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DYNAMIC INTERRELATION BETWEEN STOCK MARKET INDEX, EXCHANGE RATE, T-BILLS AND POLICY RATE: THE CASE OF EGYPT 2010-2020

Yara Ayman Elkahky
Economics Lecturer at University of Hertfordshire Business School, New Capital, Egypt
Former Economist at Banque Misr, Cairo, Egypt
PHD Candidate at German University in Cairo, New Cairo, Egypt
Master of Science Holder in International Finance from Berlin School of economics & law, Berlin, Germany
yara.elkahky@gmail.com

Christian Richter
Dean of Faculty of Economics & Business at Berlin School of Business and Innovation, Berlin, Germany
Dean of Business School, & Professor of Economics at University of Hertfordshire Business School in Egypt by GAF, Cairo, Egypt
Christian.richter@berlinsbi.com

Dina M. Yousri
Assistant professor of Economics & Statistics at German University in Cairo, New Cairo, Egypt
Assistant professor of Statistics at German International University, New Capital, Egypt
Assistant professor of Statistics at German International University, Berlin, Germany
dina.elsayed@guc.edu.eg

Abstract

Numerous studies have recommended that macroeconomic variables have an impact on the stock exchange *performance employing the yield rate of Treasury bills, lending rate as an indicator for the monetary policy, and debt market related capital inflows. The purpose of this study is to investigate, using regression, cointegration, and VECM models the impact of policy rate, Treasury bills yields, and exchange rate on the performance of the Egyptian stock exchange during the period from 2010 to 2020. The outcomes disclosed the absence of short-run impact of the noted indicators on the stock market. However, just in the long run, before the 2016 currency flotation there was a stable equilibrium in the long run involving the index of stock market and each of yield on government's treasury bills and rate of lending?*

Keywords:
Stock Market Performance, Lending Rate, Treasury Bills Yield Rate, Exchange Rate, Egypt

1. Introduction

A dynamic stock market is considered one of the main pillars of a nation's economic stance, and simultaneously the expansion in the economy is reflecting the stability and strength of its secondary market and financial intermediary systems. Hence, funds are mobilized and move into various economic sectors in a controlled manner, which denotes progress and dynamism. Meanwhile, Egypt's economy has grown steadily since 2009, the year the secondary market and Egypt's stock market index (EGX 30) were created. Giving that, 2009 is considered as the commencement of EGX 30 (Michael, 2018). However, various economic and financial challenges have been negatively impacting the Egyptian economy in the past few years due to political turmoil and social disruption resulting from the uprising in January 2011 (Yousri, 2022; Yousri & Richter, 2018; Elatroush, 2013). As well as worldwide crises such as the Covid-19 pandemic, these factors had an adverse effect on its hard currency inflows from foreign capital (Diwan, Houry, & Sayigh, 2020).

Consequently, this signified the necessity for support from the international financial community to retain the country's economic stance (IMF, July 2021). Hence, the IMF and WB provided the Egyptian government with an economical-backed loan arrangement that was associated with several economic reforms on the structural, fiscal, and monetary front. Such reforms included shifting the fixed exchange rate regime to a flexible one, reducing the state

footprint in the economic system, implementing specific tax reforms, and improving transparency and accountability of the country's public finances. (IMF, July 2021).

Ever since, Egypt's stock market, foreign exchange rate, and economic position have become increasingly reflective of and vulnerable to external shocks. In addition, with the implementation of the IMF loan program, injections of foreign capital by means of foreign inbound investment, or equity and debt investment have been key pillars in shaping the Egyptian pound. This occurs through the Egyptian debt and equity markets and is influenced by monetary policy decisions made by Egypt's central bank (Elshahawany & Ward, 2022; Qorchi, 2007).

Thus, this paper focuses on factoring in the indicators of Egypt's financial market, and investigating possible linkages among macro, and financial indicators on Egypt's stock market index (EGX30). The research importance is that Egypt's economy has been negatively impacted by the concurrent global economic stance, and the internal policies that are putting Egypt's economy in a vulnerable position due to various shocks that are increasing the uncertainties and volatility in global asset and commodity markets. Hence, it is critical to shed the light on the macroeconomic variables' interrelations, especially in ~~the~~ emergent economies like Egypt with few literature and research papers. By understanding the interrelation between the macro-variables, policymakers and investors will have a better opportunity to assess Egypt's economic stance and its characteristics. Given that, there is a research gap despite the consistent dynamics, and ~~the~~ complexity of the interrelation of Egypt's macroeconomic variables, with a limited number of research papers, which focused on identifying the interrelationship between Egypt's stock market, policy rate, and exchange rate. Therefore, there is still a need to bridge the knowledge gaps in this field that is consistently changing. This paper's objective will eventually help to analyze the dynamic interplay between Egypt's key macro-financial indicators and their role in the market of stock exchange in Egypt.

