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THE IMPACT OF MACROECONOMIC INDICATORS ON BITCOIN: A CASE STUDY ON PAKISTAN

Momna Gul[1], Shumaila Hashim[2] & Asma Hayat[3]

[1]M.Phil. Scholar, Institute of Business Administration, Gomal University, D.I.Khan, Pakistan
[2]Chairperson, Institute of Business administration, Gomal University, D.I.Khan, Pakistan
[3]PhD Scholar, Institute of Business Administration, Gomal University, D.I.Khan, Pakistan

KEYWORDS	ABSTRACT
Macroeconomic Indicators, Bitcoin, Case Study, Pakistan	Modern-day revolution is brought on by cryptocurrencies. Both the terms cryptocurrency & currency describe means of exchanging goods & services. In system that uses cryptocurrencies, every transaction is preprogrammed. Underlying blockchain technology governs transactions by using consensus mechanisms, hash algorithms, and public and private key encryption, doing away with the need for user to have faith in the counterparty. In this study, impact of macro-factors on bitcoin in Pakistan was examined. The relevance of this study is that the majority of people are ignorant of bitcoin to spread awareness of bitcoin and how to use them among the general audience. The macroeconomic indicators (GDP, INF, Exchange, & Gold) were monitored on a quarterly basis between JAN 2016 and DEC 2021. The E-view program and numerous tests on secondary data were also used in this inquiry. In Pakistan, there is no long-term link. Bitcoin's short-term relationships with Pakistan's GDP, INF, ER, and gold. In short term, there is a link between bitcoin and the exchange rate.
Correspondence	Shumaila Hashim
Email:	shumailahashim@gu.edu.pk
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INTRODUCTION

A recent revolution in modern period is cryptocurrency. Both terms cryptocurrency and currency describe a method of exchanging goods and services. In the cryptocurrency system, each transaction is preprogrammed (Fauzi, Paiman & Othman, 2020). Because, it does not have the physical form, cryptocurrency is type of the private digital cash known as digital currency. All cryptocurrencies already have a set number of coins that they will issue; the overall currency supply is fixed (Teker, Teker & Ozyesil, 2020). When demand for or use of a cryptocurrency increases, its prices do. Prices

for cryptocurrencies are influenced by news, business, and investor strategy. Ethereum, Eos, Ripple, Bitcoin Cash, USD coin, Tether, the Litecoin, Binance coin, Bitcoin SV, Stellar, Dogecoin, Cardano, XRP, and others are among the most widely used cryptocurrencies along with Bitcoin. More than 100 countries have laws governing the usage of cryptocurrencies. Bitcoin was the first cryptocurrency, created in 2009 by individual or group operating in pseudonym Satoshi Nakamoto. The currency execution was used when it was made available as open-source software in 2009 (Fauzi, 2020). But trading began in 2010.

In cryptocurrencies, accountability and openness two key components that foster trust are coupled, allowing counterparties to interact without fear that their confidence may be undermined. To gain knowledge of different bitcoin and daily price fluctuations. A distributed, unchangeable ledger is what blockchain is. All transactions in the cryptocurrency are validated by software and added to the public ledger. The fact that the bitcoin lessens corrosion is among its most important advantages. As result, people are less likely to participate in corrupt behavior (Conlon & Mcgee, 2020). One benefit of bitcoin is that it encourages the financial inclusiveness. Users can now get the financial solutions without turning to traditional economic institutions (Muhammad & Rehman, 2023). The financial industry in Pakistan has experienced a substantial impact from bitcoin. It's a fresh form of money that is gaining popularity quickly. Bitcoin has both advantages and disadvantages, and each has had a varied impact on banking industry. Peer-to-peer networks are used to maintain the public ledger, which is maintained by numerous computers. Where things start to get interesting is with the price of electricity.

In this linking, Pakistan is in remarkably unusual circumstance historically. The nation's potential to produce electricity exceeds local demand for first time in decades (Reuters, 2021). Knowledge and comprehension of Bitcoin and virtual currencies in Pakistani consumers. Impact of macroeconomic indicators on Bitcoin can be influenced by many factors, includes economic conditions, government policies, investor sentiment, and global market trends (Muhammad & Rehman, 2023). However, it's important to note that Bitcoin is decentralized digital currency and operates independently of any specific country or its macroeconomic indicators (Fauzi, Paiman & Othman, 2020). Nonetheless, macroeconomic factors can indirectly affect the adoption and price movements of Bitcoin within a particular country, like Pakistan. Inflation refers to general increase in prices of goods and services over time. High inflation can erode the purchasing power of a currency, leading some individuals to seek another store of value like Bitcoin (Teker, Teker & Ozyesil, 2020). Lower interest rates may incentivize investors to seek the higher-yielding assets, including Bitcoin, as traditional investment options become less attractive. Therefore, this inquiry offers a thorough analysis of Bitcoin adoption, ownership, and knowledge.

