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ABSTRACT — **This paper aims to identify the likely source(s) of value that cryptocurrencies exhibit in the marketplace using cross sectional empirical data examining 66 of the most used such 'coins'. A regression model was estimated that points to three main drivers of cryptocurrency value: the aggregate computational power employed in mining for units of the cryptocurrency; the rate of unit production; and the cryptologic algorithm used for the protocol. Bitcoin-denominated relative prices were used, avoiding much of the price volatility associated with the dollar price of Bitcoin. The resulting model can be used so better understand the drivers of value observed in cryptocurrencies. These findings may also have implications in understanding other assets such as commodity forms of money.**

Keywords—*Bitcoin, cryptocurrencies, altcoins, asset pricing, money, payment systems, currency exchanges*

I. Introduction

In the past two or three years, there has been a proliferation of digital currencies, so-called cryptocurrencies. The most well-known and widely used is bitcoin[1] (BTC), which also has the greatest current market valuation, usage, merchant acceptance and popular appeal. At the same time, hundreds of alternative cryptocurrencies based on the same or similar systems as BTC have arisen, collectively referred to as 'altcoins'. In a Hayekian free market for digital currencies, the various altcoins have gained acceptance and monetary value to varying degrees. To give some insight into these market values, at the time of this writing, the market capitalization (total number of units available multiplied by the current market price in US dollars) for bitcoin is over $4 billion[2] and one Bitcoin is valued around $300 – having reached a height of over $1,200. One altcoin known as Litecoin has a market capitalization of around $75 million. Dogecoin, which was created as a complete farce at its inception, has nonetheless garnered a market capitalization of over $14 million. Aside from Bitcoin at the top, the next 50 most popular altcoins have a collective net value approaching half a billion dollars. To be sure, bitcoin is an order of magnitude larger than its competitors, however these amounts are certainly significant – and the rapid rate at which these values were accumulated is fascinating. There are very few barriers to entry for anybody with fairly rudimentary computer programming skills to create a new altcoin in a matter of hours and then let it loose into the world. Many of the most popular altcoins thus far are, in fact, copies of the original Bitcoin computer code (which is open source) with tweaks to its configuration and to key variables.

Due to its growing popular appear and merchant acceptance, it becomes increasingly important to try to understand the factors that influence value formation for Bitcoin. However, the price fluctuations of bitcoin versus national currencies such as the U.S. dollar, euro or Chinese yuan, has been extremely volatile. This price volatility produces a lot of noise that makes meaningful analysis difficult. In fact, there is increasing evidence that the rise in price for one bitcoin to over $1,000 around December 2013 was largely caused by coordinated price manipulation at the Mt. Gox exchange involving fraudulent trading algorithms which pilfered customer accounts[3]. The subsequent failure of the Mt. Gox exchange and the associated customer accounts was likely a direct result of this market manipulation.

Fortunately, there is an active and fairly liquid market for various altcoin– bitcoin trading pairs. By looking at bitcoin-denominated relative prices and removing the external dollar, euro, yuan, etc. exchange rates much of the noise and price volatility can be removed, making for a better analysis of the data. Comparing how the variations in several shared attributes of cryptocurrencies affects their relative prices with bitcoin, factors that influence value formation can be identified. This paper describes a cross-sectional data analysis of 66 cryptocurrencies in such a manner using objective factors shared by each of them.

1 For technical details on the bitcoin protocol see the white paper by the pseudonymous S. Nakamtoto, 2008.
2 Market capitalization numbers are relevant as of early-March 2015.

3 See: The Willy Report: https://willyreport.wordpress.com/

II. A Brief Overview of Bitcoin

The technical specifications of the bitcoin and altcoin protocols are beyond the scope of this paper, however some key points must be understood before going any further, under the assumption that most readers have little to no prior knowledge of this topic. Taking bitcoin as the generic example, one can then extend those concepts to the greater universe of altcoins.

