

## Do Crypto Specific Regulations Work?

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### Summary

Regulations against cryptocurrencies have globally increased since 2018. Existing evidence suggests that geopolitical events, the Covid-19 pandemic and changes in monetary policy are amongst the most significant factors affecting overall price movements for cryptocurrencies. Econometric tests conducted in the blog find a relation between cryptocurrency prices and prices of other equity assets but not between crypto prices and crypto specific regulation. The tests also show that cryptocurrencies behave like equity. There are some considerations related to this analysis which are not covered in this blog and will be followed up later with a detailed analysis. They are all addressed in Appendix 4.

### Survey of existing literature

Governments across the world have viewed cryptocurrencies and their impact on traditional financial systems with suspicion. Since 2018, many governments have announced policies to check the misuse of cryptocurrencies. The crash in cryptocurrency prices and collapse of exchanges have reinforced regulatory concerns. Research, however, finds little evidence of policies and regulatory events affecting the price of cryptocurrencies. Feinstein and Werbach (2021) have surveyed a number of policies during the period 2013 to 2019 and concluded that policy regulations do not have lasting effects. Auer and Claessens (2018) also found evidence of a reactionary and unsustainable change in returns (1.52 per cent increase in prices and 3.13 per cent decline

in volume in a period of 24 hours after a regulatory change). Shanaev et al (2019) examine movement of prices for 120 different policy events. The results again are mixed with only anti-money laundering policies seen to have an effect.

### Five episode breaks across crypto

Regulatory action on cryptocurrencies has significantly increased since the time covered in existing literature. This blog analyses the closing prices of the three most popular cryptocurrencies namely Bitcoin, Ethereum and XRP from May 2019 to September 2022<sup>1</sup>. The average price of these cryptocurrencies vary significantly. The average price since May 2022 until February 2023 hovered around USD 24675.33 for Bitcoins, USD 1655 for Ethereum and USD 0.39 for XRP.

The time series data are presented in Figure 1. A structural break-test analysis<sup>2</sup>, shows partitions of five segments across four break dates, represented by yellow vertical lines in each of the graphs. The break dates and segmentation are fairly uniform across the three cryptocurrencies. While segments 1 and 2 show a flat trend, 3 and 4 are periods of high growth and 5 is the period of decline. For XRP, most of the growth is in a narrower period over segment 4. Average price levels increased by 2.8, 7.9 and 1.5 times for Bitcoin, Ethereum and XRP, respectively between period 1 and period 5. Appendix 1 provides details of the break dates and average price.

<sup>1</sup> Daily data for structural break test taken from [coinmarketcap.com](https://coinmarketcap.com/). <https://coinmarketcap.com/>.