Objectives of Study

1. This research study aims to research the broad Bitcoin introductions both globally and in Pakistan.
2. To study the relationship between Bitcoin and the economic indicators (GDP, Inflation rate, Exchange Rates, Gold prices).
3. To econometrically determine impact of Macroeconomic indicators (GDP, Inflation Rate, Exchange Rate, Gold Prices,) on Bitcoin in Pakistan.

LITERATURE REVIEW

Although certain exchanges, like Pakcoin, have started to operate, the majority of people are still unaware of virtual currencies due to lack of awareness and lack of legal support. Without fully understanding how they operate or the security risks involved, people trade bitcoins. A household survey found that daily additions are made by more than 230 people. All the digital currencies are prohibited under Pakistani banking regulations and policies, but due to herd instinct, consumers continue to utilize them (Ikram & Naeem, 2019). Male and female Pakistani citizens who utilize the online banking or payment services are the research's target population. The population's sample is the portion that has been chosen for the investigation. In the current study, 200 respondents from a sample of their homes in Islamabad and Rawalpindi were used. Thus, the largest city in Pakistan is Rawalpindi, while Islamabad is its capital. Residents of both cities have a high purchasing power, superior technology, and a high level of education. By comparing bitcoin awareness with numerous demographic variables like age, education level, gender, employment status, computer proficiency as well as required household income researchers can ascertain the level of customer awareness of bitcoin in Pakistan.

The facts and figures show the statistics related to phenomena. Pakistanis are generally 67% aware of Bitcoin. Compared to women, men are more conscious. The percentage of men who are aware of Bitcoin is 67.1%, but the percentage of women who are aware of it is only 32.9%. The ownership of bitcoin was stated by 84.3% of men, whereas only 15.7% of women claimed to hold bitcoins. 60% of Pakistanis don not possess any bitcoin. Even if they own, it still amounts to barely less one 19%. Pakistanis who possess Bitcoin are uncommon (Mehmood, Haq, Kayani, Kayani, & Rashid, 2021). Only Khyber Pakhtunkhwa Assembly has so far passed resolution urging the Federal Government to legislate and regulate cryptocurrencies. Despite the fact that cryptocurrencies have not yet been legalized in Pakistan, it is thus believed that over 9.0 million people, or 4.1% of the country's entire population, presently own cryptocurrencies. In this connection, this number calls for appropriate legislation (Ali, Khan & Ali, 2021). Similar situations occur in Pakistan, which comes in at number 3 on the list. In this linking, with a thriving domestic freelancing economy and total yearly inward remittances amounting to roughly 10% of the GDP, cryptocurrency has been booming in the nation since 2014.

Pakistani tax authorities have cracked down on cryptocurrency-related tax evasion and money laundering ever since 2017. A growing number of the people and organizations all around the world are using cryptocurrencies for variety of investments, transactions, and operational needs. Pakistan is no different. Pakistan is ranked third among top ten nations with most bitcoin and cryptocurrency users, per the 2021 Chainalysis Global Crypto Adoption Index. Former TV host Waqar Zaka, who has more than a million YouTube subscribers, has been advocating for years for the government to both legalise and invest in the business. Like Ahmed, Zaka has built up the hydroelectric-powered cryptocurrency mining farm. Provincial administration of Khyber-Pakhtunkhwa selected Zaka and Ahmed to serve on the commission investigating how it can make money from such endeavours earlier this year. The group declared in March that it was considering creating other mining farms using Zaka's facility as a model (Muneeb & Rehman., 2023). In this linking, although the use of

cryptocurrencies is not barred in Pakistan, linking ecosystem to conventional financial institutions can be difficult.

The SBP warned "all banks and payment system operators to refrain from processing, trading and promoting in virtual currencies token and a circular that was published in April 2018 stated, "not facilitate their account holders to transact in VC and tokens" (Khurshid, 2020). In their 2017 study the relationship between the status of the economy and the price of bitcoin was investigated by Xin Li and Chong Alexa Wang. The balance of payments can be maintained using the exchange rates, claim Gallali and Kouki, (2021). According to Li and Wang, the fundamentals of the economy are tied to bitcoin exchange rates (2017). Riska and Nadia, (2018); Li and Wang (2017) demonstrate that exchange rates do not affect cryptocurrencies. According to Bouri (2017), bitcoin functions as a type of the safe-haven asset. The global GDP measurement and GDP-related macroeconomic news coverage were found to have no statistically significant relationship with Bitcoin price movement by Corbet (2020); Frias and Freire (2019); Qudah and Aloulou, (2020); Mohsin, Naseem., Rehman, Baig and Salamat (2020); Miśkiewicz, Matan and Karnowski (2022) shows that GDP long run effect on BTC. At first look, the USD-denominated price of gold during a ten-year period appears to have maintained steady.

