies is close to zero in 2014 before the sector really took off. From there they stayed relatively low until they started climbing in 2016 and 2017. After they peaked in 2017 the crypto market crashed, largely in part to the introduction of futures contracts which allowed for shorting in the industry. From there, the market did not move much until late 2019 when a lot of these cryptocurrencies became less speculative and began to offer more real use cases. This has led to a large run up since then.

III. Empirical Results

In this section, I test for the illiquidity premium in the cryptocurrency market. I begin by using a portfolio approach, whereby I separate the cryptocurrencies based on their *Illiq* levels. More specifically, I divide them into quintiles based on their *Illiq* during the lagged week, with Q1 being the most liquid quintile and Q5 being the most illiquid quintile. I then examine the average returns for each *Illiq* bucket in the subsequent week. The results of this analysis are reported in Table 3.

Panel A. Weekly Data		
$Illiq_{t-1}$ Quintile	$Illiq_{t-1}$	Ret_t
Q1	0.0002	0.70%
Q2	0.0049	0.43%
Q3	0.0469	0.43%
Q4	0.3760	1.09%
Q5	5.4878	2.42%
Difference (Q5 - Q1)	5.4876***	1.72%**
t-stat	(14.66)	(2.35)

The second column of Table 3 shows the mean of the lagged illiquidity measure for each of the quintiles. The first quintile is the most liquid, so it is only .0002 up to the fifth quintile which is the least liquid at 5.49. The difference between the first and last quintile is 5.4876 which is statistically significant at the .01 with a t-stat of 14.66. The last column shows the mean return of each quintile in the following week after the portfolios are formed. The mean weekly return of the liquid first quintile is 0.70% and the mean return of the more illiquid last quintile is 2.42%. The difference between these two extreme quintiles is 1.72%, which is significant at the 0.05 level (t-state equal to 2.35). These numbers indicate that I could long a basket of the most illiquid cryptocurrencies (Q5) and simultaneously short a basket of the most liquid cryptos (Q1) to create risk-adjusted return that is 142.73% annualized.

To further examine the relationship between illiquidity in the crypto market and prices, I estimate the following regression equation using a Fama and MacBeth (1973) approach:

$$Ret_{i,t} = \alpha + \beta_1 Illiq_{t-1} + \beta_2 Price_{t-1} + \beta_3 Rvolt_{t-1} + \varepsilon_{i,t} \, , \tag{1}$$

where the dependent variable, $Ret_{i,t}$, is the weekly continuously compounded return of cryptocurrency *i* during week *t*. market. The first independent variable is $Illiq_{t-1}$, which refers to the lagged version of the *Illiq* variable. The second independent variable is $Price_{t-1}$, which is the lagged version of the *Price* variable. The last independent variable is $Rvolt_{t-1}$, which is the lagged version of the *Rvolt* variable. The results of this analysis are reported in Table 4.

	[1]	[2]	[3]
$Illiq_{t-1}$	0.2095*	0.2101*	0.2495**
	(1.69)	(1.71)	(1.97)
$Price_{t-1}$		0.0000	0.0000
		(0.02)	(-0.73)
$Rvolt_{t-1}$			-0.0412*
			(-1.67)
Constant	0.0070	0.0072	0.0117
	(0.86)	(0.86)	(1.44)
N	347	347	347

I ran three model specifications of equation (1). In the first restricted regression reported in column [1], I estimate equation (1) with lagged *Illiq* as the only independent variable. It returns statistically significant results. More specifically, it appears that a one-unit increase in lagged illiquidity increases the following week's returns by over 20 basis points. The upper and lower bounds of the confidence intervals are both above zero indicating that I can say at a 95% confidence level, that the lagged illiquidity has a positive effect on returns. In column [2], I show the results of estimating equation [1] including both lagged *Illiq* and *Price* as the independent variables. Again, I find that a one-unit increase in lagged *Illiq* is associated with over a 21-basis point increase in the following week's returns. In the final model specification, reported in column [3], I estimate the full model specification in equation [1]. Other factors held constant, I find a significant illiquidity return premium of about 25 basis points per week.

IV. Concluding Remarks

The illiquidity premium is the additional return investors seek for buying more illiquid and riskier assets (Amihud, 2002). The entirety of the crypto market, in its current state, is already seen as speculative and risky. The more illiquid cryptocurrencies are even more speculative and risky. To test the difference in returns between illiquid and liquid cryptocurrencies, I examine the 372 most actively traded coins in the U.S. from September 2014 to May 2021 and ranked them by their illiquidity. I use the Amihud (2002) illiquidity measure, which takes the absolute value of the weekly returns and divides by the dollar volume. I then placed cryptocurrencies into portfolio quintiles based on their rankings and took the returns of each quintile in the following period. The difference in average weekly returns between the most liquid and least liquid cryptocurrencies is about 172 basis points. This figure is both economically and statistically significant. These findings suggest that a positive illiquidity premium exists in the cryptocurrency market.

