
Measuring the impact of cryptocurrency prices on Switzerland's money supply (Bitcoin model)

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Abstract:

This study relies on examining the impact of cryptocurrencies on Swiss monetary policy from 2009 to 2023 by relying on Bitcoin price changes as an interpreted independent variable of the subordinate money supply variable (M2) using the VAR self-declining vector model. Based on the findings, a statistically proven moral effect of the money supply was found on short-term bitcoin price changes and through causation testing we obtained a two-way relationship between the two variables.

Keywords: Bitcoin, central bank, cryptocurrency, cash offer.

Jel Classification Codes: C43, EA21.

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1. Introduction:

Originally introduced in 2009 by a group of programmers, under the pseudonym Satoshi Nakamoto, Bitcoin is a cryptocurrency or virtual money derived from mathematical cryptography and conceived as an alternative to government-backed currencies. (Cheah, 2015)

Cryptocurrencies have a market capitalisation of at least 3 billion USD.¹ They have also created market volatility. Their presence is tracked by policymakers in almost every country of the world where they are likely to impact markets. The main source of this attractiveness for cryptocurrencies has roots in the unusually high returns from Bitcoin investments. (Narayan, 2019)

The Bitcoin is a virtual “currency” which, initially, appears similar to traditional currencies. It is, however, not subject to regulation by central banks, does not enjoy the backing of goods or services with intrinsic value and has a decentralised “production” and exchange platform which has contributed to its popularity as a means of settling e-commerce transactions (Ram, 2016) Due to the interest in Bitcoin, major discussions between policymakers and academics have arisen, especially since this currency is not controlled by the government, not even by monetary authority. (Ma, 2022)

Bitcoin is a worldwide cryptocurrency and digital payment system. The system is peer-to-peer and the transactions take place between users directly without any financial intermediaries. (Rosbi, 2017) The first Bitcoins were transacted in January 2009 and by June 2011 there were 6.5 million Bitcoins in circulation among an estimated 10,000 users¹. In recent months, the currency has seen rapid growth in both media attention and market price relative to existing currencies (Reid, 2011)

Theoretically, if Bitcoin is mainly used as a currency to pay for goods and services, it will compete with fiat currency, and thereby influence the value of the fiat currency and ultimately affect monetary policies implemented by a central bank. (Baur, 2018) Due to the challenges and risks posed by the use of cryptocurrencies, today it is a major challenge for monetary authorities due to their lack of control. During this study, we will try to show the impact of these cryptocurrencies (bitcoin) on the Swiss financial system (money supply).

2. Literature Review:

Many previous studies have addressed the topic of cryptocurrencies, namely bitcoin, cashmass or monetary system where, we will try to present the most important studies with a link to the subject of our study according to the following:

Table N 1: Literature Review

STUDY	Period	Method	Findings
Nashirah Abu Bakar (2017)	from 1st January 2017 until 31st October 2017	normality test using Shapiro-Wilk method	The investment in cryptocurrency is highly volatile. Therefore, investors need to monitor the exchange closely to gain better return and prevent loss.
Chaoqun Ma 2022	from July 19, 2010 to December 31, 2020.	regressionmodels	Through what has been achieved, the shocks caused by monetary policy significantly affect bitcoin prices in the market.
Benjamin M. Blau 2021	period that ranges from January 1st, 2019 to December 31st, 2020	Var Model	Bitcoin is relied upon as a mechanism for managing inflation risk, as the latter changes allow you to see the expected changes in inflation.
Xiao Li 2024	2013 - 2019	GARCH models	Results summarize that there is a negative link between BPG, INF and MV but it is not influential in RER
Paresh Kumar Narayan 2019	2011 - 2018	GARCH type model	Our analysis shows that when BPG increases, inflation increases, exchange rate appreciates, and money velocity declines.
Lei Wang 2023	Using monthly data covering the period July 31, 2010 to August 31 2020,	regressionmodels	The results obtained showed that bitcoin price has an impact on the cash supply as stocks and consumer prices are any positive effect between bitcoin prices and the consumer index in the short term.

Source:Prepared by the researcher based on previous studies

Previous studies have tried to measure the impact of system-wide financial surprises on bitcoin prices in the long and short term and have also addressed many economic variables such as exchange rates, inflation, etc. Most studies have found that the money supply affects bitcoin prices in two directions, and some sudden shocks to the financial system have been shown to affect bitcoin prices. Thus, through our current study, we will try to demonstrate the extent to which cryptocurrency rates (bitcoin) affect monetary policy and test this impact and relationship in two directions using a self-declining vector model on the Swiss financial system.