This research paper is structured as follows: Section 2 presents the literature review, and section 3 provides the methodology used. Section 4 summarizes the main empirical results, and findings. And Section 5 draws conclusions.

2. Literature Review

According to previous research about the influence of interest rates on the stock market, which is an extensively researched topic in both developed and emergent economies, many of those studies concluded that interest rates and stock returns were negatively correlated

(Modigliani, 1971; Mishkin, 1977). Which means the association of more capital inflows to the stock market and the expectation of higher rates of investment return with an interest rate cut, and vice versa when a hike in interest rate takes place. As higher interest rates stimulate more savings in banks and capital reallocation from the stock market to the banking system (Eldomiaty, Saeed, Hammam & AboulSoud 2020). Furthermore, it was found that the long run interest rates have a negative impact on the stock market performance (Al Mukit 2013; Mukherjee & Naka, 1995).

However, Lee (1997) discovers that in more recent periods, the link between interest rates and stock market returns has changed from being negative in the past to almost zero or showing a positive relation. As the stock market returns tend to show less sensitivity to risk-free rates as time passes (Eldomiaty et al., 2020). Nevertheless, other studies covering 15 developed and emerging nations explored the correlation between interest rates and stock prices. They observed that the two variables are negatively correlated (Alam and Salah Uddin, 2009). The majority of previous literature on the relation between interest rates and stock returns claims that it is a negative interplay (Eldomiaty et al., 2020).

Moreover, (Addoi & Sunzuoye, 2013) studied the stock market exchange in Ghana as an emerging lower-middle income country case. The results showed an inverse relation between the stock exchange index and lending rate; however, it was not a strong relation. Additionally, the similar outcome between the yield rate of Treasury bills and the stock exchange index was observed. However, it revealed the presence of an association of long-term equilibrium between the yield rate of Treasury bills, the lending rate, and the stock exchange index as the dependent variable. Therefore, the lending rate and yield rate of Treasury bills can have a combined long-term effect on the stock exchange index as indicated in Ghana's case. Additionally, the outcomes demonstrated the improvements in Ghana's financial market's efficiency. Consequently, it proved that factoring the yield rate of the Treasury bill yield rate and the lending rate into the security prices (Addoi & Sunzuoye, 2013). Additionally, another empirical study on Egypt's economy by (Kamal, 2018), showed that stock market returns in Egypt is influenced by the movements of the macroeconomic variables. Which was proven by using a co-integration analysis that showed a significant combined negative impact of Treasury bills (T-bills) yield rate, 3-month deposit, and lending rates on Egypt's stock exchange index on the short and long run over the duration of November 2004 and November 2017 (Kamal, 2018).

Further empirical results on the same topic could be different due to using different variables as shown by (Adjasi, Harvey & Agyapong, 2008). They used the exchange rate instead of the country's policy rate and Treasury yield rate to explore the linkage among stock market returns and exchange rate movements, using Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH). The results have indicated an inversely proportional relation among the two indicators. In other words, a decline in the nation's currency value eventually leads to higher equity market gains. Which shows the cointegration between the two variables on the long run (Adjasi et al., 2008).

3. Methodology

This research used a time series analysis for Egypt's macroeconomic variables to measure the impact of end of period lending rate, 3-months EGP-dominated Treasury bills yield rate, and the USD/EGP exchange rate on Egypt's stock market index (EGX30). The monthly data used in this paper are from the Central bank of Egypt. The dependent variable is the stock market returns index, with the free float capitalization index for the 30 most liquid and capitalized stocks in the Egyptian Exchange (EGX) representing the equity market. The sample data is monthly from January 2010 to December 2020; to capture the trend which happened after 2011 revolution, 2016 exchange rate floating regime and the Corona pandemic that started end of 2019 globally and domestically at the beginning of 2020. Also, the percentage change of the Exchange rate was used to test the possible impact on the stock market performance, as illustrated in Table 1.

