

# THE RELATIONSHIP BETWEEN CRYPTO CURRENCIES AND OFFICIAL ARABIAN CURRENCIES EXCHANGE RATE

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## ABSTRACT

*The purpose of this study is to investigate the relationship between the exchange rate returns of the top three cryptocurrencies (Bitcoin, Ethereum and Ripple) and eight of Arabian currencies, namely; Egyptian Pound, Iraqi dinar, Lebanese Lira, Moroccan Dirham, Omani Riyal, Qatari riyal Saudi Arabian Riyal, and Tunisian Dinar, against US dollar. Daily exchange rate closing price (against US\$) data for the chosen sample in the period between 1st of Jan 2017 and 1st of Jan 2020 were obtained from different sources. To analyze these data, several statistical methods have been used, such as multiple regression analyses, unit root test, and correlations. The results indicated that, (with the exception of Lebanese Lira with Bitcoin and with Ripple, Moroccan Dirham with Ethereum, Iraqi dinar with Ripple), there were no significant relationships between the Arabian currencies and cryptocurrencies exchange rate. On the other hand, the results showed a significant positive relationship between Bitcoin, Ethereum and Ripple.*

*Finally, the study concluded that, since there was a negative relationship between Iraqi dinar and Ripple, the former can benefit in hedging and diversification. The study also concluded that Arabian countries exchange markets do not highly affect the cryptocurrencies markets, which may be due to the absence of legal recognition by governments besides the absence of the public acceptance for such currency.*

**Keyword:** Cryptocurrencies, Arabian Currencies, Exchange Rates, Bitcoin, Ethereum, Ripple.

## INTRODUCTION

Financial crises at the beginning of the twenty-first century, especially the 2008 mortgage crisis, have undermined confidence in the current monetary system which have shown high vulnerability to external shocks. At the time of this suffering, cryptocurrencies (CRC) were born, marking the launch of the new digital world economy. The era of CRC looked mysterious, controversial and strange when Nakamoto (who has not been known) launched Bitcoin (BTC) as a peer-to-peer electronic cash system, without the presence of the third party and without a central authority controlling it. A CRC is defined as “a digital asset designed to work as a medium of exchange using cryptography to secure the transactions and to control the creation of additional units of the currency” (Sovbetov, 2018).

Since BTC establishment in 2009, there are now at least 5140 CRC trading in 20760 CRC markets, with \$287,219,952,477 as market capitalization on 23 Feb- 2020. The price of these CRC is volatile, for example, BTC price had ranged from \$65.53 on July 5<sup>th</sup>, 2013 as a minimum price to \$20,089 as the highest price on Dec 17<sup>th</sup>, 2017 (CoinMarketCap.2020). With this huge fluctuation in its price, it has attracted investors of all ages, as the Coin Dance report indicates that CRC market is able to attract a wide range of people from very young to the elderly. The report indicates that 8.36% of CRC market trading was from the age category

between 18 to 24 years old, while 45.71% and 30.62% are from 25 to 34 and 35 to 44 years categories respectively. Interestingly, the share of the elderly (45+) is around 16%, providing evidence that the CRC market attracts everyone.

Although CRC literature is scant, the number of related empirical studies is remarkably growing in various aspects, such as the CRC price changes, determinants, relationship with other traditional currencies, assets, and indices with mixed and variant results. In the Arabian context, where these currencies are not legal, and not acceptable as a medium of exchange, except in UAE and a very limited number of other areas, and with the absence of studies that discuss the relationship between CRC and Arabian currencies exchange rates ACX. This study tried to answer the following main question:

Is there a relationship between ACX and the top 3 CRC exchange returns? Specifically, the study tries to answer the following minor questions:

1. Is there a relationship between ACX and BTC exchange returns?
2. Is there a relationship between ACX and Ethereum (ETH) exchange returns? 2-Is there a relationship between ACX and Ripple (XRP) exchange returns?

Thus, this study aims to explore the relationship between eight ACX and the top three CRC returns by using the appropriate statistical tools. It also aims to revise the previous literature and to create a new classification for the related literature by dividing it into five major fields and subfields based on the researcher's point of view.

This is one of the first studies to examine the relationship between cryptocurrencies and the official Arabian currencies exchange rate. The study is expected to contribute to the Arabian scant literature on the nascent market of cryptocurrencies and to provide essential informations that might be beneficial to researchers and investors.