3. Theoretical framework for cryptocurrencies and money supply:

Cryptocurrencies are a digital representation that can be stored and traded electronically, valued through the Application and Offer Act and valued by individuals accepting them as an exchange broker and value store.(Hamza, 2020)

With the advent of bitcoin, the term cryptocurrency, a two-part term of currency, was used in exchanges. Crypto cryptography, which means how computer technologies are used in cryptography.(Osmania, 2022)

Bitcoin relies on several open programs and protocols that allow the latter to make cross-border payments, for materials and at best cost. (Simser, 2015)

Bitcoin uses two types of networks and includes transactions, which is a consolidation and conversion of funds. Blocks are based on checking the collected transactions.. (Barber, 2012)

money supply Expresses the forms of funds that individuals seek to hoard and retain where they vary from one type to another of a country, as an obligation incumbent upon the exporting enterprises and, conversely, as a duty of the State to provide them for goods and services.(Polarbah, 2023)The monetary bloc means the broad concept of money supply by international financial and monetary institutions such as the International Monetary Fund (IMF), which in addition includes cash and semi-monetary assets.(Suiyah, 2018)

3.1. The Impact of cryptocurrencies on cash supply:

The spread of cryptocurrencies can pose a challenge to monetary policy by: (Beate Sauer, 2016)

- **Total Money Offer:** Cryptocurrencies are additional payment methods along with other existing payment methods issued by the Central Bank that result in higher inflation rate.

- **Create money in cryptocurrency frameworks:** the issuance of cryptocurrencies is far from monetary policy as the offer of the latter, specifically bitcoin, is limited and decreasing over time to reach a stage that will not be an opportunity to create this currency, thus.

4. Methodology and Data:

During our study, we relied on two time series from 2009 to 2023 to examine the relationship and impact between the variables of our study and to answer its problems, where. The study data were collected from the World Bank (WDI) and the Central Bank of Switzerland. Thus, during this study, we will seek to determine the impact of bitcoin on the money supply and discover the relationship between them, relying on the enhanced Dickey-Fuller root test and VAR model. The following table shows the study variables.

Table N2: Study Variables

variable	Code	Type	source
Cryptocurrencies (Bitcoin rates)	Bitc	Independent Variable	SNB
Cash mass (money supply)	M2	Dependent Variable	WDI

Source: Prepared by researchers based on the above

4.1 Model:

Our current study relied on several methodologies adopted in previous studies. These include: Chaoqun Ma (2022), Benjamin M. Blau(2021), Xiao Li(2024), Paresh Kumar Narayan(2019), Lei Wang (2023)etc,To reveal the relationship between bitcoin and cash supply in Switzerland, according to the next model:

$$M2=f(\text{Bitc})$$

$$id = \beta_0 + \beta_1 \text{BLOCK} + \varepsilon t$$

Where:

- **Bitc**: represents Bitcoin price changes.
- **M2**: Money Supply.
- **$\beta_0 \beta_1$** : represent the model's parameters.
- **ϵ_t** : represents random error.

The main idea of this paper is to look for the impact of cryptocurrencies on Switzerland's cash mass, by understanding past studies and trying to benefit from them, by analysing the relationship between variables related to our current study. Based on the following hypotheses:

-Hypothesis 1: There is a causal link between the changes in cryptocurrency rates (bitcoin)) and short-term money supply.

-Hypothesis 2: There is a positive impact between the changes in cryptocurrency rates (bitcoin) and the money supply.

5. Estimation process and empirical findings:

5.1 Unit root test:

To assess the stability characteristics of variables associated with the time chains in question, we used the enhanced Dickey-Fuller (ADF) test commonly used in the literature. which aims to determine whether the variable follows the unit's root process, indicating its stability at levels (I (0)) or inconsistency (requires difference to achieve stability (I 1) using the E-Views 12 program. (Paparoditis, 2018).The results of this test in the table below, which shows whether the variables are first or second class and to detect the presence of a unit root in each series.

TableN3: ADF unit root test results

Variable	2 nd difference								
	Intercepte			Trend and Intercept			None		
	ADF	Level 5%	Prob	ADF	Level 5%	Prob	ADF	Level 5%	Prob
<u>Bitc</u>	-10.84858	-2.566263	0.0021	-10.54929	-3.587527	0.0005	-11.01977	-1.953858	0.0016
<u>M2</u>	-5.975389	-2.746225	0.0023	-5.452600	-3.603202	0.0003	-6.116770	-1.675020	0.0048

Through the results obtained from the unit root test we note that the two series are stable grade 2 and the results show that the statistical absolute values of the ADF test are greater than the critical values at a 5% morale level which means that we accept the zero hypothesis that there is no unit root for the chains associated with the study variables.