Table 1: *Research Variables*

Variable	**Egypt's Stock Market Index (EGX30)**	**Egypt's Lending Rate (IR)**	**Egypt's Treasury Bills Yield Rate (T-bills)**	**Egypt's Exchange rate (FX Rate)**
Explanation	Stock market return index in percentage change	Interest rates as a proxy for Egypt's monetary policy rate	Treasury yields rate as a proxy for debt market capital inflows	Exchange rate in percentage change
Types of Variables	Dependent	Independent	Independent	Independent
Data Source	Egypt's CBE	Egypt's CBE	Egypt's CBE	Egypt's CBE

(Source: *Author's Findings)*

The paper was formulated based on these four hypotheses**:**

- H-1: The yield on Treasury bills and the stock exchange index has a negative relation.
- H-2: The stock exchange index and lending rate have a negative relation.
- H-3: The yield on Treasury bills and lending rate has a positive relation.
- H-4: Stock market index and exchange rate have a positive relation.
- H-5: The yield on Treasury bills, and lending rate have a combined inverse impact on the stock exchange index.

The models in this paper are linking Egypt's stock exchange index (EGX30), the Treasury bill rate (TBR) for three months, and the end-month lending rate (IR). And the data analysis took place by utilizing the econometrics software (E-views 11). Also, the dependent variable is the EGX30, which is the index of Egypt's stock exchange and is presented as the following function, (f = function, TBR = yield on Treasury bills, and IR = lending rate. Hence, the regression analysis was formulated based on the following: Equation: EGX = f (TBR, IR, FX):

- Equation 1: $EGX = \beta 0 + \beta 1 TBR + et$ (1)
- Equation 2: $EGX = \beta 0 + \beta 1 IR + et.$ (2)
- Equation 3: $TBR = \beta 0 + \beta 1 IR + et.$ (3)
- Equation 4: $EGX = \beta 0 + \beta 1 FXR + et$ (4)
- Equation 5: $EGX = \beta 0 + \beta 1\ IR + \beta 2 TBR + et$ (5)

Hence, based on the above five equations, β0 represents the constant intercept. While β1 and β2 are the coefficients of the independent variables, which is varied from one equation to another, as illustrated above. And to test the five hypotheses for this paper, models and methods employed to investigate the long run and short run relationships between the mentioned variables were the Cointegration Model, the Estimation of the Vector Error Correction Model (VECM), and the Ordinary Least Squares (OLS) methods. To analyze the time series behavior of the data, the cointegration tests, and VECM were applied to show the time series behavior of the monthly data for the short run dynamics, and the long run equilibrium. While the Augmented Dickey-Fuller test unit root test was used to test the stationarity of the time series data. And the regression model was employed to capture the coefficient of determination to show the number of variations of the dependent variable that could be explained by the independent variables.

4. Empirical Findings

4.1 Descriptive statistics

To gain some insights about the movement of the mentioned variables over the time series in Table 2, descriptive analysis was applied to show if the sample data is normally disturbed or not. The kurtosis for the policy rates (end-month lending rate), and the T-bills yield rate (3-month Treasury bills rate) is lower than the 3-benchmark level; meaning that it is a negative kurtosis, indicating lower values than the sample mean (flattened curve). While the stock market index (EGX30 Index), and FX rate are showing a positive kurtosis, indicating higher values from the sample mean (peaked curve). Adding that, the normal skewness for the stock market index (EGX30 Index) has a value of 0.31, close to the benchmark of the 0 value, which shows that the data distribution is closer to being symmetric around its mean. Also, the EGX30 is the variable that is most symmetrically distributed around its mean, it is also showing a slight extended right tail, indicating that there are more values above the observed mean. As well ~~as~~, the exchange rate is reflecting a high kurtosis value more than the benchmark 3 level.