Bitcoin is an open source software-based online payment system that emerged in 2008-2009. Payments are recorded in a shared public ledger using its own unit of account, which is also called bitcoin, symbolically BTC. Transactions occur peer-to-peer without a central repository or single administrator – it is a decentralized virtual currency which also can be completely anonymous. New bitcoins are created as a reward for payment processing work in which users offer their computing power to verify and record payments into the public ledger. Called *mining*, individuals or companies engage in this activity in exchange for the chance to earn newly created blocks of bitcoins.[1] Mining is done via specialized hardware that has a certain amount of computational power, measured in *hashes per second* – analogous perhaps to the processing power of a CPU microchip measured in hertz. The aggregate bitcoin network has a cumulative computational power additive of all the mining effort employed around the world. For every 1 GigaHash/second (GH/s) any individual miner puts online, for example, that amount will be added to the overall network power. Mining is quite competitive, in the sense that somebody mining with more computational power or with greater efficiency has a better chance of finding a block than somebody with less. Besides mining, btcoins can be obtained in exchange for currencies such as dollars, euros, etc., for other altcoins, or in exchange for products, and for services. Users can send and receive bitcoins electronically using 'wallet' software on a personal computer, mobile device, or a web application.

III. Survey of Relevant Literature

There is an emerging academic research literature regarding cryptocurrencies, with most emphasis surrounding bitcoin. Much of the economic study undertaken has attempted to address the 'moneyness' of bitcoin or whether it is more analogous to a fiat versus commodity money such as 'digital gold' (Gertchev, 2013) (Harwick, 2014) (Bergstra, 2014).

Yermack (2013) also looks at bitcoin's moneyness and points out weaknesses in bitcoin as a currency. Although I agree that bitcoin does not function like credit money, it might function like commodity-money albeit without the intermediation that gives rise to fractional reserve banking. Yermack claims that bitcoin (and all cryptocurrencies by association) have no intrinsic value. I would consider the possibility that while its characteristics are intangible and the labor employed to mine for them is computational, it does have an intrinsic value, albeit virtual, which cannot be compared to tangible intrinsic value possessed by gold for example. I don't disagree with the premise that bitcoin and its cousins are not money in the traditional sense and that many issues stand in the way of it moving toward mass acceptance and appeal.

Yermack makes a very valid point that the price volatility of Bitcoin as expressed in dollars is quite high and that its dollar price may vary significantly among the various exchanges. This can cause problems when trying to analyze price data. For this paper I have used only bitcoin as the denomination for the various cryptocurrency prices, without the need for dollars. Of course, one can then transpose all prices to dollars using a current dollar-bitcoin exchange rate if they chose. Hence, bitcoin is worth 1 BTC, and all other cryptocurrencies expressed in decimal form as x.xxxxxxxx BTC. It is worth noting that for many of these cryptocurrencies there only exists pairwise trading on exchanges between BTC (or another cryptocurrency) and itself; there are far less altcoin/USD trading pairs than altcoin/BTC pairs. Attempts thus far at valuation or sources of value have focused almost entirely on bitcoin without consideration to the scope of alternative cryptocurrencies or altcoins.

Jenssen (2014) identifies the "proof-of-work" feature of the mining protocol, implying there may be some sort of computer-labor power source of value. Jenssen also argues that the market price of bitcoin in dollars is due to demand given a limited supply. While this seems logical, the computational labor in and of itself is only part of cryptocurrency value formation and the limited eventual supply could very well be a red herring; since each bitcoin is divisible to eight decimal places and that number of decimal places can be theoretically increased. There is nothing to prevent the functional unit from being a nano-bitcoin[4], for example. Although dealing with leading zeros might be cumbersome, it is not prohibitive. With traditional money, there is no effective way to have the functional unit as a fraction of a cent. This paper shows that what is more important as a source of value seems to be the rate of unit formation.

Van Alstyne (2014) considers a source of bitcoin value to be the technological value in solving the so-called double spend problem. While this breakthrough certainly allowed for the viability of bitcoin, it does not in and of itself make for value. For why then would other cryptocurrencies that have the same or similar protocols underlying them have disparate relative values?

Bouoiyour & Selmi (2014) attempted to describe bitcoin value by regressing its market price against a number of independent variables including those such as the market price of gold, occurrences of the word 'bitcoin' in Google searches, the velocity of bitcoin measured by transaction data,

4 The smallest functional unit of bitcoin is currently referred to as a *satoshi*, or 0.00000001 BTC.

and so on. Largely, the variables when regressed were not statistically significant at the 5% or better level of significance. Lags on the price of Bitcoin itself were found to carry some weight, but that can be an artifact of time-series analysis. Seemingly, only the regression on lagged Google search results were significant at the 1% level. While this finding is interesting, it shows that many variables which may be hypothesized to confer value actually do not. In fact, in an 18-variable multiple regression the R^2 value they obtained was only 0.4586, indicating that some other variables must account for over half of bitcoin value. Because cryptocurrencies are nascent and still highly speculative and volatile, using time series analysis can be misleading and uninformative over the short life time of its existence.