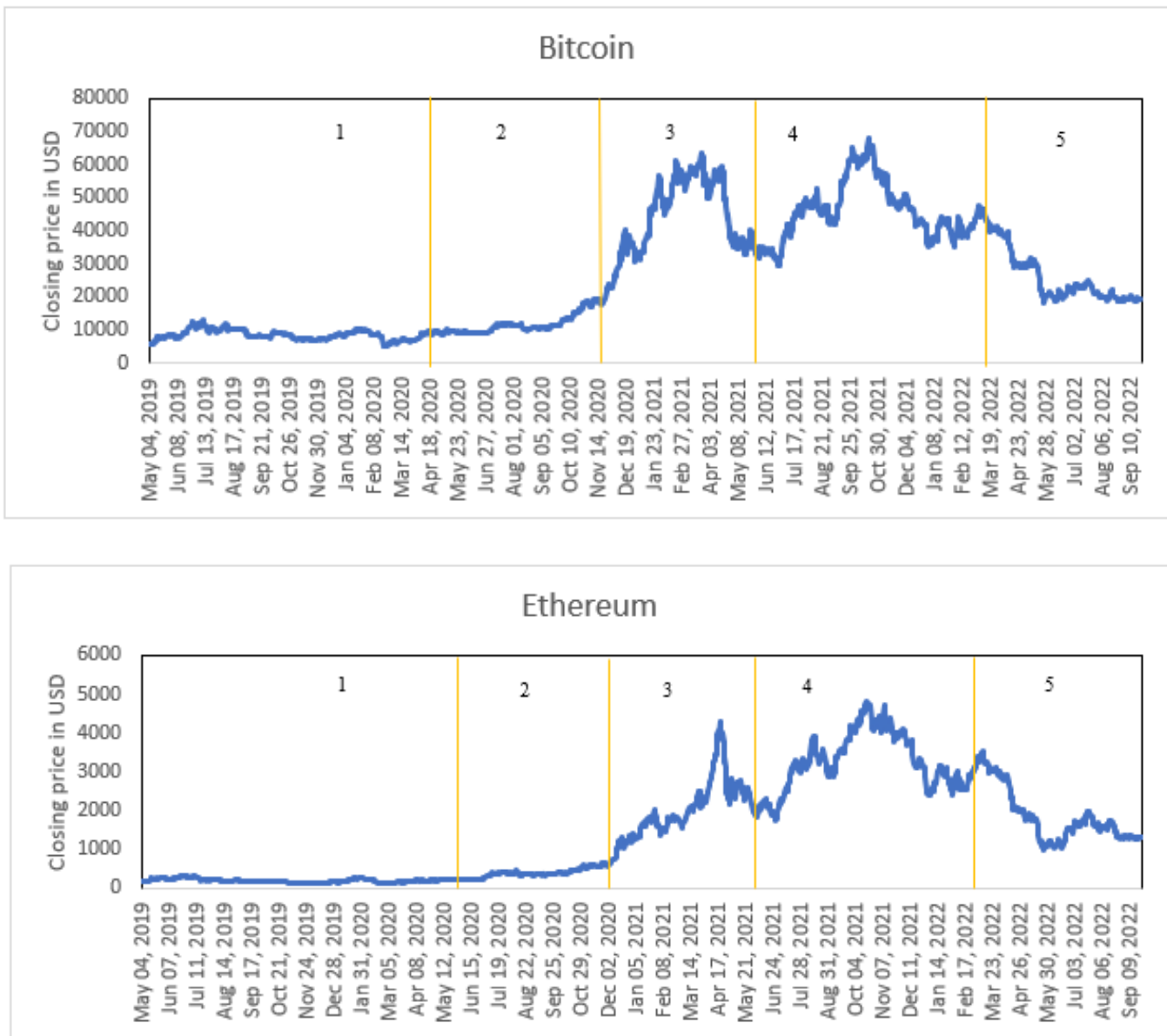
<sup>2</sup> Bai Perron (2003) break test.

The time series for total volume traded follows a slightly different pattern. Growth is steepest in the second segment and volumes are much more volatile with several peaks, instead of the clear humps observed in the case of prices.

The major policy regulation<sup>3</sup> taken into account for econometric tests do not coincide with the break dates in price changes in countries that see active crypto trading. Fifteen such regulations have been taken into account. All changes considered are in

the form of acts, regulations and bans. Appendix 2 provides a more detailed explanation of the types of policies taken into account (summary of policies). This is not an exhaustive list of policy changes, but it is indicative of strict regulations that can potentially affect crypto trading. In line with findings from the literature, we observe no significant impact of crypto specific regulatory/policy events on crypto prices (refer to methodology section in Appendix 3 for elaboration).