Table 2: *Descriptive statistics of the variables*

	EGX30	Lending Rate	T-bills	FX Rate
Mean	0.005	12.301	13.874	0.010
Median	0.005	10.250	12.891	0.000
Maximum	0.366	19.750	21.564	0.858
Minimum	-0.263	9.250	8.681	-0.090
Std. Dev.	0.082	3.421	3.302	0.079
Skewness	0.312	0.976	0.596	9.963
Kurtosis	5.870	2.372	2.093	107.725
Jarque-Bera	46.0	22.4	12.0	60609.9
Probability	0.000	0.000	0.003	0.000
Sum	0.652	1574.5	1775.8	1.33
Sum Sq. Dev.	0.844	1486.4	1385.0	0.78
Observations	128	128	128	128

(Source: *Author's Findings - EViews Software)*

To summarize the above results, it showed that the four variables are not normally distributed. The higher sum of squares deviation indicator shows a higher degree of variability within the sample data, reflecting that the data vary from the mean value. And given that, the p-values for the four noted variables are lower than the significance level of 5%, the null hypothesis for the

Jarque-Bera statistics is therefore rejected. Which is reflecting that the data sample is not normally distributed and is subjective to speculations and periodic changes, which is a signal of market inefficiency.

4.2 Correlation of the sample data

In Table 3, the correlation between the time series data reflected a strong significant, positive linear correlation between the lending rate and Treasury bill yield rate at 0.92. While it reflected a weak and insignificant relation between Egypt's index of stock exchange market and yields on government Treasury bills, as well as the lending rate. Also, the results depicted a weak correlation between FX rate and the EGX30. Meanwhile, the high correlation between lending rates as a proxy for monetary policy and the T-bills yield rate reflects a possible existence of multicollinearity between the two variables if presented in the same model. Thus, it will limit further analysis of the impact of the two noted variables on Egypt's stock market index in one equation.

Table 3: *Correlation of variables*

	EGX30	FX Rate	Lending Rate	T-bills Rate
EGX30	1.000	0.414	0.085	0.052
FX Rate	0.414	1.000	0.057	0.091
Lending Rate	0.085	0.057	1.000	0.926
T-bills Rate	0.052	0.091	0.926	1.000

(Source: *Author's Findings, EViews Software)*

4.3 ADF unit root test

Table 4a, b, and c illustrate the Augmented Dickey-Fuller (ADF) unit root test to examine the stationarity of the time series. This is after choosing the appropriate lag length of 1 or 8 through the lag structure criteria in EViews. The ADF test showed that, the time series data for the stock market index, the T-bills yield rate, and the lending rate are non-stationary at levels with a constant and intercept. Therefore, the presence of a unit root was recognized for the three indicators: T-bills, lending rate, and stock market index. So, the paper could proceed with applying the cointegration and VECM models to explore the short-run as well as the long-run relation between the dependent variable and independent variables.

Table 4a: *EGX30- (ADF) Unit Root Test*

	T-statistic	Probability
Augmented Dickey-Fuller statistic	-2.946	0.152
Critical values:		
1%	-4.036	
5%	-3.448	
10%	-3.149	

(Source: Author's, EViews)

Table 4b: *Lending Rate- (ADF) Unit Root Test*

	T-statistic	Probability
Augmented Dickey-Fuller statistic	-2.326	0.417
Critical values:		
1%	-4.037	
5%	-3.448	
10%	-3.149	

(Source: Author's, EViews)

Table 4c: *T-bills Rate- (ADF) Unit Root Test*

	T-statistic	Probability
Augmented Dickey-Fuller statistic	-2.092	0.545
Critical values:		
1%	-4.037	
5%	-3.448	
10%	-3.149	

(Source: Author's, EViews)

4.4 Hypothesis testing

In contemplation of testing the first hypothesis for this paper, if there is a negative association between Egypt's stock market index and Treasury bills yield rate, as stated in Equation one. A regression analysis was applied which showed a weak and positive linkage between Treasury bills and Egypt's stock market index. Because the T-bills yield rate coefficient of the regression equation is positive and does not meet the 5% significant level, as seen in Table 5a. The coefficient of determination is low at 0.002; indicating that variations in Egypt's stock market cannot be due to ~~the~~ changes in the Treasury bills yield rates. And since that the P-Value is at 0.56 which is higher than the 5% significance level, the relationship is statistically insignificant. Which supports the minimal variations that could be explained by the independent

variable over the dependent variable. Thus, H1 is rejected since it isn't statistically significant at the 5% level. Which shows that, various financial markets in Egypt's economy are moving independently due to various possible reasons. As market segmentation due to the different types of investors in in each financial market. And that, Egypt's financial markets are not correlated and failed to capture the funds reallocation between the Treasury and stock exchange markets during an adjustment in Egypt's monetary policy.