However, price performance of gold has been dismal when you take into consideration cumulative 21% U.S. inflation rate over this time frame. Due to its negative real returns, gold has failed to serve as a reliable store of value (US Inflation Calculator, 2021). The security turns into an inflation hedge when Branch (1974) separately calculate the rate of inflation return. Bitcoin is influenced by global economic trends and market sentiment. The factors such as geopolitical events, economic crises, or international trade dynamics can lead to increased interest and demand for Bitcoin as a borderless and decentralized asset class (Khurshid, 2020). Global economic factors can have both direct and indirect effects on the adoption and value of Bitcoin in Pakistan. According to Naryan. (2019), there is a correlation between how much money there is in Indonesia and how quickly bitcoin is growing. The regulatory stance of Pakistan's government can shape local Bitcoin market and overall impact on the economy. It is frequently believed that cryptocurrencies like bitcoin are immune to national government restrictions or acts that lead to inflation. Conlon et a. (2021) positive relation between INF and cryptocurrency.

Research Hypothesis

H1:   The cryptocurrencies and gold prices are positively correlated.
H2:   Exchange rate and cryptocurrency are negatively correlated.
H3:   The GDP and cryptocurrency are negatively correlated.
H4:   INF and cryptocurrency have a significant relationship.

RESEARCH METHODOLOGY

The effects of macro factors on crypto currencies in Pakistan were looked into in this study. Time series and secondary data were used to track macro parameters like INF, GDP, gold, and exchange on a quarterly basis between January 2016 and December 2021. E-view software were used in this study.

Additionally, changes in Bitcoin's prices and the impact of numerous macro variables on it occur every day.

Model Specification

Every research is based on certain models, so, this study is based on following model: BTC = α_o + α_1 Gold+ α_2 ER + α_3 GDP + α_4 INF + ε: Where, BTC = Bitcoin; GDP = Gross Domestic Product; INF = Inflation Rate; ER = Exchange Rate

DATA ANALYSIS

This section analyzes data by using different tools like Correlation, Unit root Test, VAR, Johansen cointegration test, VECM

Table1 Correlation Analysis

	BTC	EXCHANGE	GDP	GOLD	INFLATION
BTC	1.000000	0.621563	-0.250188	0.705697	0.669225
EXCHANGE	0.621563	1.000000	-0.539244	0.415055	0.378073
GDP	-0.250188	-0.539244	1.000000	-0.342311	-0.447357
GOLD	0.705697	0.415055	-0.342311	1.000000	0.465181
INFLATION	0.669225	0.378073	-0.447357	0.465181	1.000000

With a correlation coefficient of 1, gold and bitcoin have a favorable and substantial link. Bitcoin and inflation have a significant and positive relationship along with the high positive correlation coefficient.

Table2 Unit Root Test

Variables	p-p test statistic at level	p-p test statistic at 1st difference
BTC	-0.954561	-7.317523
INF	-0.892001	-4.666307
Gold	-1.355225	-6.791245
GDP	-1.472327	-4.359046
ER	-0.051160	-3.127503

VAR Lag Order

After determining the unit root of the data and before using the cointegration and error correction techniques, the proper lag length for the data is established using the lag length criterion specified in E-views. The results for three different countries' latency are displayed below.

Table 3 VAR Lag Order Selection Criteria

Endogenous variables: BTC EXCHANGE INFLATION GOLD GDP						
Exogenous Variables: C						
Sample: 2016Q1 2021Q4						
Observations: 24						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-334.9603	NA	5104246.	32.47241	32.77085*	32.53718
1	-288.4829	61.96995*	2204873.*	31.47456	33.56360	31.92794