**Figure 1: Price Movements for Bitcoin, Ethereum and XRP**



<sup>3</sup> Refer to table in appendix 2

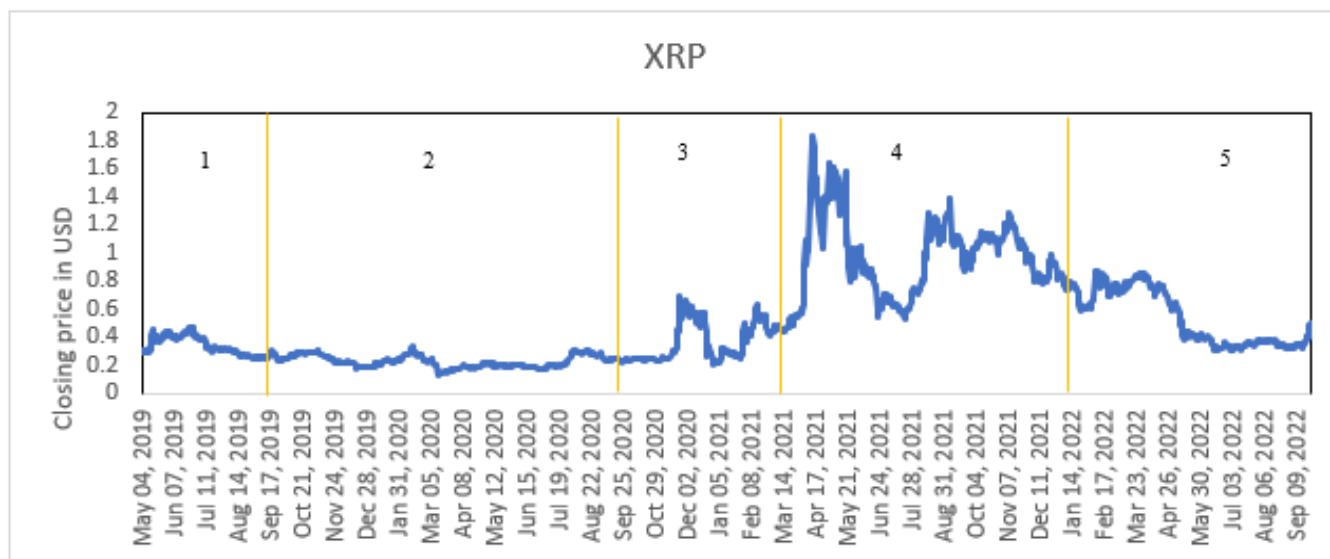
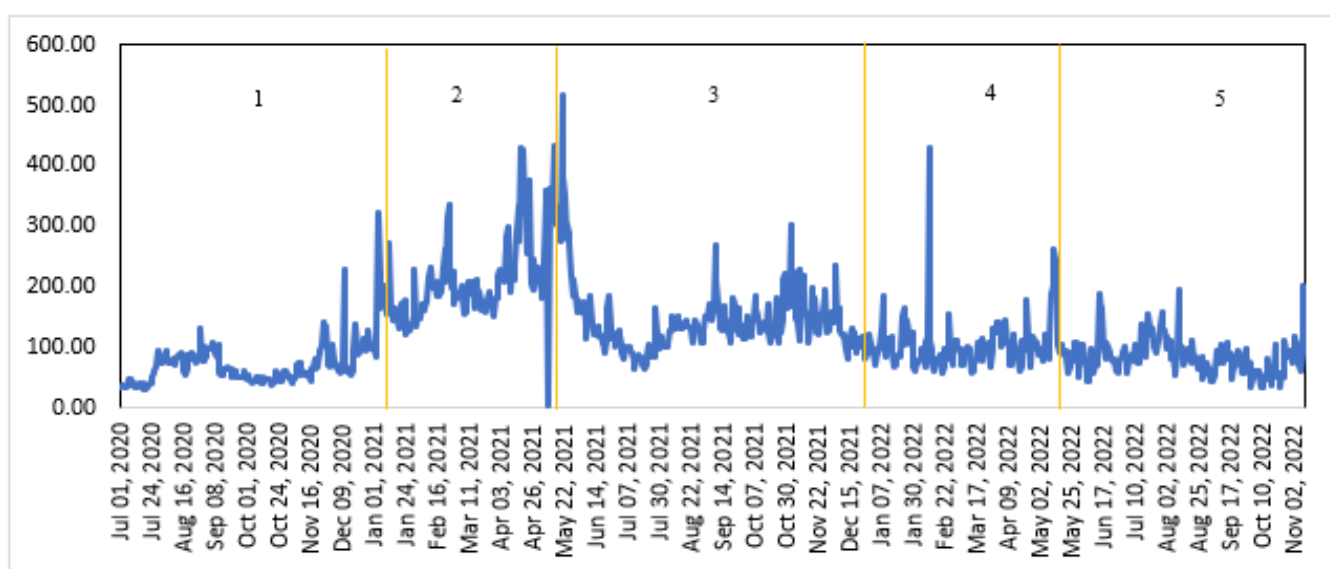


