

AN ECONOMETRIC ANALYSIS OF MONETARY POLICY AND STOCK PRICES IN NIGERIA: 1986-2008

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ABSTRACT

The focus of this paper is to investigate empirically the relationship between monetary policy and stock prices in the Nigerian stock exchange market (NSE). We employed time series data on money supply (MSU), interest (RA) and stock prices (SPR) spanning (1986-2008). This period was considered due to the liberalization of the financial sector. Using the method of co-integration and Error correction modeling (ECM), the study revealed that both MSU and IRA were rightly signed with SPR. Again, the error correction coefficient was relatively high, rightly signed and significant at 5% level. It is suggested that the SEC should be given enabling environment to monitor the activities of the market operators to bread efficiency. Above all, the monetary authorizes should formulate policies that will reduce the rising pace of inflation to encourage availability of investible funds for investors.

Keywords: *Monetary Policy, Stock Prices, Money Supply, Interest Rate, Market Operators, Investible Funds.*

INTRODUCTION

Monetary policy is one of the macroeconomic instruments with which nations (including Nigeria) do manage their economies. It entails those actions initiated by the Central Bank which aim at influencing the cost and availability of credits (Horvitz 1969, Nwankwo 1991 and Wrightsman 1976). It cover gamut of measures or combination of packages intended to influence or regulate the volume, prices as well as direction of money in the economy per unit of time. Specifically, it permeates all the debonair efforts by the monetary authorities to control the money supply and credits conditions for the purpose of achieving diverse macroeconomic objectives. In Nigeria, such powers are usually vested in the Central Bank of Nigeria (CBN) and the Federal Ministry of Finance (FMF).

Generally speaking, monetary policy formulation and implementation can be easily fashioned based on the duo of money supply and credit availability in the economy. As noted by Masha et al (2004), in ensuring monetary stability, the Central Bank through the deposit money banks implement policies that guarantee the orderly amount and development of the economy through appropriate changes in the level of money supply. The reserves of the banks are influenced by the Central Bank through its various instruments of monetary policy. These instruments include the cash reserve requirement, liquidity ratio, open market operations and primary operations to influence the movement of reserves. All these activities affect the banks in their credit operations and thus influence the cost and availability of loanable funds. Thus, the financial market provides a useful channel for the implementation of monetary policy.

The financial market is an organized institution that is created for the sale and purchases of funds. It consists of the money and capital markets. Money market is that which deals in short-term securities. On the other hand, capital markets are that part which specializes in the mobilization of long-term funds for the purpose of rapid economic growth and development (Ajie, 2006). A capital market comprises of a primary and secondary markets. A primary market is a market for new issues of securities. But the secondary market consists of exchanges and over-the-counter market where securities

are bought and sold for their issuance in the primary market. Trading on the Nigerian capital market is coordinated by the Nigerian Stock Exchange (NSC), (Nwankwo, 1991; Gbosi, 2002:7 and Odoko et al, 2004). On a general note writes Al-Faki (2005), the capital market is very vital to the growth; development and strength of any country. It supports government and corporate initiatives, finances the exploitation of new ideas and facilitates the management of financial risk. This is why it must receive more attention as we continue to reform the economy.

In sum, a well behaved capital market can be achievable if a country's macroeconomic policies (especially monetary policy) are well formulated and implemented per unit of time. Thus, there is a linkage between monetary policy and the annual closing index values (stock prices). Stock index is a means of measuring stock market trends and performance. It is used as a barometer for monitoring upswings and downswings in the stock market (SEC, 2006:15) Anyanwu (1993:147) opine that the choice of a monetary policy target variable requires some theoretical hypothesis as to the interrelationship between the target variable and the ultimate goal variable. Though the candidates for target variable include those for the indicator variable - interest rate, free reserves, the money supply, and total reserves - the most likely ones are the monetary aggregates (such as money supply) and interest rates.

The swings in the stock prices can either make or mar the lofty place occupy by the capital market in the economic growth and development of a country. Batra (1988) alludes to the fact that the economic history of the United States of America and its economic depression of 1930s move in tandem with stock market crash: each depression was preceded by a stock market crash. Batra's (1988) study was predicated on the notion that the Great Depression of the 1930s caused the stock market crash of 1987. This view was later collaborated by Akinnefesi (1988) using Nigerian data. In his view, the 1987 crash was caused to a large extent by high level of stock speculation following tight monetary policy (with rising interest rates) and increasing budget and trade deficits.