Table 4 Vector Autoregression Estimates

Sample (adjusted): 2016Q4 2021Q4				
Observations: 24				
Standard errors & t-statistics in [ ]				
	BTC	INFLATION	GOLD	GDP	EXCHANGE
BTC (-1)	0.851949	2.38E-06	0.000473	1.89E-05	-8.46E-05
	(0.37577)	(4.4E-06)	(0.00303)	(2.5E-05)	(0.00013)
	[2.26718]	[0.54660]	[0.15595]	[0.77134]	[-0.64067]
BTC (-2)	0.238225	2.66E-06	0.005587	-1.66E-05	0.000301
	(0.38844)	(4.5E-06)	(0.00313)	(2.5E-05)	(0.00014)
	[0.61329]	[0.59136]	[1.78326]	[-0.65339]	[2.20556]
INFLATION (-1)	-35606.56	0.455055	-566.4101	-0.564539	4.738061
	(34920.6)	(0.40510)	(281.641)	(2.27956)	(12.2712)
	[-1.01964]	[1.12333]	[-2.01111]	[-0.24765]	[0.38611]
INFLATION (-2)	-1468.276	-0.469595	36.48149	1.764051	-2.512845
	(34264.8)	(0.39749)	(276.352)	(2.23675)	(12.0407)
	[-0.04285]	[-1.18140]	[0.13201]	[0.78867]	[-0.20870]

Table 4a Vector Autoregression Estimates

GOLD (-1)	-43.48226	-0.000230	0.516724	-0.000957	0.010844
	(25.9478)	(0.00030)	(0.20927)	(0.00169)	(0.00912)
	[-1.67576]	[-0.76473]	[2.46913]	[-0.56516]	[1.18923]
GOLD (-2)	14.86263	-6.49E-05	-0.756055	0.001943	-0.019992
	(27.5714)	(0.00032)	(0.22237)	(0.00180)	(0.00969)
	[0.53906]	[-0.20289]	[-3.40001]	[1.07968]	[-2.06347]
GDP (-1)	-3635.047	-0.021309	-32.25354	0.390617	-0.475102
	(6822.68)	(0.07915)	(55.0261)	(0.44537)	(2.39750)
	[-0.53279]	[-0.26924]	[-0.58615]	[0.87706]	[-0.19817]
GDP (-2)	1581.148	-0.035302	1.992775	0.302100	2.202213
	(6524.49)	(0.07569)	(52.6211)	(0.42591)	(2.29272)
	[0.24234]	[-0.46642]	[0.03787]	[0.70931]	[0.96053]

Table 4b Vector Autoregression Estimates

EXCHANGE (-1)	-852.9482	0.010599	-8.572846	-0.053782	1.079861
	(567.500)	(0.00658)	(4.57699)	(0.03705)	(0.19942)
	[-1.50299]	[1.60992]	[-1.87303]	[-1.45180]	[5.41499]
EXCHANGE (-2)	1393.602	-0.002759	19.93855	0.019835	-0.067303
	(597.005)	(0.00693)	(4.81495)	(0.03897)	(0.20979)
	[2.33432]	[-0.39843]	[4.14096]	[0.50896]	[-0.32082]
C	29625.63	0.804625	1121.359	8.172001	-19.37567
	(129658.)	(1.50410)	(1045.72)	(8.46387)	(45.5621)
	[0.22849]	[0.53495]	[1.07234]	[0.96552]	[-0.42526]

Table 4c Vector Autoregression Estimates

R-squared	0.794329	0.878427	0.931971	0.822756	0.988739
Adj. R-squared	0.588658	0.756854	0.863942	0.645511	0.977478
Sum sq. resids	1.14E+09	0.153290	74095.02	4.853997	140.6597
S.E. equation	10672.86	0.123810	86.07846	0.696706	3.750462
F-statistic	3.862134	7.225514	13.69962	4.641926	87.80016

Log likelihood	-216.7920	21.86173	-115.5678	-14.41815	-49.76683
Akaike AIC	21.69448	-1.034450	12.05408	2.420776	5.787317
Schwarz SC	22.24161	-0.487319	12.60121	2.967907	6.334448
Mean dependent	14899.21	0.474435	1537.284	17.98468	138.6929
S.D. dependent	16640.99	0.251087	233.3633	1.170169	24.99060

Table 5 Johansen Cointegration Test

Sample (adjusted): 2016Q4 2021Q4				
Observations: 24				
Trend assumption: linear deterministic trend				
Series: BTC INFLATION EXCHANGE GDP GOLD				
Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.867201	84.54560	69.81889	0.0021
At most 1	0.621031	42.14836	47.85613	0.1546
At most 2	0.406270	21.77202	29.79707	0.3113
At most 3	0.394812	10.82409	15.49471	0.2225
At most 4	0.013130	0.277560	3.841466	0.5983
One cointegrating equation is indicated by the trace test at the 0.05 level.				
* Denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Table 5a Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.867201	42.39724	33.87687	0.0038
At most 1	0.621031	20.37633	27.58434	0.3157
At most 2	0.406270	10.94793	21.13162	0.6525
At most 3	0.394812	10.54653	14.26460	0.1785
At most 4	0.013130	0.277560	3.841466	0.5983