Polasik et. al. (2014) concluded that Bitcoin price formation is the result primarily of its popularity and the transactional needs of its users. They, too, utilized Google search results and found this variable to be highly significant, while the number of transactions (a proxy for velocity) was found not to be. I argue that use of Google search results is not a good metric and that the found correlation might be spurious. In the period when these studies took place, the dollar price of bitcoin was rising rapidly. This rapid price increase caused increasing media attention and word-of-mouth introducing it to more and more people who subsequently searched the internet to gain more information. The people actively mining for or transacting in bitcoin, I surmise, would not need to repeatedly input the word 'bitcoin' as a Google search term, rather people looking at it for the first time, or to investigate it to a greater degree would utilize such a search.

Zhang et. al (2014) has been one of the few researchers to approach alternative cryptocurrencies (altcoins) in conjunction with bitcoin, however they only consider three such altcoins (litecoin, dogecoin and reddcoin). Their work is largely descriptive, but lays the groundwork for future research on cryptocurrencies in general and in the framework of micro- and macroeconomics.

IV. Hypotheses and Assumptions

Using bitcoin as the generic example to explain the more general case: There are a few fundamental variables that were hard-wired into the bitcoin protocol at its inception. As most altcoins share a bitcoin lineage, the majority of cryptocurrencies have the same set of built-in variables. The numerical values of these variables can be thought of as arbitrary to some extent when they were created.

1- The total number of coins ever to be created. For bitcoin this value will be 21,000,000 and no more. I will call this variable *Total Money Supply*

2- Each block found by mining will contain a specified number of units. A block of bitcoins initially contained 50 BTC, currently it stands at 25 BTC per block, and that amount will continue to be halved over time. I will call this variable the *Block Reward*

3- A block will be found by mining over the same interval, on average, regardless of the magnitude of mining effort. Bitcoin blocks will be found, on average, once every 10 minutes. I will refer to this variable as *Block Time.*

4- The network will check to ensure that the Block Time as been achieved on average over some number of blocks previously mined. In the case of bitcoin, after 2,016 blocks have been found, the system will check and see if the actual average time in creating blocks was greater or less than 10 minutes. If it was less than 10 minutes, the system will increase the marginal difficulty in finding new blocks so that the 10 minute average will be restored. This I will call *Difficulty Retarget*

5 – The underlying *Algorithm* is the cryptologic hash function used as the basis for the protocol. Bitcoin uses what is known as SHA-256. Many altcoins use that method, while others use a function called Scrypt[5]. The inner workings of the algorithms used are beyond the scope of this paper.

6 – The *Difficulty* variable is exogenous and describes how hard (in computational power) it is to find a new block given a fixed level of hashpower. Because of the Difficulty Retarget mechanism, the difficulty will adjust up or down as aggregate mining effort is employed or removed from the network.

7 – The market *Price* is the observable price on exchanges[6] where altcoin/BTC trading pairs are listed.

By endowing a cryptocurrency with a steady rate of unit creation defined from the outset, the 'money supply' is not influenced by any central authority. It is important to note that by employing more computational power (e.g. mining hardware) to the network, it may temporarily increase the likelihood that the individual miner with the most power will be most productive; however, the network will check the Difficulty Retarget and adjust the Difficulty accordingly to restore the Block Time. Therefore, if hypothetically somebody were to put online the most powerful new technology, say many Peta-Hashes/second (1,000,000s GHps) of computational power, once the network detects that the average time between block creation was too low it would adjust the difficulty up accordingly, rendering that new technology merely adequate, and also rendering every other miner's technology inferior or even obsolete.

In devising new and alternative cryptocurrencies, the creator of a fresh 'coin' need only look at the open source computer code, copy it, and change one or more of the above variables to suit their liking. Thus, there are some altcoins that have only a 1 Difficulty Retarget instead of 2,016, or set the Total Money Supply to 100,000,000, or set the Block Reward to 4 etc. in any combination conceivable.

5 SHA-256 and scrypt remain the most commonly used mining algorithms. New algorithms such as X11 exist too but for this study only SHA and scrypt coin data are used for simplicity.