Despite the prompt intervention and resuscitation of the market, the wealth cost of the crash is enormous. For instance the Dow Jones Industrial Average (U.S, Share price Index) dropped by 515 which entailed a chunky

five hundred billion dollars (\$500 billion) loss of wealth from the market value securities market for poosh care. Also, at the international level, on that fateful day, (October 19th, 1987), 50% decline in share resulted in Japan from what happened in other developed capital markets (Financial Times, October 20, 1987). The above instances centred on developed industrial economies but can be extended to the developing ones as a result of globalization. This implies that the shield enjoyed by capital markets in most developing countries (Nigeria inclusive) due to less degree of internationalization will be eroded. In Nigeria, the CBN (2007) in its FSS 2020 compounds this by advocating that it hopes to transform the economy into the natural destination in West Africa for financial products and services, and also the ideal point for channeling investments to other parts of the continent (See Tell Magazine, 2007).

Batra (1988) adds that besides that occasioned by international spill-over effects, stock market crash could originate even in a less developed capital market. This is could be very potent in a developing economy with highly skewed income distribution (as in Nigeria) as there is a positive relationship between income and wealth inequality on one hand; and stock speculation on the other. Consequently, economic fine-turnings are required to prevent an economy from derailing into the catastrophe of stock market crash and the consequences of depression that can be caused by such behaviour. The Nigerian capital market had its modest beginning in 1946 with the issuance of the First Nigerian Government Registered Stock 1956/61 by the colonial government and managed by the Accountant-General. This was followed in 1959 by the First Federal Government of Nigeria (FGN) development stock and the floating of government development loan stock in 1961. The management of the federal government development stocks was transferred to the CBN in 1959 and later to the Lagos Stock Exchange when it was opened in June 1961 (CBN, 1979).

According to Ebajemito et al (2004), the capital market has become a veritable source of investment finance in the last decade. The growing importance, of this source of fund reflected the adverse market condition of pricing inefficiencies in the credit market, which lead to prohibiting interest rate in the loanable fund market. Consequently, companies resorted to equity

funds, which are usually cheaper and do not carry obligatory repayment terms. Historically, the intervention into the stock market crash by U.S monetary authority using an expansionary monetary policy option sincerely calls for attention. In fact, this approach has resonated, the need for economic managers to fine-tune their monetary policies. The stimulation of stock prices is predicated on monetary policy which works through the monetary portfolio model. In the view of Anyanwu (1993), portfolio simply refers to the securities held by an investor or the commercial paper held by a bank or other financial institutions. It could be a group of investments - a set of individuals' equities, bonds and other marketable assets the investor owns. Jessup (1982) adds that portfolio management involves principles and procedures by which to manage such sets of assets.

In recent years, a myriad of empirical works have gone forth to reconcile this seemingly conflict and to ascertain the exact nature of the relationship between monetary policy and stock prices in an economy. Like other studies, opinions always differ as to the impact of monetary policy aggregates on the stock prices. In Sprinkel's (1964) seminal work, he attempted to reconcile the relationship between money supply and stock prices using a graphical analysis of peaks and troughs. Based on visual observation of the data, he concluded that there exist changes in money supply which lead to changes in stock prices by about two months on the upturns and by about fifteen months on the downturns. In his view, both theoretical argument and empirical evidence strongly suggest that future liquidity change will produce some useful guidance to future investment timing decision.

Reilly and Lewis (1971) employed moving averages of money supply data. By regressing technical changes in stock prices on the current and five lagged changes in money supply they observed a weak relationship. But based on the statistical significance of the first two lagged terms they concluded that irrespective of whether the method is technically graphical or regression analysis, the same result is to be obtained. That is, those changes in money supply give rise to changes in stock prices. Alluding to the works of Reilly and Lewis (1971) above, Hamburger and Kochin (1972) attempted to use an Almon lag scheme in relating changes in stock prices to the independent variable of changes in money supply growth rates. The result of their findings equally confirmed the earlier work.