5.2 Optimal Delay Scores:

For the purpose of estimating the standard model and depending on Aic cakes, Hanan Queen Hq standard and final prediction standard as well as the adjusted standard for Irratio .Additional tests were conducted to verify the VAR model and the next table shows the results of optimal slowing periods.

TableN4 : Optimal Delay Scores Test results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-140.7106	NA	91.64512	10.19362	10.28877	10.22271
1	-90.87009	89.00098*	3.473593*	6.919292*	7.204765*	7.006564*
2	-89.19229	2.756392	4.125347	7.085163	7.560951	7.230616

Source: The outputs of Eviews.12

The results of the test show the identification of delays in the form by AIC and SC criteria, it is clear that: the number of optimal delays for study variables is equal to 1 $P = 1$. Thus, it can be said: we can estimate the VAR model with a balance relationship (1) and a delay period.(1)

5.3 Joint Integration Test:

After estimating the study model we will do this test to ensure that there is a joint integration In our study and the next table shows the results of the estimate.

TableN5 : Joint Integration Test Results

Vector Auto-regression Estimates Date: 07/04/24 Time: 15:12		
Bitc	M2	
-0.011491 (0.011077)]1.06686[	-0.125423 (0.19052)]-0.65831[	M2(-1)
-0.998352 (0.03379)]29.5462[	-0.255291 (0.59769)]0.42713[	Bitc(-1)
0.142581 (0.14822)]0.96194[	4.584145 (2.62186)]1.74843[	C
0.211152	0.7228298	R-squared
0.668933	0.8723371	Adj-R squared
0.306860	5.427967	S.E equation
437.6362	0.0037222	F-statistic
0.572848	6.318704	AkaikeAic
7.154518		Schwarz SC
34.58966	4.890997	Meandependent
1.740963	5.291268	S D dependent

Source: The outputs of Eviews.12

The results confirm an inverse correlation between bitcoin price changes and the cash supply, as the slowdown periods according to the study model were evenly distributed, i.e. one delay period for each of the independent and dependent variables. While the coefficient value was 0.21 $R^2 =$, the independent variables explain the approved variable by 21%. The probability value of (F-Statistic) = 0.0003 is that the study model is moral and statistically significant.

6.VAR model diagnosis:

We will check the extent to which the bouquet chain follows the normal distribution the loyal tests shown in the following tables will be based on:

6.1 Natural Distribution Tests:

To ascertain the extent to which the bouquet series undergoes normal distribution or we do not test Skewness Kurtosis, Bera-Jarque for natural distribution, the tables following show the results obtained:

Table N 6 of Skewness Coefficient for Natural DistributionResults

Component	Skewness	Ch-sq	df	Prob*
1	-1.920586	17.82848	1	0.4325
2	0.474616	1.088760	1	0.2967
Joint	18.911724		2	0.7292

Source: The outputs of Eviews.12

TableN 7: Test Results of Kurtosis Coefficient for Natural Distribution

Component	Kurtosis	Ch-sq	df	Prob*
1	9.830148	56.36986	1	0.2355
2	5.387485	6.887603	1	0.0543
Joint	63.25747		2	0.2899

Source: The outputs of Eviews.12

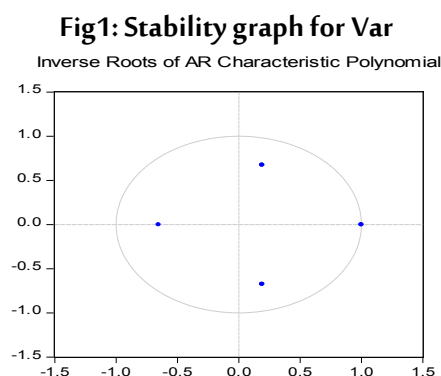
Table8: Test Results of Jarque-Bera Coefficient for Natural Distribution

Component	Jarque-Bera	df	Prob*
1	74.19834	2	0.7654
2	7.976363	2	0.2154
Joint	82.17470	4	0.9808

Through our results, it explained that natural distribution transactions are subject to natural distribution depending on both the Skewness test, Kurtosis test and Bera-Jarque test, where: ThePvalue values in the three tests are immoral, i.e., the $0.05 \geq P$ and barrage we accept (H_0) The retention is subject to natural distribution) and we reject (H_1) the retention is not subject to natural distribution), from which we conclude that: the retention is subject to natural distribution.

6.2 AR of Roots Test:

To ensure the stability of the model in question and confirm the extent to which it is free of problems of instability and any link to errors we use as shown in the following figure Characteristic AR of Roots test:



Source: The outputs of Eviews.12

From the table above we note the concentration of all the roots of the unit within the circuit, so it can be said that the study model is stable. so we can say that our study model does not have problems with the association of errors.