The remainder of this paper is organized as follows: Section 2 reviews the literature, previous studies and hypotheses development. Section 3 describes the methodology and data. Section 4 presents the results. Section 5 provides discussion and conclusion. Finally, section 6 provides limitations and recommendations.

## LITERATURE REVIEW, PREVIOUS STUDIES AND HYPOTHESES DEVELOPMENT

The Keynes' theory distinguishes between three motives for holding conventional cash; the transactions-motive, the precautionary-motive and the speculative-motive, meaning that the basic functions of money are: exchange, value storage, and as a unit of account.

Through a review of the previous literature, the researcher noted that in conjunction with the extraordinary rise in the volume of trading of these currencies and the rise in the market value of them during a very short period of time, the debate between economists and financiers has increased and researchers and scholars have become increasingly interested in uncovering the ambiguity that surrounds these currencies in terms of their nature, characteristics and pricing mechanism, its relationship to traditional currencies, market and commodity indices and other economic factors. Therefore, we will try to classify the academic works and the previous studies into four fields:

**The first field:** Previous studies that were mainly focused on the technical and legal issues, such as: (Zalan, 2017; and Joo, Nishikawa & Dandapani, 2019).

**The second field:** Previous studies that were focused on the nature, role and function of the CRC. The results of these studies were mixed.

While some argue that BTC has been contended as a currency (Berentsen & Schär, 2018

and Baek & Elbeck, 2015) and it can be used as a medium of exchange (Dwyer, 2014 and Kelly, 2014) and served as a store of value (Katsiampa, 2017 and Wallace, 2011) and can be used as a unit of account (Kristoufek, 2015 and Nakamoto, 2008). Others such as (Wu & Pandey, 2014) considered it does not contain the main features of currency and therefore it should be considered illiquid financial assets. Traboulsi (2018) also concluded that BTC is a real independent financial instrument. On the other hand, Baur et al., (2016) argued that BTC is a hybrid between precious metals and conventional currencies.

**The third field:** Studies that were focused on the CRC price determination, relationship with fiat currencies, and economic variables and its price volatility:

The previous researches within this field can be divided into five axes:

**The first axis:** There have been numerous studies that attempted to determine the factors affecting the prices of these currencies. Their results found that the fundamentals of supply and demand, the attractiveness of investors, media advertising, the volume of transactions and the investor's speculative behavior are affecting the CRC price (Kristoufek, 2013 and Dyhrberg, 2015). In addition, Sovbetov, (2018) found a weak positive effect for the SP500 in the long-term on BTC, ETH, and Litoin.

**The second axis:** Previous studies of the conventional currencies and CRC exchange rate relationship, their results were mixed.

While numerous studies results reported a significant relationship between CRC and other currencies such as the results of (Baumöhl, 2108) which revealed the presence of negative dependency between six of Forex currencies and six of CRC in the short and long term. Kurka (2017) also reported very low connectedness between BTC and EUR/USD, JPY/USD. Additionally, Poyser (2017) documented a negative association of BTC price with the pair of yuan to USD, while it had a positive association with the pair of USD to euro. Szetela et al. (2016) also revealed that there was a conditional variance between BTC and US dollar, euro and yuan, while no dependency existed between the return of BTC to Zloty and all other exchange rates.

Finally, Van Wijk (2013) found that euro-dollar exchange rate and the oil price have a significant impact on the value of BTC in the long run. Others, Traboulsi, (2018) concluded the absence of any significant indirect effects between CRC market and traditional currencies, stock market indices, and commodities such as gold and Brent. Icellioglu & Ozturk (2017) also reported no long or short-run relationships between BTC and other exchanges i.e. dollar, euro, pound, yen and yuan.

**The third axis:** Studies that were focused on comparing CRC and traditional currencies volatility:

Several studies have found that CRC exchange rates are highly risky as in the (Sapuric & Kokkinaki, 2014) results which indicated that the fluctuation of the BTC exchange rate is much higher than the fluctuation of the exchange rate of other major currencies. Chu et al., (2015) concluded that the investment in BTC is highly volatile with a high return, and its exchange rate increased more than 50 times than the dollar. Baek and Elbeck, (2015) found that “BTC is 26 times more volatile than the S&P 500 Index”.