Again, Kraft, J. and Kraft, A. (1977) made use of Sims test for unidirectional causality over four months to determine channel of influence between money supply and stock prices. The regression of stock prices (levels and percentage changes) on future money (levels and percentages) was significant while that of money supply on future stock prices was not. They therefore concluded that causality does not run from money supply to stock prices and changes in money supply do not lead movement in stock prices. Batra's (1988) study into the cause of the US money market crash concluded that monetary authority intervened with an expansionary monetary policy. This policy, together with reduction in stock market trading hours, annulled to Wall Street fiasco and revived the market. The announcement of increase money supply signaled a robust stock trading.

Nishat (2004) analyze long term relationship between macroeconomic variables and stock price. He used CPI, IIP, money supply and foreign exchange rate as explanatory variables. In this paper, result indicates a causal relationship between the stock price and economy. He used Karachi stock exchange 100 index price for 1974 to 2004. Analysis of his work found that industrial production index is largely positively significant while inflation is significantly negatively related. Gay (2008) used MA method with OLS to find relationship between stock prices and macroeconomics variables effects on four emerging economies India, Russia, Brazil and China. He used oil price, exchange rate, and moving average lags values as explanatory variables; but results are insignificant which shows inefficiency in market. He concluded that these economies are emerging so domestic factors influence outside factors-oil price and exchange rate.

Sharma and Singh (2007) used rate of interest, exchange rate, industrial production index, money supply and inflation as explanatory variables while AR and MA as served as explanatory variable to remove effects of non stationary in the data. His finding revealed that lags values are highly correlated with current prices suggest speculation in market. Exchange rate, industrial production index and money supply is significantly related, he took data set from 1986 to 2004. From the foregoing discussions, we note that the bulk of studies centred on the US stock market sequel to the October 19th, 1987 crash and other countries. Also, these studies often times exclude

the impact of interest rate - a major component of monetary policy aggregate. However, in Nigeria, Akinnifesi (1988) looked at the effect of interest rate deregulation (not the effects of interest rate) on stock prices. Specifically, this study includes the effect of money supply on stock prices.

Furthermore, Kalar (2002), using Nigerian data investigated the statistical analysis of the relationship between money supply and stock prices. In his view, there exists a significant relationship using the portfolio model. By and large, irrespective of the angle either of the scholars above view the relationship between monetary policy aggregates - money supply and interest rates - and annual closing index values (stock prices), the basis centres on theoretical perspectives. Accordingly, these theories include efficient market theory (EMT), fundamental/Technical Analysis (FTA) and more recently, modern portfolio theory. We look at each of them in the next section.

Efficient Market Theory (EMT): This is generally regarded as a situation where share prices fully reflect all available information on the company. In order words, the theory assumes that such information will be correctly interpreted by the investors in their investment decisions. Given this fact, it is therefore expected that in an efficient market, information will be quickly and widely disseminated as cheaply available to all investors. Simply put, price change of course will only occur at the break of new information to the market which could affect future profitability of the company and consequently future dividends (Iyinbor, 2006).

Fundamental Market Analysis (FMA): Aside efficient market theory, there exist the fundamental analysis (FMA). The proponents posit that a myriad of factors like earnings per share of a company, the price and earnings multiple, book value (ie company's assets less its liabilities), leverage, dividend yield and a host others affect the market. O'Neil Wyss (2001) adds that to evaluate the overall environment in which the company operates, you should also examine cultural and political trends, activity within the industry, and the general direction of the economy. Arising from the above, companies that are in better financial conduction will be more competitive within their industry and will be capable of exploiting upcoming business opportunities. When evaluating a stock before purchase, successful advisors scrutinize a variety of financial indicators.

Technical Analysis (TEA): This process of investment theory ignores the school of fundamental analysis and uses charts and graphs to make decisions. Technicians like to analyze price movements and chart patterns from the past in order to draw conclusions about future buying and selling. They believe that the market is much more psychological than logical when it comes to trading securities, O'Neill Wyss (2001). A cursory look at Technical Analysis shows that their emphasis centres on the precise point in time to buy securities. Thus, it looks forward to the up and down trends in stock's price. This contraction and expansion is due to the type of monetary policy so adopted in the economy.