6 Exchange data was obtained from cryptsy.com, bleutrade.com and btc-e.com

Because there are active markets on the internet, exchange ratios and prices for each of these altcoins is known and are tradeable in real-time and across a number of platforms. The fact that there are altcoins of all configurations makes it a rich data set with which to inquire into what factors may bestow value on to them.

a priori, my hypotheses are:

1. *The amount of mining (computational) power devoted to finding a 'coin' is positively correlated to altcoin value.* The more aggregate GHps employed in mining for a crypto-currency, the higher the value. I make this assertion for a number of reasons. First, the more mining power there is, the more acceptance for that 'coin' can be inferred – since mining also serves to verify transactions, the amount of mining power in use is a proxy for overall use and acceptance of that altcoin. A cryptocurrency with no acceptance or usage will have neither value nor computational power directed at it[7]. Second, a rational miner, motivated by profit, would only seek to employ mining resources to a profitable pursuit. Therefore, if the marginal cost of mining exceeded the marginal price of mining, that miner would redeploy his resources elsewhere, removing the computational power from the network of that altcoin and into another. Third, the computational power is a proxy for the mining difficulty since the more network power employed, the greater the difficulty will become in order to maintain the pre-programmed Block Time. Therefore, difficulty can be used as an indirect poroxy of aggregate mining power.

There is the possibility that the causal relationship between price and computational power is reversed, or bi-directional. It is certainly plausible that computational power will be deployed to where it is already profitable to do so (e.g. prices are already high). To check this, a Granger causality test was run on price and aggregate hashpower. The results strongly indicate that causality runs one-way from mining effort to price and not the other way.

2. *The rate of 'coins' found per minute is negatively correlated to altcoin value.* Extending the law of diminishing marginal utility, the more readily something is available, and the more rapid that pace of availability, the lower the value; in other words, the faster the rate of unit formation, the lower the price. If an altcoin is configured such that it produces an abundance of units per block, and/or blocks are found in rapid succession, it will negatively impact the value of those units. On the other hand, scarcity per block would tend to lead to greater perceived value. This hypothesis takes into account the variables of Block Reward and Block Time.

7 Computational power, or hashing power (in units of GH/s) can be directed to mine for any coin the miner chooses, but it is mutually exclusive. For example, if hashing power is directed at mining for XYZ it cannot simultaneously mine for ABC (with only a few exceptions in the form of so-called merged mining).

3. *The percentage of coins mined thus far compared to that which is left to be mined before the Total Money Supply is reached is positively correlated to altcoin value.* Since there is an exogenous future limit to the money supply, the closer the percentage of units that have been mined compared to what is still left to be found will increase its scarcity and confer value. This can be computed by dividing the number of coins found so far to date by Total Money Supply[8]. This can be used to measure relative scarcity.

4. *Altcoins based on the scrypt algorithm will be more valuable than SHA-256.* The scrypt system was put into use with cryptocurrencies in an effort to improve upon the SHA-256 protocol which preceded it and which bitcoin is based on. Specifically, scrypt was employed as a solution to prevent specialized hardware from brute-force efforts to out-mine others for bitcoins[9]. As a result, Scrypt altcoins require more computing effort per unit, on average, than the equivalent coin using SHA-256. The relative difficulty of the algorithm confers relative value.

5. *The longevity of the cryptocurrency is positively related to altcoin value* In other words, the longer a cryptocurrency has been around and used, the more value it will have. This is because in a competitive environment, such as that in altcoins, the 'losers' will simply cease to exist. Therefore, the longer a cryptocurrency has persisted, the more valuable it should be. All cryptocurrencies have a 'genesis' date which is easy to ascertain for the data[10].

V. Empirical Results and Regression Analysis

A least-squares multiple regression was estimated using cross-sectional data from 66 of the most widely used altcoins with the following specification:

$$\ln(\mathrm{PRICE}) = \beta_1 + \beta_2 \ln(\mathrm{GHps}) + \beta_3 \ln(\mathrm{COINS\_PER\_MIN}) + \beta_4(\mathrm{\%COINS\_MINED}) + \beta_5(\mathrm{ALGO}) + \beta_6(\mathrm{DAYS\_SINCE}) + e$$

8 For coins with no upper limit to Total Money Supply, a very large number, 1×10^{100} was used to avoid computational errors caused by dividing by infinity.