**The fourth axis:** several studies have been conducted to test the relationship between these currencies, such as the study of (Gkillas & Katsiampa, 2018) that tested the behavior of returns of five CRC (BTC, Ethereum, Ripple, BTC Cash, and Litecoin) and concluded that the most dangerous currency is for BTC and the lowest risk is Litecoin.

**The fifth axis:** Previous studies that focused on the possibility of using the currencies in portfolios: (Corbet et al., 2018) and (Gangwal, 2016) concluded that CRC may offer diversification advantages in an international investor portfolio. (Dyhrberg, 2016) also concluded that it can be used as a hedge against stocks index and against the US dollar in the short term.

**The fourth field:** studies focused on exploring the future of these currencies and to which extent their prices can reach, and if it is a bubble or not (Bouoiyour & Selmi, 2016; and Katsiampa, 2017).

## HYPOTHESES

From the above discussion and in order to test the relationship between ACX & CRC return, our preliminary hypotheses will be as follows:

*H1: There is no significant relationship between the ACX and (BTC).*

*H2: There is no significant relationship between the ACX and (ETH) return.*

*H3: There is no significant relationship between the ACX and (XRP) return.*

## METHODOLOGY

### Data and Sample

Daily exchange rate closing price (against US\$) data for the top 3 CRC and for eight different Arabian currencies for the period between 1st of Jan 2017 and 1st of Jan 2020 were obtained from Coin Metrics (coinmarketcap.com) and <https://sa.investing.com/> respectively.

The sample consists of the top three (BTC, ETH and XRP) from (1540) CRC and eight Arabian currencies (Egyptian Pound (EGP), Iraqi Dinar (IQD), Lebanese Lira (LBR), Moroccan Dirham (MAD), Omani Rial (OMR), Qatari Riyal (QAR), Saudi Riyal (SAR), and Tunisian Dinar (TND) selected from 22 Arabian countries.

Once the exchange rate price data were obtained from different sources, they were compiled into one cohesive data frame and incomplete information due to differences in the dates of the data for the CRC was omitted.

### Study Variables

**Dependent Variables:** This study employed the daily currencies exchange (against \$) return of top three crypto currencies which are: BTC, ETH and XRP returns.

**Independent Variable:** The study employed the return of eight ACX against USD\$ as mentioned above. We exclude the Arabian currencies which have a fixed exchange rate with USD\$.

**Control variables:** This study used ETH and XRP as control variables in model 1, BTC and XRP in model 2 and ETH and BTC in model 3. The daily currency returns were computed as shown below.

$$R_{i,t} = (C_{i,t} - C_{i,t-1} / C_{i,t-1}) \dots \dots \dots (1)$$

where:

$R_{i,t}$  = return of currency exchange rate against USD\$ for country  $i$  at time  $t$ .

$C_{i,t}$  = Closing price for currency  $i$  at time  $t$ .

$C_{i,t-1}$  = Closing price for currency  $i$  at time  $t-1$ .

### Study Model Specification

The linear model used in this study is given below:

$$CRC_{i,t} = \alpha + \beta ACX_{i,t} + \varepsilon_{i,t} \dots \dots \dots (2)$$

Because the study employs 3 CRC return as proxies of CRC we used the following linear Models:

$$\textbf{Model 1: } BTC_t = \alpha + \beta_1 ETH_t + \beta_2 XRP_t + \beta_3 EGP_t + \beta_4 IQD_t + \beta_5 LBR_t + \beta_6 MAD_t + \beta_7 OMR_t + \beta_8 QAR_t + \beta_9 SAR_t + \beta_{10} TND_t + \varepsilon_{it} \dots \dots \dots (3)$$

$$\textbf{Model 2: } ETH_t = \alpha + \beta_1 BTC_t + \beta_2 XRP_t + \beta_3 EGP_t + \beta_4 IQD_t + \beta_5 LBR_t + \beta_6 MAD_t + \beta_7 OMR_t + \beta_8 QAR_t + \beta_9 SAR_t + \beta_{10} TND_t + \varepsilon_{it} \dots \dots \dots (4)$$

$$\textbf{Model 3: } XRP_t = \alpha + \beta_1 BTC_t + \beta_2 ETH_t + \beta_3 EGP_t + \beta_4 IQD_t + \beta_5 LBR_t + \beta_6 MAD_t + \beta_7 OMR_t + \beta_8 QAR_t + \beta_9 SAR_t + \beta_{10} TND_t + \varepsilon_{it} \dots \dots \dots (5)$$

Where: All currencies as mentioned above.