Modern Portfolio Theory (MPT): The MPT was enunciated by Markowitz (1959). He assumed that most people want to be cautious when investing and that they will take the smallest possible risk in order to obtain the greatest return. This theory is based on two assumptions: (i) the history of investment activity in major asset classes tends to repeat itself, and (ii) not all assets go up and down in tandem. This strategy is well suited for a variety of investors because they can choose the level of risk that is best suited for their confront level. Three models are available for this purpose:

- (a) **Conservative:** Designed for lower risk with a heavier concentration in bonds or equity income funds.
- (b) **Moderate:** Designed for medium risk with a balance between different types of stock and bond funds.
- (c) **Aggressive:** Designed for higher risk with a heavier concentration of stock or growth funds (O' Neill Wyss, 2001).

In sum, the EMT simply dwells on the availability of information to investors on the stock market. The FMA centres on fundamental factors like leverage, value of bonds, earnings per share and more. The TEM employs chart's and graphs in displaying the movement of stock prices. Finally, MPT seem to integrate the other theorists. To this, the theoretical framework for this study centres on the MPT. This is predicated on its ability to accommodate conservative, moderate and aggressive risk takers. The buying and selling of all categories of securities can easily determine the stock prices in the economy. Above all, it can be easily undergo re-balancing. O'Neill Wyss (2001) notes that this strategy takes money out of assets that have risen in

value and reinvest the money into assets that are relatively underpriced. In effect, investors are selling high and buying low, just as market gurus say that they should do. However, this concept works well in a portfolio whose investors use a buy-and-hold approach for a portion of the assets. This strategy repositions cash in major asset classes in order to buy low and sell high. As we enter the 21st century, serious investor needs to structure their portfolios in order to prepare for the challenges that lie ahead. The MPT concept is designed to strengthen existing assets and to help build more capital with confidence in the future.

METHODOLOGY

The stock index value (Stock Prices (SPR)) is a means of measuring stock market trends and performance (SEC, 2007). The stock prices data was obtained from the Nigerian Stock Exchange Commission (SEC) - briefs and capital bulletin. It was used as the dependent variable. Money Supply (M2) is defined as currency outside banks plus demand deposits. The data was sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin (various issues). Interest Rates were employed in its strict economic sense as the cost of borrowing money. The rate used was the prime lending rate. The data was obtained from the CBN too.

Using Nigeria's money supply, interest rate and annual closing index values (stock prices) from the time series variables, an ordinary least square (OLS) method was used to estimate them. For robustness, an appropriate estimation technique was applied. Precisely, the time series properties of the data were examined by carrying out unit root test as well as Johansen co-integration test. This was to avoid spurious regression caused by non-stationary of some time series data. Gujarati (1995) opine that in practice, then, it is important of find out if a time series possesses a unit roof. The theory of co-integration as advanced by Granger (1981) and Engle and Granger (1987) were used to address the issue of integrating short-run dynamics with the long-run. Our model follows Mohammad, Hussian and Ali (2009) with slight modifications to analyse the relationship between the variables. Precisely, the variables adopted in this model centres on SPR, MSU and IRA. This enables us to ascertain the impact of monetary policy on stock prices. We have the model in the form:

$$SPR = \phi_0 + \phi_1 MSU + \phi_2 IRA + U_t \quad - \quad - \quad - \quad - \quad (1)$$

(A priori ϕ_1 and $\phi_2 < 0$)

Where:

- ϕ_0 = constant
- ϕ_i = coefficient of variables while
- U_t = normally distributed error term.

RESULTS AND DISCUSSION

The figures documented on table 1 show that money supply has been on the increase from N21916million in 1986 to as high as N86153million in 1991. This phenomenal increment can be attributed to deregulation of the financial sector. As noted by Gbosi (2002), financial sector liberalization (that is to say, deregulation) was undertaken in order to promote the use of market-based instruments of monetary control for improved financial sector efficiency. Furthermore, between 1992 and 1998, it rose from N53115.2million to about N207061.8million. Following the advent of democracy, its figures increased sharply from N306654.9million in 1999 to as high as N2695342.1million in 2008. This increment is not surprising since an increase in public sector size attract huge expenses.