Table 5a: *Regression- Stock Market Index and T-Bills Model*

Variables	Coefficients	SE.	T-statistic	Probability
TBR	0.0013	0.002	0.583	0.561
C	-0.0127	0.031	-0.405	0.686
R2	0.0027	**Mean dependent variance**		**0.005095**
Adjusted R2	-0.0052	**SD. dependent variance**		0.082
SE. of regression	0.0817	**Akaike info criterion**		-2.156
Sum squared residual	0.8414	**Schwarz criterion**		-2.111
F-statistic	0.3404	**Durbin-Watson stat**		2.084

(Source: *Author's Findings)*

Furthermore, in testing the second hypothesis if there is an inverse relation between stock exchange index and lending rates as a proxy for monetary policy, as illustrated in Equation two, it also showed a positive, weak relationship between lending rate and the stock market returns, as seen in Table 5b. The relationship between the variables is not strong, as it isn't statistically significant at 5% since ~~that~~ the p-value stands at around 0.34. Thus, regressing the stock market index on the lending rate can't predict the stock market's performance. Adding to that, the coefficient of determination is low at 0.007; indicating that variations in the stock market performance can't be explained by the lending rate movements. And given that, the significance level is 5%, and the p-value of the F-statistic is at 34%, so the equation's significance level is greater than the benchmark, which supports the minimal variations that could be explained by the independent variable over the dependent variable.

Thus, Hypothesis two is rejected and failed to capture the negative relation between the money market and the stock exchange market, which indicates that the financial market in Egypt is inefficient to show the reallocation of funds with a monetary policy rate hike or a cut. Since that, an increase in interest rates stimulates more savings in banks, which decreases the flow of capital to the stock market, whereas a reduction in interest rates results in higher capital

inflows to the stock market and stimulates higher rates of investment returns, according to (Eldomiaty, Saeed, & Hammam, 2020). Thus, the paper's results here contradict another study that indicated an inversely proportional relationship between the discount rate and equity prices (Pearce, Roley, 1985; Hafer, 1986).

Table 5b: *Regression-Stock Market Index and Lending Rate Model*

Variable	Coefficients	SE.	T-statistic	Probability
IR	0.002	0.002	0.955	0.341
C	-0.020	0.027	-0.732	0.466
R2	0.007	Mean dependent variance		0.005
Adjusted R2	-0.001	SD. dependent variance		0.082
SE. of regression	0.082	Akaike info criterion		-2.160
Sum squared residual	0.838	Schwarz criterion		-2.116
F-statistic	0.912	Durbin-Watson stat		2.086

(Source: *Author's Findings)*

On the other hand, in Equation three for hypothesizing the presence of a positive association between the yield rate of Treasury bills, and lending rate in Table 5c, the p-value of the lending rate coefficient of (0.89) was at 0.000, which indicated a positive linkage between lending rate and the yield rate of Treasury bills that has a strong and positive correlation at around 92%, as clarified in Table 3. The co-movement between the monetary policy lending rate, and the yield on T-bills could be an indicator that reflect the movements of the monetary policy rate. Also, the R2 is high at 85%, and therefore hypothesis three is accepted at a significance level of 5%. Which indicates that 85% of the variations occurred to the Treasury bills yields rates are explained by the variations that took place to the lending rates based on the CBE's monetary decisions. However, due to the high correlation it is creating a possible multicollinearity issue which gives a biased judgment about the relation between the two noted variables if included in the same model while testing their impact on the EGX30. Hence, it limits to test them in the same model against the stock market index for further analysis through the research.

Table 5c: *Regression-T-bills and Lending Rate Model*

Variable	Coefficients	SE.	T-statistic	Probability
IR	0.894	0.03	27.55	0.000
C	2.878	0.41	6.95	0.000
R2	0.858	Mean dependent variance		13.874
Adjusted R2	0.856	SD. dependent variance		3.302
SE. of regression	1.251	Akaike info criterion		3.301
Sum squared residua	197.200	Schwarz criterion		3.346
F-statistic	758.950	Durbin-Watson stat		0.247