$\alpha$ : is the intercept.

$\beta$ : Coefficient.

$\varepsilon$ : Error.

### Statistical Methods

To achieve the study objectives, the employed models in the study are tested using multiple regression tests, correlation ADF and PP. Durbin-Watson stat DW and Multi-Collinearity test has also been used where Variance Inflationary Factor VIF has been based on to verify the absence of linear interference between the independent variables of the study.

## STUDY RESULTS

### Descriptive Statistics

Table 1 presents descriptive statistics of the daily exchange returns for all selected currencies in this study. Table 1 shows the descriptive statistics of the study variables, the table reports that CRC average return is negative reaching -0.00279, -0.00388, -0.00660 for BTC, ETH, and XRP respectively. Meanwhile, the median value for these currencies is -0.0023, 0.0004, and 0.0029 for BTC, ETH, and XRP respectively.

Table 1 DESCRIPTIVE STATISTICS								
	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	VIF

BTC	-0.00279	-0.0023	0.1874	-0.25	0.04	-0.34	6.91	1.02
ETH	-0.00388	0.0004	0.270553	-0.3366	0.06	-0.78	7.86	1.02
XRP	-0.00660	0.0029	0.460047	-1.7937	0.10	-7.65	125.39	1.01
EGP	-0.000159	0.000000	0.043300	-0.045700	0.00	0.14	53.91	1.01
IQD	-0.00005	0.0000	0.028100	-0.0270	0.01	0.01	15.46	1.10
LBR	-0.00001	0.0000	0.005400	-0.0053	0.00	0.03	8.50	1.08
MAD	-0.00006	-0.0001	0.012300	-0.0101	0.00	-0.12	5.01	1.08
OMR	-0.000009	0.0000	0.003100	-0.0028	0.00	0.08	15.02	1.02
QAR	0.00002	0.0000	0.061100	-0.0576	0.01	0.50	49.02	1.01
SAR	0.000000	0.0000	0.000500	-0.0004	0.00	0.71	14.07	1.01
TND	0.00032	0.0003	0.045000	-0.0910	0.01	-1.02	25.17	1.08

Source: Author calculations.

The standard deviations, however, are 0.04 for BTC, 0.06 for ETH, and 0.10 for XRP. This indicates that XRP price fluctuation is higher than that of BTC and ETH, which are consistent with (Gkillas and Katsiampa, 2018) results who report that “BTC and Litecoin were found to be the least risky”.

On the other hand, Arabian currencies' average returns ranged from -0.000159 for EGP as the lowest value to 0.00032 for TND as the highest value. The median values were around zero, and the standard deviations ranged from 1.02 for TND as the lowest value to 0.71 for SAR as the highest value. This indicates that the Saudi Riyal exchange rate return is the most volatile.

The Multicollinearity test was used to verify the absence of linear interference between the independent variables. As well as, Variance Inflationary Factor (VIF) is less than 5. This means that all variables are free of the multicollinearity problem.

## EMPIRICAL RESULTS

In this section, we conduct stationarity tests, correlation and multiple regression tests.

### Stationarity Test

Table 2 represents ADF & PP test results:

Table 2 STATIONARITY TEST											
	BTC	ETH	XRP	OMR	QAR	IQD	TND	MAD	SAR	LBR	EGP
ADF	-15.8*	-17.4*	-33*	-9.80*	-8.4*	-10.1*	-5.70*	-9.4*	-12.6*	-8.70*	-10.4*
PP	-34.2*	-33.0*	-33*	-86.9*	-122*	-33.2*	-46.2*	-32.2	-44.9*	-92.4*	-32.3*

\*, \*\*, Significant at  $\alpha < 0.01$  and 0.05 Source: Eviews results.

Table 2 shows that all variables in the study are stationary at level, where all of the P values are less than 0.05.

### Correlation Results

Table 3 present the correlation among the variables.