Figure 2: Total Volume of Cryptocurrency Traded (USD Billion)



### Traditional policy regulations work better than crypto specific regulations

The price breaks registered from segments 4 to 5 can be explained by China's outright ban on crypto, global inflation, increase in interest rates, the effects of the Russo-Ukraine war, etc.<sup>4</sup> There is evidence to show that geopolitical fluctuations and monetary policies determine the concurrent movement of cryptocurrency prices. In a study on prices of Bitcoins, Aysan et al(2018) conclude that geopolitical and economic policy uncertainty indices have a significant impact on the same. Kyriazis (2020) also concludes that geopolitical fluctuations cause major changes in returns of cryptocurrencies. Corbet et al (2017) conclude that cryptocurrencies are susceptible

to changes in interest rates. They add that economic factors affect cryptocurrencies as much as they affect fiat currency.

It is noticeable that cryptocurrency price movements are not affected much by crypto specific regulations. Literature suggests that the traditional tools of monetary policy work as effectively for cryptocurrencies as well. More importantly, the econometric tests in this blog show a significant positive impact of equity on crypto prices. Cryptocurrencies exhibit the properties of equity which make them susceptible to similar fluctuations. The similarity between these two assets explains why traditional policy tools affect cryptocurrencies more than crypto specific policies.

<sup>4</sup> Rise and fall of cryptocurrencies; looking at the cryptocurrency crash in 2022. <https://www.financialexpress.com/blockchain/rise-and-fall-of-cryptocurrencies-looking-at-the-cryptocurrency-crash-in-2022/2628151/>.

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## Appendix 1

### Summary of structural break tests

Cryptocurrency	Break Dates	Average price in USD ( $P_{pre}$ ) <sup>5</sup>	Average price ( $P_{post}$ ) <sup>6</sup>
Bitcoin	<ul style="list-style-type: none"><li>• June, 2020</li><li>• December, 2020</li><li>• July, 2021</li><li>• March, 2022</li></ul>	8798.045	24675.33
Ethereum	<ul style="list-style-type: none"><li>• July, 2020</li><li>• January, 2021</li><li>• July, 2021</li><li>• March, 2022</li></ul>	207.096	1655.425
XRP	<ul style="list-style-type: none"><li>• November, 2019</li><li>• October, 2020</li><li>• April, 2021</li><li>• January, 2022</li></ul>	0.260655	0.39

## Appendix 2

### Summary of policies

Country	Date	Policy	Type of policy
Singapore	January 2020	Payment services act	Act
Netherlands	May 2020	Amendment to Dutch implementation act	Act
UAE	November 2020	SCA decision for regulation of crypto	Act
Switzerland	February 2021	DLT act	Act
UK	June 2021	FCA banning sale of crypto derivatives to retail consumers	Ban
India	March 2022	Finance bill 2022	Act
Mexico	March 2018	New set of fintech laws.	Regulation
France	April 2019	PACTE, AMF	Act
Italy	April 2018	EBP	Act
Spain	March 2021	Royal decree law 5/2021	Act
Indonesia	February 2019	Bapebbti regulation	Regulation
Indonesia	July 2019	Bapebbti amendment	Regulation
China	September 2017	PRC ban	Ban
Japan	April 2017	Allowing digital currency to be used as a mode of payment	Regulation
Japan	December 2017	National tax agency	Act

## Appendix 3

### Methodology :

We use a generalised least squares MLE approach to model three equations of cryptocurrency prices. The primary variable of concern is the dummy variable. We assign dummy values for each month that policy (given in the table in Appendix 2) was implemented. The model estimated is of a monthly frequency for

the period of March 2017 to November 2022. This was the period in which there were large variations in cryptocurrency prices. Given the fairly recent rise in the popularity of cryptocurrencies, most of the policies implemented globally also lie within this time frame. The data specifics are as follows.