(Source: *Author's Findings)*

In the below Table 5d, hypothesis four tested if there is a positive relationship between stock market index and exchange rate in Equation four during the duration from 2010 till 2020. It showed that, the relation between the two variables was significant at 5% and positive. However, the 17% coefficient of determination (R2) constrained the acceptance of this relation. Though, to address the structural breakouts at the time of the 2016-currency floatation and to capture an accurate explanation for the interrelations between the mentioned variables, a statistical adjustment to the sample data was required. As seen in Figure 1, the time series plotting of the EGX30, T-bills yield rate, and policy rate seemed to be correlated and moving directly proportionally between the periods from 2015 till 2017. Which was around the time of Egypt's currency flotation in November 2016, backed by the IMF program and government intervention. Thus, the outlier period from 2015 to 2017 was excluded in the further analysis by data splitting.

Table 5d: *Regression-Stock Market Index (EGX30) and Exchange Rate Model -2010-2020*

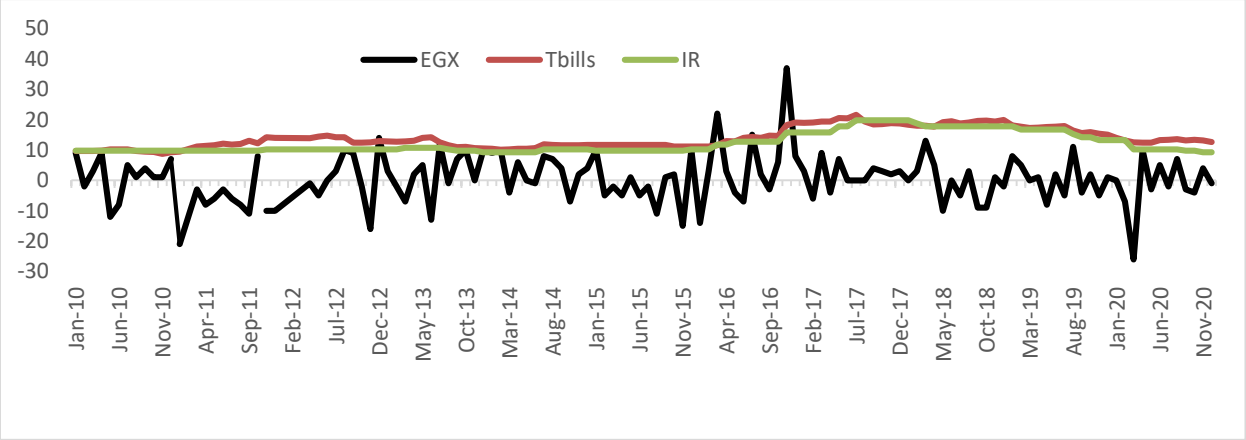
Variables	Coefficients	SE	T-statistic	Probability
FX Rate	0.429	0.08	5.10	0.000
C	0.001	0.01	0.10	0.924
R2	0.171	Mean dependent variance		0.005
Adjusted R2	0.164	SD. dependent variance		0.082
SE. of regression	0.075	Akaike info criterion		-2.340
Sum squared residual	0.699	Schwarz criterion		-2.296
F-statistic	25.992	Durbin-Watson stat		2.248

(Source: *Author's Findings)*

Variables	Coefficients	SE	T-statistic	Probability
FX Rate	0.429	0.08	5.10	0.000
C	0.001	0.01	0.10	0.924
R2	0.171	Mean dependent variance		0.005
Adjusted R2	0.164	SD. dependent variance		0.082
SE. of regression	0.075	Akaike info criterion		-2.340
Sum squared residual	0.699	Schwarz criterion		-2.296
F-statistic	25.992	Durbin-Watson stat		2.248

(Source: *Author's Findings)*

Figure 1: *2010-2020 - Time Series Plotting for EGX30, T-bills, IR (in %)*



(Source: CBE data)

As a result, the sample data's time series from 2010 to 2020 was split into two periods: January 2010 to October 2016, and February 2017 to December 2020. Then, in Tables 5e and 5h, the regression analysis was applied again to test H4, which showed that there is an insignificant relationship between the variables in January 2010 – October 2016 and February 2017-December 2020. Even though, it was reflecting a significant relation over the duration of 2010-2020. Therefore, hypothesis four is rejected, and another signal of market inefficiency was observed. Since, the market efficiency theory indicates that the securities market should price in and fully reflect all publicly available information (Fama, 1970).