Table 3 CORRELATIONS MATRIX											
	BTC	ETH	XRP	OMR	QAR	IQD	TND	MAD	SAR	LBR	EGP
BTC	1										

ETH	0.59*	1									
XRP	0.30*	0.33*	1								
OMR	0.002	-0.02	0.029	1							
QAR	0.006	0.007	-0.007	0.020	1						
IQD	-0.024	0.003	-0.04	0.12*	0.057	1					
TN	-0.015	0.008	0.015	-0.03	0.0007	0.027	1				
MAD	0.050	0.096*	0.006	-0.01	0.02	0.020	0.26**	1			
SAR	-0.023	0.002	-0.02	-0.012	0.046	-0.001	0.031	0.006	1		
LBR	0.07**	0.019	0.07**	0.010	0.039	0.25*	0.025	-0.009	0.06**	1	
EGP	0.014	-0.013	-0.002	0.017	-0.002	0.07**	-0.024	0.018	0.034	0.001	1

\*, \*\*, significant at  $\alpha < 0.01$  and 0.05.

Table 3 shows the lack of spiritual connection between BTC and all of the Arabian currencies with the exception of LBR which is shown by the result to have a very weak positive relationship and is statically significant with a coefficient value of 0.002.

As for ETH, the result indicates the presence of a weak positive relationship with a coefficient of 0.096 and statically significant only with MAD. The results did not show any significant relationship between XRP and other Arabian currencies except with LBR. The results also show the presence of a significant positive relationship between BTC, ETH and XRP, these results consist with (Inci and Lagasse, 2019) results.

### Regression Analysis

Table 4 represents the results of multiple regression results for BTC, ETH and XRP and ACX (Model 1, Model 2 and Model 3) respectively.

#### First Hypothesis Results Test (Model 1)

Table 4 model 1, report that LBR coefficient (1.694) is positive and statistically significant at  $\alpha < 0,01$ , this indicates the presence of a positive relationship between LBR and BTC. The table also reports the values of ETH and XRP coefficients (0.409 and 0.052 respectively) which are statistically significant with a positive relationship between these currencies returns. The results for the rest of the currencies are statistically insignificant. The regression model 1 can be estimated as follows:

$$\text{BTC} = 0.409 \cdot \text{ETH} + 0.052 \cdot \text{XRP} + 0.269 \cdot \text{EG} - 0.316 \cdot \text{IQ} + 1.964 \cdot \text{LB} + 0.054 \cdot \text{MG} + 1.137 \cdot \text{OM} - 0.010 \cdot \text{QR} - 18.780 \cdot \text{SA} - 0.119 \cdot \text{TN} - 0.0008.$$

#### Second Hypothesis Test Results (Model 2)

Table 4 represents the results of multiple regression results for ETH and ACX model 2, the results show that the MAD coefficient (1.727) is positive and statistically significant at  $\alpha < 0,01$ , this indicates a positive relationship between MAD and ETH. The results also indicate that the coefficient of LBR (-1.726) is significant but at  $\alpha < 0,10$ . The results also report the values of the coefficient of BTC (0.739) and XRP (0.103) are statistically significant with a positive relationship between these currencies returns. The results for the rest of the currencies are statistically insignificant. The regression model 2 can be estimated as follows:

$$\text{ETH} = 0.103 \cdot \text{XRP} + 0.739 \cdot \text{BTC} - 0.362 \cdot \text{EGP} + 0.394 \cdot \text{IQD} - 1.727 \cdot \text{LBR} + 1.727 \cdot \text{MAD} -$$

$$3.920*OMR + 0.048*QAR + 18.846*SAR - 0.040*TND - 0.001$$

<b>Table 4</b>						
<b>REGRESSION RESULTS FOR CRC AND ACX</b>						
<b>In.dep. Var. ↓</b>	<b>Model 1</b>		<b>Model 2</b>		<b>Model 3</b>	
<b>Dep.v→</b>	<b>BTC</b>		<b>ETH</b>		<b>XRP</b>	
	<b>β</b>	<b>T-Stat.</b>	<b>β</b>	<b>T-Stat.</b>	<b>β</b>	<b>T-Stat.</b>
BTC	-----	-----	0.739*	(21.53)	0.353*	(4.50)
ETH	0.409*	(21.53)	-----	-----	0.385*	(6.64)
XRP	0.052*	(4.49)	0.103*	(6.64)	-----	-----
EGP	0.269	(1.00)	-0.362	(-1.00)	0.085	(0.12)
IQD	-0.316	(-1.58)	0.394	(1.46)	-1.017**	(-1.95)
LBR	1.964*	(2.60)	-1.726***	(-1.70)	4.823**	(2.46)
MAD	0.054	(0.11)	1.727*	(2.75)	-1.187	(-0.97)
OMR	1.137	(0.45)	-3.920	(-1.15)	9.180	(1.40)
QAR	-0.010	(-0.06)	0.048	(0.22)	-0.111	(-0.26)
SAR	-18.78	(-1.1)	18.846	(0.817)	-26.388	(-0.59)
TND	-0.119	(-0.85)	-0.040	(-0.22)	0.301	(0.83)
C	-0.0008	(-0.73)	-0.001	(-0.78)	-0.004	(-1.54)
R <sup>2</sup>	0.372		0.385		0.135	
Adj. R <sup>2</sup>	0.366		0.379		0.127	
DW stat	1.85		1.86		1.96	
F-statistic	63.51		67.05		16.75	
Prob.(F-stat.)	0.00		0.00		0.00	