<sup>5</sup> Average price before Covid (May 2019- July 2020)

<sup>6</sup> Average price after Covid (March 2022-February 2023)

Variable	Unit	transformation	source
Bitcoin (bit)	USD	Growth rate	Investing.com <a href="https://in.investing.com/crypto/bitcoin/historical-data">https://in.investing.com/crypto/bitcoin/historical-data</a>
Ethereum (eth)	USD	Growth rate	Investing.com <a href="https://in.investing.com/crypto/ethereum/historical-data">https://in.investing.com/crypto/ethereum/historical-data</a>
XRP (xrp)	USD	Growth rate	Investing.com <a href="https://in.investing.com/crypto/xrp/historical-data">https://in.investing.com/crypto/xrp/historical-data</a>
MSCI (Morgan Stanley Capital International) world index (msci) <sup>1</sup>	Index	Growth rate	Investing.com <a href="https://in.investing.com/indices/msci-world-historical-data">https://in.investing.com/indices/msci-world-historical-data</a>
Geopolitical risk index (gpr) <sup>2</sup>	Index	Growth rate	Caldara and Iacoviello <a href="https://www.policyuncertainty.com/gpr.html">https://www.policyuncertainty.com/gpr.html</a>
Economic policy uncertainty index (epu) <sup>3</sup>	Index	Growth rate	Caldara and Iacoviello <a href="https://www.policyuncertainty.com/all_country_data.html">https://www.policyuncertainty.com/all_country_data.html</a>
Global price of crude oil APSP index (oil) <sup>4</sup>	Index	Growth rate	St.Louis Fred <a href="https://fred.stlouisfed.org/series/POILAPSPINDEXM">https://fred.stlouisfed.org/series/POILAPSPINDEXM</a>

Notes:

1. msci represents the performance of selected global stock markets. An increase in the index value implies better stock market performance in selected countries
2. gpr refers to the geopolitical risk index. An increase in the value of the index indicates an increase in global geopolitical risks.
3. epu refers to economic policy uncertainty. An increase in the value of the index indicates an increase in global economic uncertainties.
4. APSP crude oil index refers to the benchmark prices of oil globally. An increase in the value of the index would indicate an increase in global prices of crude oil

Our objective is to analyse if policy regulations have an impact on the considered cryptocurrency prices along with a set of control variables. Various aspects such as geopolitical risks, policy uncertainties, global stock market performance and crude oil

prices are considered in the literature for modelling. Such variables can be expected to affect the prices of cryptocurrencies. We estimate the following equations separately.

$$bit_t = \beta_0 + \phi_1 bit_{t-1} + \phi_2 bit_{t-2} + \beta_1 epu_t + \beta_2 gpr_t + \beta_3 msci_t + \beta_4 oil_t + D + e_t^1$$

$$eth_t = \beta_0 + \phi_1 eth_{t-1} + \phi_2 eth_{t-2} + \beta_1 epu_t + \beta_2 gpr_t + \beta_3 msci_t + \beta_4 oil_t + D + e_t^2$$

$$xrp_t = \beta_0 + \phi_1 xrp_{t-1} + \phi_2 xrp_{t-2} + \beta_1 epu_t + \beta_2 gpr_t + \beta_3 msci_t + \beta_4 oil_t + D + e_t^3$$