And by that, Egypt's stock exchange market seemed to be efficiently operating over the whole duration, however, it turned out to be inefficient when the 2016 structural breakout was excluded. Therefore, this is an insightful observation that the government interference over the whole sample data from 2010-2020 made the time series seem to be correlating. And that the

foreign exchange market, and the securities market have a significant relationship. However, when excluding the outlier of the economic political intervention in the market with the 2016 currency flotation, it came to be insignificant.

Table 5e: *Regression-EGX30 Index and Exchange Rate Model (2010-2016)*

Variables	Coefficients	SE.	T-statistic	Probability
FX Rate	0.313	0.532	0.588	0.56
C	0.001	0.010	0.099	0.92
R2	0.005	Mean dependent variance		0.00
Adjusted R2	-0.009	SD. dependent variance		0.08
SE. of regression	0.081	Akaike info criterion		-2.16
Sum squared residual	0.500	Schwarz criterion		-2.10
F-statistic	0.346	Durbin-Watson stat		2.21

(Source: Authors Findings, EViews)

Table 5h: *Regression-EGX30 Index and Exchange Rate Model (2017-2020)*

Variables	Coefficients	SE.	T-statistic	Probability
FX Rate	0.70	0.589	1.184	0.24
C	0.00	0.010	0.147	0.88
R-squared	0.03	Mean dependent variance		0.00
Adjusted R-squared	0.01	SD. dependent variance		0.07
SE. of regression	0.07	Akaike info criterion		-2.55
Sum squared resid	0.20	Schwarz criterion		-2.47
F-statistic	1.40	Durbin-Watson stat		2.28

(Source: Authors Findings, EViews)

In order to test hypothesis five if the independent variables lending rate, and yield on T-bills have a combined negative association with the dependent variable Egypt's stock exchange index, cointegration model was applied. However, before applying various cointegration methods, both variables, the T-bills rate and lending rate had to be modeled in two different ways. And, the whole time series was divided into two durations: 2010–2016 and 2017–2020. And the lag selection criteria test in Table 4, was chosen based on targeting to have just one cointegrating equation for each of the two variables (IR, and T-bills) over the two durations.

After the time series data split, the cointegration test showed the presence of one cointegrating equation for each of the independent variables over the two durations. Tables 6a, 6b show the presence of one cointegrating equation for each of the independent variables over

the first duration from 2010 until 2016. It indicates that, the variables are cointegrating and related in a linear pattern. Hence, if there is a short run shock, it will be adjusted in the long run. Which is reflecting a steady, linear long run linkage among the noted indicators. Consequently, there is a cointegrating dynamics among the stock exchange index, and yield on T-bills, as well as between the stock market index and lending rate.

Table 6a: *Cointegration Test (Maximum Eigenvalue) - Lending rate versus EGX30*

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.575391	67.67027	14.26460	0.0000
At most 1	0.042811	3.456592	3.841465	0.0630

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

(Source: Authors Findings from EViews Software)

Table 6b: *Cointegration Rank Test (Maximum Eigenvalue) T-bills versus EGX30*

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.525045	58.81824	14.26460	0.0000
At most 1	0.001428	0.112904	3.841465	0.7369

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

(Source: Authors Findings from EViews Software)

Following that, the vector error correction model (VECM) was implemented to assess the long-run and short-run dynamics and capture the relationship between the variables. And despite, reflecting a significant long-run relation between each of the independent variables, and the dependent variable in the VECM results, it came to be insignificant on the short run. The VECM model results in the long and short run are summarized in Table 7a for the two-time series (2010–2016) and (2017–2020) for each independent variable. It indicated that, over each of the time series on the short run for both T-bills yield rate, and lending rate, the relation was insignificant with the stock market index as more than 5% significance level, as seen in Tables 7b, and Table 7c. As well ~~as~~, on the long run over the duration between 2017 to 2020 for both independent variables, they had an insignificant relation with the stock market index, as not at the 5% significance level. However, on the long run, for the duration between 2010 and 2016, for

both lending rates, and T-bills yields rate there was a significant relation at 5%, and 10% for each variable, respectively, in Tables 7a.