\*, \*\*, \*\*\* significant at  $\alpha < 0.01, 0.05$  and  $0.10$ . Source: Statistical Analysis Results (Eviews)

### Third hypothesis test results (Model 3)

Table 4 represents the results of multiple regression results for XRP and ACX (Model 3). The regression results indicate a statistically significant relationship between both of LBR and IQD and XRP. In detail, the coefficient of LBR (4.82) is positive and statistically significant at  $\alpha < 0,01$ , and the coefficient of IQD (-1.017) is negative and also statistically significant at  $\alpha < 0,05$ . The results also report the values of ETH and BTC coefficients (0.385, and 0.353 respectively) which are statistically significant with a positive relationship between these currencies returns. As for the rest of the currencies, the results report the lack of any statistically significant relationship between them and CRC. The regression model can be estimated as follows:

$$XRP = 0.353*BTC + 0.385*ETH + 0.085*EGP - 1.017*IQD + 4.823*LBR - 1.187*MAD + 9.180*OMR - 0.111*QAR - 26.388*SAR + 0.301*TND - 0.004$$

Finally, the results indicate that R<sup>2</sup> is 0.372, 0.385 and 0.135 for model 1, 2 and 3 respectively, which means that all of the independent variables explains about 37.2%, 38.5% and 13.5% of the variation of BTC, ETH and XRP return respectively, while 62.8%, 61.5%, and 86.5% variations of returns of BTC, ETH, and XRP respectively, are attributed to other variables not mentioned in the models. The results also indicate the absence of the autocorrelation problem in all models were DW values are 1.81, 1.86 and 1.96 for models 1, 2 and 3, respectively. Similarly, all models are statistically acceptable with a statistically significant F- Statistics 63.51, 67.05 and 16.75.



## DISCUSSION AND CONCLUSION

The results above indicate the absence of a significant relationship between ACX and CRC except for LBR with BTC and with XRP which may reflect the high trading of Lebanon citizens on CRC, the results also report a significant relationship between (MAD and ETH) and between (IQD and XRP). Based on correlation and regression results, we can conclude the rejection of the first, second, and third null hypothesis.

These results are consistent with several previous studies such as (Baumohl, 2018; Kurka, 2017; Poyser, 2017; Szetela et al. 2016; and Finally, Van Wijk, 2013) and inconsistent with Icelliglu and Ozturk (2017).

The results also showed the presence of a significant positive relationship between BTC, ETH, and XRP, these results consistent with (Corbet et al., 2018), who found that CRC may offer diversification benefits for investors.

Finally, the study concluded that, since there was a negative relationship between Iraqi dinar and Ripple, the former can be beneficial in hedging and diversification. The study also concluded that Arabian countries' exchange markets do not highly affect the cryptocurrencies markets, which may be due to the absence of a legal recognition by the governments and the absence of public acceptance.

## LIMITATION AND RECOMMENDATIONS

Since this study focuses on a very wide market that contains more than 1540 CRC and 22 ACX, and because of the unavailability of enough data, this study employed only top 3 CRC and 8 ACX.

Based on its results, this study recommends:

1. Further researches should be done regarding CRC in the Arabian environments.
2. Extending the study using another CRC.
3. The researcher believe that the importance of CRC must be considered and the governments should encourage the involvement in this market.
4. The Business Colleges, specifically, finance and banking departments should introduce courses related to CRC.