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Table 1. Summary Statistics

This table displays summary statistics that describe the sample of 372 cryptocurrencies. I obtain weekly pricing and volume data from CoinMarketCap between September 2014 to May 2021. *Price* is the exchange rate between the cryptocurrency and USD. $*Volume* is the number of coins traded in USD. *Rvolt* is range based volatility, or the natural log of the weekly high price minus the natural log of the weekly low price. *Illiq* is Amihud (2002) illiquidity, or absolute continuously compounded return divided by dollar volume (scaled by 10^4).

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Median	$0.29	$1,117,190.00	0.0986	0.0007
p75	$2.37	$11,957,400.00	0.1613	0.0112

Table 2. Correlation Matrix

This table shows the Pearson pooled correlation coefficients between various cryptocurrency measures. *Price* is the exchange rate between the cryptocurrency and USD. $*Volume* is the number of coins traded in USD. *Rvolt* is range based volatility, or the natural log of the weekly high price minus the natural log of the weekly low price. *Illiq* is Amihud (2002) illiquidity, or the absolute value of the weekly close-to-close return divided by dollar volume (scaled by 10^4). P-values are in brackets.

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Illiq	-0.0115	-0.0165	0.1438	1.0000
	[0.0328]	[0.0023]	[<.0001]	

Table 3. Illiquidity Return Premium in Cryptocurrencies – Portfolio Analysis

This table displays average weekly returns across lagged illiquidity portfolio sorts between September 2014 to May 2021. *Ret* is the weekly close-to-close continuously compounded return. *Illiq* is Amihud (2002) illiquidity, or absolute continuously compounded return divided by dollar volume (scaled by 10^4). T-statistics are in parentheses. *** and ** represent statistical significance at the 0.01 and 0.05 levels, respectively.

Panel A. Weekly Data

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Q5	5.4878	2.42%
Difference (Q5 - Q1)	5.4876***	1.72%**
t-stat	(14.66)	(2.35)

Table 4. Illiquidity Return Premium in Cryptocurrencies – Fama-Macbeth Regressions

This table reports the results from estimating the following Fama-Macbeth regression:

$$Ret_{i,t} = \alpha + \beta_1 Illiq_{t-1} + \beta_2 Price_{t-1} + \beta_3 Rvolt_{t-1} + \varepsilon_{i,t}$$

where the dependent variable is the close-to-close return for cryptocurrency *i* during week *t*. *Illiq* is Amihud (2002) illiquidity, or the absolute value of the weekly close-to-close return divided by dollar volume (scaled by 10^4). *Price* is the exchange rate between the cryptocurrency and USD. *Rvolt* is range based volatility, or the natural log of the weekly high price minus the natural log of the weekly low price. T-statistics are in parentheses. ** and * represent statistical significance at the 0.05 and 0.10 levels, respectively.

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Constant	0.0070	0.0072	0.0117
	(0.86)	(0.86)	(1.44)
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Figure 1. Illiquidity in Cryptocurrency Market Through Time

This table plots average illiquidity across the 372 cryptocurrencies during the sample period.

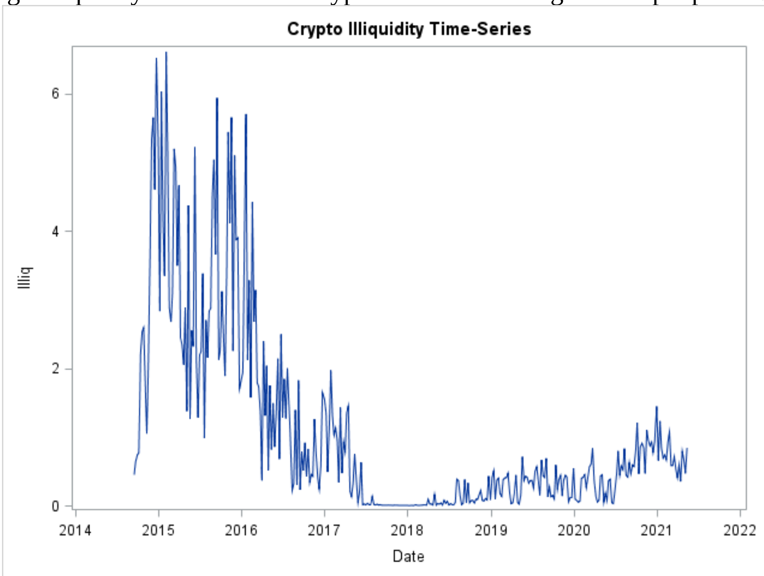

Figure 2. Dollar Volume in Cryptocurrency Market Through Time
This table plots average dollar trading volume across the 372 cryptocurrencies during the sample period.