We include two autoregressive components till order 2 to avoid endogeneity/ spurious results. These components are denoted by  $\phi$ . For the stability and stationarity of the model, the condition is that  $|\phi| < 1$ . All the three models show stable results for autoregressive components  $\phi$  which implies that the gls estimation is also stable. The  $\beta$ 's denote the coefficients of each variable while D denotes the

coefficient of the policy implementation dummy variable.  $e_t^1, e_t^2$  and  $e_t^3$  are the error components for the corresponding equations. The results show that none of the policies resulted in a change in prices. While the impact of implementing crypto regulatory policies is insignificant, there were some interesting results.

equation	intercept	$\phi_1$	$\phi_2$	Epu ( $\beta_1$ )	Gpr ( $\beta_2$ )	Msci ( $\beta_3$ )	Oil ( $\beta_4$ )	Policy dummy (D)
Bitcoin	1.87	0.11**	0.12**	-0.12	0.13	1.39**	0.07	3.78
Ethereum	6.42	0.15**	0.14**	-0.04	0.26	2.44***	0.01	-6
XRP	1.26	-0.08**	0.06**	-0.12	0.17	0.92	-0.57	21.8

\*, \*\*, \*\*\* represent statistical significance at 10%, 5% and 1% respectively.

The above table gives the coefficients of the GLS estimation. It can be seen that the policy dummy is statistically insignificant, indicating that policy interventions had no effects globally. The growth rates of the prices of Bitcoins and Ethereum show a positive significant relation with the MSCI. This

indicates that if global stock markets perform better, then it effectively increases the growth rates of changes in the prices of the two dominant cryptocurrencies. This is not true for XRP. This can be ascribed to the stable nature of the currency because it is pegged to the dollar.

*Technical appendix:*

Some methodological issues need to be addressed. There is abundant data available for cryptocurrencies on a daily basis. This is not true for other indicators. To build a comparable and consistent econometric model across the three cryptocurrencies, we use

monthly data with 70 observations. A GLS estimation using MLE has been employed. GLS controls for heteroscedasticity, resulting in coefficients with less variance. The estimation is as follows.

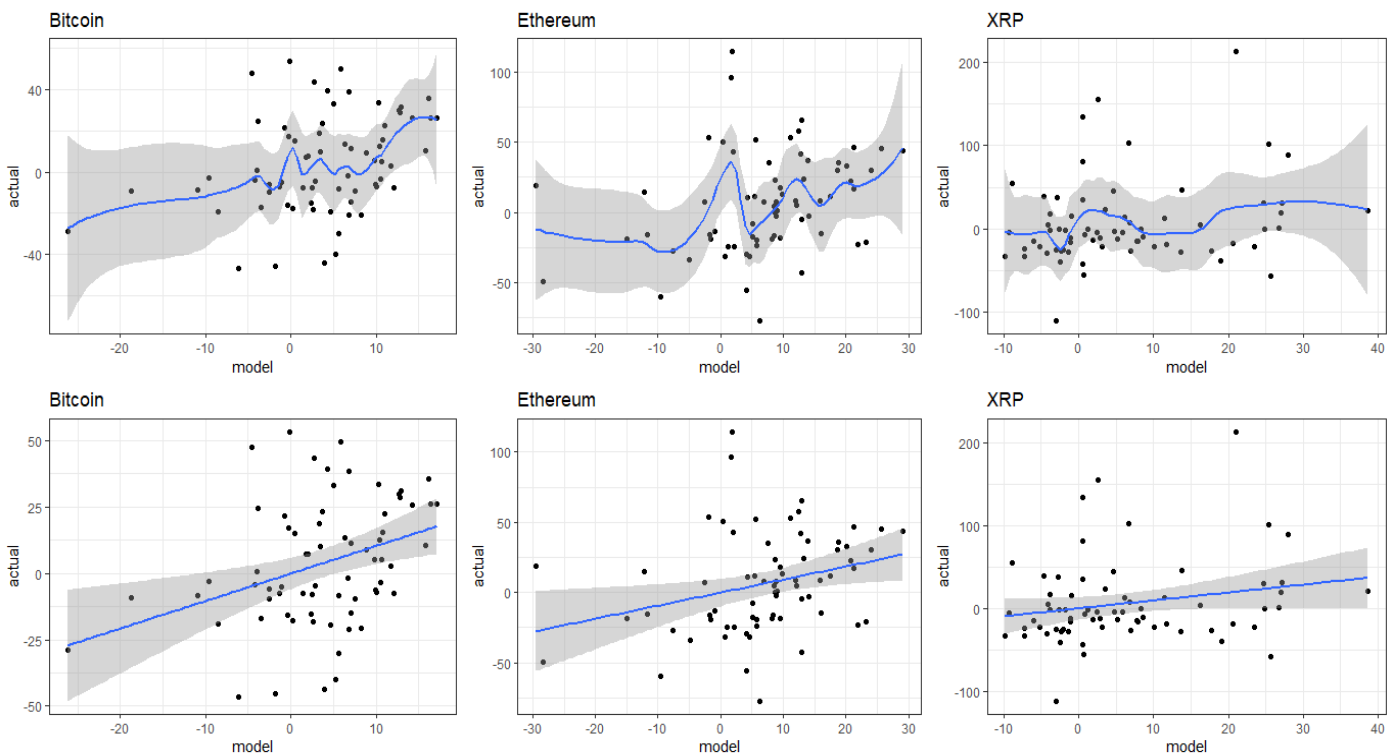
$$\hat{\beta} = (x' \Omega^{-1} x)^{-1} x' \Omega^{-1} y$$