## REFERENCES

- Baek, C., & Elbeck, M. (2015). Bitcoins as an investment or speculative vehicle? A first look. *Applied Economics Letters*, 22(1), 30–34.
- Baumohl, E. (2018). Are crypto currencies connected to Forex? A quantile cross-spectral approach. *Finance Research Letters*, 29(c), 363-372.
- Baur, D., Hong, K., & Lee, A. (2016). Bitcoin: Currency or Asset? Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2736020](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2736020)
- Berentsen, A., & Schär, F. (2018). A short introduction to the world of crypto currencies. *Federal Reserve Bank of St. Louis Review, First Quarter*, 100(1), 1-16.
- Bouoiyour, J., & Selmi, R. (2016). Bitcoin: A beginning of a new phase? *Economics Bulletin*, 36, 1430–1440.
- Chu, J., Nadarajah, S., & Chan, S. (2015). Statistical analysis of the exchange rate of bitcoin. *PLoS One*, 10(7), 1-18.
- Coin Market Cap (2018). Crypto currency market capitalizations. Retrieved from <https://coinmarketcap.com/>
- Corbet, S., Meegan, A., Larkin, C., Lucey, B., & Yarovaya, L. (2018). Exploring the dynamic relationships between crypto currencies and other financial assets. *Economics Letters*, 165, 28-34.
- Dwyer, G.P. (2014). The economics of bitcoin and similar private digital currencies. *Journal of Financial Stability*, 17(C), 81-91.
- Dyhrberg, A. (2016). Hedging capabilities of Bitcoin. Is it the virtual gold? *Finance Research Letters*, 16, 139–44.
- Gangwal, S. (2016). Analyzing the effects of adding Bitcoin to portfolio. *International Journal of Economics and*

- Management Engineering*, 10(10), 3519-3532.
- Gkillas, K., & Katsiampa, P. (2018). An application of extreme value theory to crypto currencies. *Economics Letters*, 164, 109-111.
- Icellioglu, C.S., & Ozturk, M.B.E. (2017), In search of the relationship between Bitcoin and selected exchange rates. *Maliyeve Finans Yazıları*, 109, 51-70.
- Joo, M., Nishikawa, Y., & Dandapani, K (2019). Crypto currency, a successful application of block chain technology. *Managerial Finance*. Retrieved from DOI 10.1108/MF-09-2018-0451.
- Katsiampa, P. (2017). Volatility estimation for Bitcoin: A comparison of GARCH models. *Economics Letters*, 158, 3-6.
- Kelly, B. (2014). *The Bitcoin big bang: How alternative currencies are about to change the world*. Wiley.
- Kristoufek, L. (2015). What are the main drivers of the Bitcoin Price? Evidence from Wavelet Coherence Analysis. *PLOS ONE*, 10(4).
- Kurka, J. (2017). Do Crypto currencies and Traditional Asset Classes Influence Each Other? IES Working Paper 29/2017. IES FSV, Charles University, Prague.
- Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved from <https://nakamotoinstitute.org/literature/bitcoin/>
- Poyser, O. (2017), Exploring the determinants of Bitcoin's price: An application of bayesian structural time series (retrieved from: <https://arxiv.org/abs/1706.01437>).
- Sapuric, S., & Kokkinaki, A. (2014). Bitcoin is volatile! isn't that right? Lecture Notes in *Business Information Processing*, 183, 255-265.
- Sovbetov, Y. (2018). Factors influencing crypto currency prices: Evidence from Bitcoin, Ethereum, Dash, Litecoin, and Monero. *Journal of Economics and Financial Analysis*, 2(2), 1-27.
- Szetela, B., Mentel, G., & Gędek, S. (2016). Dependency analysis between Bitcoin and selected global currencies. *Dynamic Econometric Models*, 16(1), 133-144.
- Traboulsi, N. (2018). Are there any volatility spill-over effects among crypto currencies and widely traded asset classes? *Risk Financial Manag*, 11, 66.
- Van, W.D. (2013), What Can Be Expected from the Bitcoin? Erasmus Rotterdam Universiteit Working Paper Retrieved from <https://thesis.eur.nl/pub/14100/FinalversionThesis-Dennis-van-Wijk.pdf>.
- Wallace, B. (2011). The rise and fall of Bitcoin. *Wired*, November 23.
- Wu, C.Y., & Pandey, V.K. (2014). The value of bitcoin in enhancing the efficiency of an investor's portfolio. *Journal of Financial Planning*, 27, 44-52.