9 Application-specific integrated circuit (ASIC) mining hardware are designed with the single specific purpose to mine for one algorithm. SHA-256 ASIC chips were developed first. Now there are also scrypt ASICs. Note that a SHA-256 can only mine for cryptocurrencies based on that one algorithm and scrypt ASICs can only mine for altcoins based on scrypt.

10 The so-called Genesis Block of any cryptocurrency is impressed into its blockchain. Bitcoin's genesis date, for example, is Friday, January 09, 2009 02:54:25 GMT.

where:

ln(PRICE) is the natural logarithm of the bitcoin-denominated market price on September 18, 2014.

ln(GHps) is the natural logarithm of the computational power in GigaHashes per second.

ln(COINS_PER_MIN) is the natural logarithm of the number of coins found per minute, on average which is computed by dividing Block Reward and Time Between Blocks.

%COINS_MINED is the percentage of coins that have been mined thus far compared to the total that can ever be found.

ALGO is a dummy variable for which algorithm is employed, taking on the value of '0' if SHA-256 and '1' if Scrypt.

DAYS_SINCE is the number of calendar days from inception of the cryptocurrency through September 18, 2014.

The resulting regression output produced model A:

$$\ln(PRICE) = -9.68^{***} + 0.67 \cdot \ln(GHps)^{***} - 0.98 \cdot \ln(COINS\_PER\_MIN)^{***} - 0.57 \cdot COINS\_MINED + 7.43 \cdot ALGO^{***} + 0.00067 \cdot DAYS\_SINCE$$

$R^2 = 0.844$, Adjusted $R^2 = 0.830$, DW-statistic = 2.24, F-statistic = 63.71
*t-statistics are indicated in the appendix according to each explanatory variable.*** indicates p < 0.001.*

The R^2 is quite high, suggesting that approximately 84.4% of the variation in relative cryptocurrency prices are determined by the variables in the model.

Hypothesis 1 is supported in that the coefficient is positive as expected a priori (prices increase as computational power increases), and the t-statistic indicates that it is highly statistically significant that computational power influences price.

Hypothesis 2 is supported in that the coefficient is negative as expected a priori (prices decrease as the rate of coin production per minute increases), and the t-statistic indicates that it is highly statistically significant that coins produced per minute influences price.

Hypothesis 3 is *not* supported in that the sign of the coefficient is unexpected, and also the t-statistic indicates that percentage of coins mined is not statistically significant. One possible reason for this result is that while the total number of coins is determined at the inception of a cryptocurrency, the 'coins' themselves are divisible down to 8 decimal places by default, and that number of decimal places can be increased, potentially without limit. Therefore, it may be the case that an absolute Total Money Supply may not actually be a limiting factor since once that ceiling is reached, the units can simply be divided and subdivided. For example, 1 BTC is actually 1.00000000 BTC, and there is nothing preventing 0.00000001 BTC from having useful value (except perhaps that it is cumbersome).

Hypothesis 4 is supported in that the coefficient is positive as expected a priori that Scrypt altcoins are more valuable than SHA-256, on average, and the t-statistic indicates that it is highly statistically significant that Scrypt as opposed to SHA-256 influences price.

Hypothesis 5 is *not* supported by the regression output, although the sign of the coefficient is positive which was expected a prior, the number of days since inception is not statistically significant. One possible reason for this result is that the vast majority of altcoins are less than two years old, which hasn't given the market enough time for competition to weed out the losers and reward the winners.

Removing the independent variables which were not statistically significant in Model A (%COINS_MINED and DAYS_SINCE), a new regression was estimated to produce Model B, which had the following output:

$$\ln(PRICE) = -9.53^{***} + 0.69 \cdot \ln(GHps)^{***} - 0.98 \cdot \ln(COINS\_PER\_MIN)^{***} + 7.46 \cdot (ALGO)^{***}$$

$R^2 = 0.843$, Adjusted $R^2 = 0.835$, DW-statistic = 2.12, F-statistic = 111.04
t-statistics according to each explanatory variable and full regression output for Model B are indicated in the appendix.
**** indicates p < 0.001.*

Model B presents a more parsimonious output with a very similar R^2 compared to Model A, while improving the F-statistic and slightly improving the t-statistics for each explanatory variable. The model was checked for consistency with the assumptions of a linear regression, and exhibits normality of residuals, does not exhibit heteroskedasticity, co-linearity, or other common regression errors. It is a robust model.