where  $\hat{\beta}$  corresponds to the coefficient estimates.  $x$  is an  $N \times K$  dimensional matrix (for  $N$  observations and  $K$  parameters) of the explanatory variables and  $y$  is the dependent variable of dimensions  $N \times 1$ .  $\Omega$  here is the variance covariance matrix of errors ( $\Omega = ee'$ ) accounting for shifts in heteroscedasticity.

fitted values while the upper panels show a polynomial local regression (loess). It can be seen that while there is some degree of correlation between the actual and fitted lines, it is not very strong for any of the equations. In fact, a more non linear fit on the top panel is a more accurate fit. This implies that there is some degree of non linearity that needs to be accounted for in the modelling approach. Such issues could be tackled by including more data and variables by utilising other methods and models. The specifics of a more detailed modelling can be explored in a more extensive study.

There are some methodological issues that need to be addressed. Figure 3 shows the plots of the fitted lines from the model and actual lines for each equations (Bitcoin, Ethereum and XRP). Of the panels shown below, the lower panel shows that linear regression

**Figure 3**



## Appendix 4

The caveats listed below lie beyond the scope of this blog. While these problems need to be addressed, it would require a more rigorous methodological/econometric approach.

- An important point of discussion is the nature of causation of policy. The direction of effects between crypto price fluctuations and policy – whether there is a unidirectional relationship, a simultaneity or reverse causality – must be determined. This would reveal more information that policy makers can work upon.
- It is suspected that crypto prices share a long term relation with USD. Changes in the strength of the dollar causes changes in crypto-currency prices. Inferences from a study on cointegration would provide policy implications. Furthermore, one can also analyse different kinds of volatility. This again has not been explored in the blog.
- There was no global crackdown on crypto-currencies before 2017. It was only after 2017 that policy interventions started globally. This makes it a little harder to model the effects of policy on crypto-currencies.
- While data on cryptocurrency prices are available on a daily basis, the data for covariates are not available with as much frequency. This makes it harder to fit models for more robust inferences. More importantly, Covid seems to have largely inflated the value of crypto-currencies. This has caused larger deviations from expected trends for the considered cryptocurrencies. The inherent trends for each currency have not been captured. It is only the average prices that have shifted pre and post Covid. Hence, it is thus equally important to look at more natural trends of such currencies as opposed to the ones fuelled by Covid.