Again, the stock index value (SPR), with its base point of 100 - 1984, has grown tremendously over the years. For instance, it grew from N168.8 points in 1986 to 5672.6 points in 1998. As at 2000, it was 8111 points before reaching 38421.8 points in 2008 (Table 1). Like money supply and stock prices, interest rates kept fluctuating within double digits. Specifically, during expansionary monetary policy we expect a decrease in interest rates. However, table 1 shows that this is not so in Nigeria. Except in 1992 of 29.8%, the rates seem undulating. For instance, between 1999 and 2008, on the average, the rate fluctuates between 21.3 and 17.1%.

Accordingly, an increase in IRA attracts an increase opportunity cost of holding money which can be substituted between stock and interest bearing securities and cause falling stock prices and another reason for falling stock prices is that when increase in interest rate, it can course increase in cost of production. On the other hand, the direction of impact of monetary growth is negative because increase money supply increase in inflation, so people maintained their real cash balance. So they sell share and other asserts which

cause decline in share prices but on other hand increase monetary growth reduce interest rate which reduce cost of capital and increase earnings of corporation. So we have found ambiguous effects (Mohammad et al, 2009). Table 1 below presents Nigeria's money supply, interest rate and annual closing index values (stock prices) from 1986-2008.

Table 1: Nigeria's Money Supply, Interest Rates and Stock Prices

Year	MSU (N'm)	IRA (%)	SPR (Index)
1986	21916	10.5	163.8
1987	32804	17.5	190.9
1988	36400	16.5	233.6
1989	38307	26.8	325.3
1990	64903	25.5	513.8
1991	86153	20	783
1992	53115.2	29.8	1107.6
1993	79725.8	18.3	1543.8
1994	97553.4	21	2205
1995	117349	20.1	5092
1996	142869.1	19.7	6992
1997	161108.4	13.5	6440.5
1998	207061.8	18.3	5672.6
1999	306654.9	21.3	5266.4
2000	398348.4	18	8111
2001	499161.5	18.3	10963.1
2002	653241.2	24.4	12137.2
2003	759632.5	20.7	20128.9
2004	932930.1	19.2	23844.5
2005	1089450.3	17.95	24085.8
2006	1747252.8	16.9	33189.3
2007	2693554.3	16.5	57990.2
2008	2695342.1	17.1	38421.8

Note: Prime rates are use for interest rate (IRA), the 1984 base year was used for stock prices (SPR) and (MSU) is the quasi money (M2).

Sources: (i) SEC, Annual Report and Accounts (various issues).
(ii) CBN (2008): "Statistical Bulletin" Vol. 18.

Table 2 shows the result of the static (short run) regression for the stock price model using log-linear. The R² of 0.975 calculated implies that 98 percent of the total variation in the model is explained by the regressors. The remaining 2 percent is accorded factors exogenous to the model but covered by the error term. Again, the F-statistic computed equally shows that the overall model is significant. Also, the Dw calculated is 0.695 and far from 2, which means that there is presence of serial autocorrelation.

Table 2: Short-run Regression for Stock Prices Model at Log-linear

Variable	Coefficient	t-value
C	-4.64	-3.40
log(MSU)	1.03	25.45
log(IRA)	-0.16	-0.43

R² = 0.975, F-statistic = 370 and Dw = 0.695

Source: Authors' Computation.

Due to the presence of high R², F-ratio as well as existence of serial autocorrelation, we proceed to test for unit root in order to make the variables stationary. This is done in the Spirit of Dickey and Fuller (1979). The result is documented in table 3.

Table 3: ADF Stationary Test Result on Variables

Variables	Level/ Difference	Calculated ADF	ADF Critical 5%	Remark
SPR	Level	-1.677183	-3.0114	Non-stationary
	First Difference	-3.279313	-3.0199	Stationary
MSU	Level	-1.670043	-3.0199	Non-stationary
	First Difference	-3.015008	-2.0294	Stationary
IRA	Level	-2.749555	-3.0114	Non-stationary
	First Difference	-4.111065	-3.0199	Stationary

Note: The ADF tests for H₀X_t as 1(1) against H₁X_t as 1(0).

Source: Authors' Computation.

The results of the unit root test above indicate that all the variables were stationary at first difference operation 1(1) at 5% critical value of ADF. Thus, we proceed to conduct the long-run relationship between the variables. The result is shown on table 4.