6.3 Granger Causality:

In order to detect the direction of the relationship between the study variables based on the hypothesis that there is no relationship between the dependent and independent variable, we do this test according to the following table:

TableN 9: Results of Granger-Causality examination

DEPENDENT VARIABLE :M2			
Excluded	Chic-sq	df	prob
Bitc	0.182438	1	0.0393

DEPENDENT VARIABLE : BITC			
Excluded	Chic-sq	df	prob
M2	-1.108184	1	0.00260

Based on the results, which examines short-term causal relationships, a two-way causal relationship was demonstrated, namely, a statistically significant influence between the money supply on bitcoin price changes and this was demonstrated by the Chaoqun Ma (2022) and (Xiao2024) Lily Wang (2023) study and other previous studies, a statistically significant link to a 5% morale level was also found. Between bitcoin price changes and the cash offer was demonstrated in the study model estimate and an ethical but reverse relationship was obtained.

7. Discussion:

By studying the impact of cryptocurrencies and adjusting bitcoin price changes on the money supply, the chains studied are second-class stable. Slowing periods according to the study model were also evenly distributed, i.e., one delay period for each of the independent variables and the dependent variable. While the value of the coefficient was 21%, the bitcoin variable explains the money supply at 21%.

Through the results obtained from the AR test, it is clear to us that the estimated model has achieved stability conditions and this is due to the concentration of all the roots of the unit within the section.

The results of the evaluation of the study model showed a negative and moral impact between the changes in bitcoin prices and the money supply. This negative effect is caused by the risks resulting from these currencies, on the one hand, although they face problems due to inefficiency as a result of the volatility they experience and are not creditworthy of the central bank and the inability of monetary authorities to control them because they are issued by no official body on the other.

After a causation test, a two-way relationship was found. For example, in 2023 Switzerland updated a set of corporate and financial laws to provide a solid legal basis for bitcoin trading over the past two years. The Federal Financial Markets Control Authority licensed two crypto banks and a cryptocurrency exchange and gave the green light to the first investment fund to deal primarily with encrypted assets.

The Swiss government's aim was to make cryptocurrencies suitable for consumption by banks. The second inverse relationship between bitcoin price changes and the money supply, which has been illustrated by currency risks and challenges arising from their use, has put pressure on the authorities in Switzerland despite their efforts and precautions. Some banks have begun to deal with cryptocurrency services. However, the financial sector is still very cautious in dealing with it, as banks fear being exposed to money-laundering problems.

This is why many crypto startups still face difficulties opening a bank account in Switzerland. And so these currencies can affect the effectiveness of the central bank, thereby negatively affecting the financial system through liquidity risks that make it their source to sell at any price, and the associated prices fluctuate and shocks move to interfere with the rest of the stablecoins.

The more the cryptocurrencies overlap with the financial system, the more dangerous they become, especially with their modernity and the lack of understanding of Swiss society due to the ignorance responsible for issuing them and dealing with aliases. But despite all this, these cryptocurrencies have not reached the stage where they can damage Switzerland's monetary policy due to their low market share compared to other legal currencies. Therefore, cryptocurrency issuance authorities must turn to the central bank and leave the

responsibility to manage cryptocurrencies in order to strengthen the monetary authority's capabilities and maintain the cohesion of the economy.

8. Conclusion:

In this context, the two researchers presented a study on the impact of bitcoin cryptocurrencies on the money supply in Switzerland from 2009 to 2023. The results highlighted the role of cryptocurrencies in Switzerland's economy as a mechanism to process transactions and open up new prospects for banking. In view of Switzerland's good position to play a leading role in this area, establishing a network of cryptocurrency companies, known as Crypto Valley, which work in cooperation with the traditional financial sector, bitcoin is now available in Switzerland in large markets and is managed in excellent asset management companies such as Blackrock and Fidelity. The adoption of Bitcoin by these influential companies demonstrates that cryptocurrencies have become a major product and cannot be overlooked.

The study contributes experimentally and through previous studies that include topics of cryptocurrency and money supply. The adoption of cryptocurrencies creates a somewhat responsive response in Switzerland, but yet the financial sector is still very cautious in dealing with them. Where banks are afraid of being exposed to money-laundering problems, where the effects of bitcoin price changes are not always predictable, Thus our findings provided a comprehensive view of cryptocurrencies negotiable, divisible and used for international transactions without the need for intermediaries. Today, Switzerland is one of the most attractive countries in digital currencies and seeks to boost investment. by welcoming more foreign cryptocurrency companies, Switzerland is now running a system of self-administered organizations unlike most countries where financial regulators are driven by the Central Bank and policymakers with very limited knowledge of the cryptocurrency industry. s compliance and the submission of a report in their own place, as an independent entity rather than individual companies that have to be directly accountable to financial regulators.

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