Model B states that *holding everything else constant*:

- given a 1% increase in aggregate GH/s output, the price will rise by approximately 0.69%.
- given a 1% increase in coins produced per minute, the price will fall by approximately 0.98%
- given that the altcoin uses the Scrypt protocol, the price will be higher by approximately 7.46% compared to it's SHA-256 counterpart., all else equal.

I would argue that in either of these two regression models the intercept term has no valid economic interpretation.

VI. Discussion

These regression models can be useful in a number of ways. It specifies the factors which influence relative prices of the wide variety of cryptocurrencies that exist, inclusive of bitcoin, and without the noise generated by price volatility with national currencies. It shows that approximately 84% of relative value formation can be explained by the three variables: computational power (indirectly difficulty), coins per minute and which algorithm is used.

Using this model, pricing existing or newly created cryptocurrencies can be undertaken with some greater degree of confidence. It also suggests that relative rates of production for given level of mining effort are paramount. For a given level of hashpower, increasing the difficulty will yield less units. Similarly, reducing the block reward or employing a more rigorous mining algorithm will yield fewer units.

Given Model B it is possible, in theory, to create an altcoin of high value simply by choosing Scrypt (or another even more difficult protocol) and reducing the coins produced per minute to some minuscule amount – this can be accomplished by increasing the Block Time and simultaneously reducing the Block Reward. Once that is achieved, the hard part is getting the computational power (and the mining difficulty) of the network up – and that is largely out of the control of the altcoin creator.

One implication is that the total money supply, or ultimate number of units to ever be created is not a driving factor in value creation, rather it is the *rate* of unit creation that matters.

The model may be able to offer some insight into the value of bullion or metal-based commodity money, if there is enough theoretical basis to draw analogies from. Although most monies today are fiat and are not backed by any precious metal, it may be interesting to compare in the following way to commodity-based money: the computational power (difficulty) might be represented by the capital and labor employed to mining for precious metals; the coins per minute variable can be represented by the productivity of the mines; and the algorithm dummy variable might be replaced by gold versus silver. If this is even loosely the case, it may provide some insight into cryptocurrencies as being more aptly branded 'cryptocommodities'.

Of course, there are other subjective factors in determining the market price not included in the model, but which are yet to be identified. At any given point in time, any individual cryptocurrency may trade above or below its modeled value, the same as any other asset. There is likely to be a speculative premium, as well as the tendency to hoard mined coins which will play an additional role in value formation, but which is more difficulty to quantify and measure.

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*Data sets collected from http://www.coinmarketcap.com, http://www.coinwarz.com, and http://www.blockchain.info

Appendix

Table 1: *Full Regression Output for Model B*

Dependent Variable: LOG(_PRICE)
Method: Least Squares
Date: 09/18/14 Time: 22:18
Sample: 1 83
Included observations: 66

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.526966	0.779882	-12.21591	0.0000
LOG(GH_S_HASHPOWER)	0.685330	0.064390	10.64349	0.0000
LOG(COINS_PM)	-0.983477	0.061908	-15.88620	0.0000
TYPE="Scrypt"	7.461170	0.875470	8.522473	0.0000

R-squared	0.843083	Mean dependent var	-5.493893
Adjusted R-squared	0.835491	S.D. dependent var	3.888541
S.E. of regression	1.577183	Akaike info criterion	3.807849
Sum squared resid	154.2253	Schwarz criterion	3.940555
Log likelihood	-121.6590	Hannan-Quinn criter.	3.860287
F-statistic	111.0381	Durbin-Watson stat	2.119851
Prob(F-statistic)	0.000000		

Table 2: *Granger Causality Study*

Pairwise Granger Causality Tests
Date: 12/11/14 Time: 10:11
Sample: 1 66
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GH_S_HASHPOWER does not Granger Cause _PRICE	64	65.5462	1.E-15
_PRICE does not Granger Cause GH_S_HASHPOWER		0.01678	0.9834

Table 3: *Basic Regression Output w/t-stats for Model A*

$$\ln(PRICE) = -9.67 + 0.67\ln(GHps) - 0.98\ln(COINS\_PM) - 0.574\%MINED + 7.43ALGO + 0.00067DAYS$$

t = (-11.816)*** (8.710)*** (-15.231)*** (-0.382) (7.877)*** (0.804)
(*** indicates p < 0.001)