Table 4: Results of Johansen Co-Integration Test

Eign Value	Likelihood Ratio	5% Critical Value	1% Critical Value	Hypothesized No. of CE(S)
0.958625	93.17948	29.68	35.65	None**
0.802420	39.03300	15.41	20.04	At most 1**
0.490563	11.46563	3.76	6.65	At most 2**

X(**) denotes rejection of the hypothesis at 5% (1%) significance level
 L.R test indicates 3 cointegrating equation(s) at 5% significance level

Source: Authors' Computation.

Using the Johansen co-integration multivariate test, all the variables were co-integrated at 5% level of significance. Furthermore, we employ the error correction mechanism (ECM) to determine the equilibrating error from period to period. This is done in the spirit of general-to-specific approach. That is, we begun with the estimation of an over-parametised error correction model from where a parsimonious error correction is obtained as documented on table 5.

Table 5 shows that 69% of change in SPR was explained by the proxies. Also, the overall regression is significant at 5%. The computed value of Dw of 1.71 portent a minimal level of serial autocorrelation. Both MUS and IRA are rightly signed with SPR. Moreso, the error correction coefficient was relatively high, rightly signed and significant at 5% level. Both lag (lag 1 and 2) value of money supply seems insignificant in explaining change in stock prices. Thus, it implies that exogenous factors exist in the model. Amongst these factors is inflation and had been widely noted by Friedman (1966), Johnson (1973) and Anyanwu (1993). For them, inflation is always and everywhere a monetary phenomenon. This is summarised in the money transmission phenomenon. Again, the current value of IRA has an indirect relationship with SPR and insignificant at 5% level. This is in tandem with Adebeye (2004) that a higher real interest rate encourages the people to substitute consumption for saving (the substitution effect). On the other hand; the higher interest rate on savings makes savers to achieve their saving targets lower stock of savings (the wealth or income effect).

Table 5: Parsimonious Error Correction Model for SPR

Dependent Variable:	D(LOG(SPR))
Method:	Least Squares
Date:	01/25/10
Time:	18:42
Sample(adjusted):	1990 - 2008
Included observations:	19 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.207017	0.204499	-1.012313	0.3331
D(LOG(SPR(-1)))	0.488499	0.272681	1.791465	0.1007
D(LOG(SPR(-3)))	0.328062	0.255241	1.285304	0.2251
D(LOG(MSU))	0.976821	0.311321	3.137662	0.0094
D(LOG(MSU(-1)))	-0.374000	0.534793	-0.699336	0.4989
D(LOG(MSU(-2)))	0.420409	0.520656	0.807460	0.4365
D(LOG(IRA))	-0.357613	0.269215	-1.328357	0.2110
ECM(-1)	-0.637286	0.279406	-2.280861	0.0435
R-squared	0.688920	Mean dependent var		0.251139
Adjusted R-squared	0.490961	S.D. dependent var		0.291656
S.E. of regression	0.208088	Akaike info criterion		-0.006151
Sum squared resid	0.476306	Schwarz criterion		0.391508
Log likelihood	8.058431	F-statistic		3.480103
Durbin-Watson stat	1.713206	Prob(F-statistic)		0.032092

CONCLUDING REMARKS

The main objective of this paper is to empirically investigate the relationship between monetary policy and the stock prices in Nigeria for the period 1986-2008. This was chosen to enable us ascertain how the financial sector liberalization which started in 1987 had actually impaired on stock prices. Also, there had been adverse condition of pricing inefficiencies in the credit market which lead to prohibiting interest rate in the loanable fund market. Thus, we used annual time series data on monetary policy aggregates - money supply and interest rate-as well as stock prices. Based on the method of co-integration and error correction method, the result shows that there

was high R², F-ratio and existence of serial autocorrelation at the short-run. This prompted the test for long-run properties.

The unit root test show that all the variables are stationary at first difference operation at 55% level. Thereafter, the variables became co-integrated at 5% level; hence, the ECM was tested. The result of the parsimonious error correction points to the fact that SPR was explained by the proxies. The overall model was significant with minimal serial autocorrelation. Both MSU and IRA are rightly signed with SPR. However, it was discovered that MSU seems insignificant in explaining change in SPR. Thus, it was attributed to exogenous factor like inflation, financial sector instability, External sector instability and more. Above all, IRA was significant at 5% level.

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