Accordingly, hypothesis five is only accepted for the duration of 2010–2016 on the long run, indicating a stable negative relationship between the variables in the period from 2010–2016 before the repercussions of the November 3rd currency implementation, and the government's intervention backed by the IMF loan program. Which turned the market to be inefficient in the duration of 2017–2020 on the long run, after showing significance relations in 2010–2016. However, even the results showed a negative cointegrating long-run relationship between EGX30, and each of the lending rate, and T-bills yield rate. It is still not capturing the accurate interrelation between the variables, as insignificant short-run coefficients make it difficult to interpret how each variable will respond to short-term shocks in the model, as in Tables 7b, and 7c. And even with the presence of significant coefficients of the Error Correction Term (ECT), which reflect the speed of adjustment towards the long run equilibrium, as seen in Tables 7b and 7c, the short-run coefficients of the VECM model were insignificant.

Table 7a: *Summary of the VECM Model Findings*

Time Series: 2010-2016		***Time Series: 2017-2020***	
Short Run Equation		***Short Run Equation***	
Lending Rate	**T-bills yield rate**	**Lending Rate**	**T-bills yields rate**
Insignificant	Insignificant	Insignificant	Insignificant

Time Series: 2010-2016		***Time series: 2017-2020***	
Long Run Equation		***Long Run Equation***	
Lending rate	**T-bills yields rate**	**Lending rate**	**T-bills yields rate**
Significant at 5%	Significant at 10%	Insignificant	Insignificant

(Source: Author's findings)

Table 7b: *VECM Estimation for EGX using Interest rates (lending rate) – Short run dynamics – 2010-2016*

Variable	Coefficients	SE.	T-statistic	Probability
△ EGX-1	0.083	0.127	0.649	0.504
△ IR-1	-0.016	0.025	-0.634	0.2079
C	0.001	0.103	0.085	0.7468
ECM (-1)	-1.080	0.116	-9.333	0.000
R2	0.541	Prob. (F-statistic)	0.000	
Adj. R-Squared	0.523			
F-Statistic	29.108			
Durbin Watson Statistic	2.000			

(Source: Author's, EViews)

Table 7c: *VECM Estimation for EGX using T-bills yield rates – Short run dynamics – 2010-2016*

Variable	Coefficients	SE.	T-statistic	Probability
EGX-1	0.038	0.126	0.306	0.8109
TBR-1	-0.011	0.015	-0.762	0.3665
C	0.001	0.010	0.093	0.8045
ECM (-1)	-1.034	0.114	-9.101	0.0000
R2	0.518	Prob. (F-statistic)	0.000	
Adj. R2	0.499			
F-Statistic	26.520			
Durbin Watson statistic	1.973			

(Source: Author's, EViews)

5. Conclusion

This empirical research investigates the dynamic interplay of Egypt's macro and financial variables on the fluctuations of the stock market. From the perspective of examining the mechanism of fund allocation between debt-based and equity-based capital inflows along with a raise or a cut in Egypt's CBE monetary policy. The regression analysis showed an insignificant relationship between each of the independent variables, T-bills yield rate, lending rate, and exchange rate, and the stock market index as the dependent variable. The results also showed that, there was a significant relationship between the exchange rate and the stock market index from 2010 until 2020. However, when the period of 2016 currency fluctuations were adjusted by the data split, the relationship turned out to be insignificant. Which suggested that the financial market seemed to be correlated, but it is not as when the outlier was omitted, the financial market

changed to signal insignificance links between the variables. Consequently, the foreign exchange, and securities markets are not efficient, as statistically proven through ~~the~~ regression analysis, cointegration, and the VECM model.

Also, in efforts to explore the short- and long-term interactions among Egypt's stock exchange index (EGX30), Egypt's T-bills yield rate, and lending rate. The relation in the short-run was insignificant, while, and in the long-run was significant during the period from 2010 until 2017. Which is also limiting the ability to give a reliable model to estimate the possible channel of impact of Egypt's macroeconomic variables on stock market performance. And it reflects possible outcomes that Egypt's financial markets are not efficient as controlled by the government's budget financing needs. These findings contradict previous empirical research papers, which empirically proved that there is a significant joint negative impact on the short-run, and long-run of T-bills, 3-month deposit, and lending rates on Egypt's stock market returns over the duration of November 2004 and November 2017, as noted by Kamal (2018). Also, this paper results are not aligned with ~~both~~ (Alam & Uddin, 2009), and (Spiro, 1990) who indicated the presence of an inverse relationship between the performance of the stock market and ~~the~~ real interest rates.

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