Table 6 Least Squares Method

Dependent Variable: D (BTC)				
Method: Least Squares				
Sample (adjusted): 2016Q4 2021Q4				
Observations: 24				
D(BTC) = C (1) * (BTC (-1) - 1272.91389012*GDP (-1) - 114.581826639				
*GOLD (-1) - 48632.3656112*INFLATION (-1) + 848.898747531				
*EXCHANGE (-1) + 90778.6106736) + C (2) *D (BTC (-1)) + C (3) * D (GDP)				
-1)) + C (4) *D (GOLD (-1)) + C (5) * D (INFLATION (-1)) + C (6)				
*D (EXCHANGE (-1)) + C (7)				
	Coefficient	Std. Error	t-Statistic	Prob.
C (1)	0.160025	0.194141	0.824270	0.4236
C (2)	-0.097929	0.317885	-0.308065	0.7626

C (3)	-6179.539	5218.635	-1.184129	0.2561
C (4)	-28.37590	22.52570	-1.259712	0.2284
C (5)	-22549.49	26991.16	-0.835440	0.4175
C (6)	-1154.006	495.6720	-2.328164	0.0354
C (7)	6916.379	2801.503	2.468810	0.0270

Table 6a Least Squares Method

R-squared	0.469478	Mean dependent var	2149.022
Adjusted R-squared	0.242112	S.D. dependent var	11772.27
S.E. of regression	10248.56	Akaike info criterion	21.56886
Sum squared resid	1.47E+09	Schwarz criterion	21.91704
Log likelihood	-219.4731	Hannan-Quinn criter.	21.64443
F-statistic	2.064852	Durbin-Watson stat	2.559153
Prob(F-statistic)	0.123698		

Since the trace test indicates that there are only two cointegrated equations among variables, we accept the null hypothesis that there are no more than three such equations. The final null hypothesis of the study, which was that there is no long-run relationship to predict the order of integration and stationary variables, can be rejected as a result. Evidence of sustained relationship between research variables was supplied by bitcoin and independent variables. BTC, INF, ER, and Gold have positive correlations in correlation tests, whereas GDP has negative association. Long-term correlation amid macroeconomic variables and BTC in Johansen cointegration test. macroeconomic indicators have a strong impact on VECM and BTC.

DISCUSSION & CONCLUSION
Since 2018, the State Bank of Pakistan has maintained a position of strategic ambiguity regarding cryptocurrencies, however considering Pakistan's association with the FATFs, this has to be reviewed. In this inquiry, secondary data are used. In this study, macro variables GDP, INF, Exchange, and Gold will be tracked on quarterly basis from January 2016 through December 2021. Descriptive statistics, correlation matrices, unit root tests, VECMs, Johansen tests, VARs, and Wald tests are among the tests utilized. For their initial bitcoin purchase, the State Bank of Pakistan converts up to 5% of its gold holdings, or about $180 million. Currently, these expanding gold reserves are being wasted away. Bitcoin serves the need for a store of value and a medium of exchange, and it diversifies the portfolio of national reserve assets. It appears that the study is primarily concerned with determining how macroeconomic data affects cryptocurrencies used in Pakistan, particularly Bitcoin. The long-term associations and significant effects of inflation (INF), gold prices, exchange rates (ER), and interest rates (IR) on Bitcoin were examined using a variety of tests and models, including VAR lag order and vector error correction model.

The skewness of Bitcoin, GDP, and gold is right-skewed, while INF and ER are left-skewed, according to Pakistan's descriptive data. While the kurtosis of the GDP, INF, Gold, and ER is platy kurtosis, the kurtosis of Bitcoin is a leptokurtic distribution. The coefficient in the VEC model has a positive value of 0.160025 and a probability of 0.42. There are no long-term connections between GDP, GOLD, INF, ER, or BTC. Independent factors are responsible for 46% of bitcoin, according to the R-square

result. These findings led to the ideal Durbin-Watson value of 2.559153, which demonstrates that there is no serial correlation in the data's error term after using the VEC model. The short-term correlation between the exchange rate and BTC was tested by Wald. This can be accepted because the chi-square p-value is significant and is 1% less than 5%. The study's recommendation is that future research look into Pakistan's alternative cryptocurrencies. In this connection, this might result in a better comprehension of the local bitcoin sector and aid in the creation of investment and policy plans that are more successful. Overall, in this regard, this study offers the opportunities for further research in area and offers insightful information about connection amid Pakistan macroeconomic data and cryptocurrencies.

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