

The Determinants of Stock Returns in the Algiers Stock Exchange Using the Arbitrage Pricing Theory: An Empirical Study on BIOPHARM Stock
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Abstract :

This article aims to know the factors affecting the return of BIOPHARM's stock, listed on the Algiers Stock Exchange, by using the Arbitrage pricing model, and by using the multiple linear regression model, the effect of money supply, crude oil futures price, with a positive relationship, and the effect of the interest rate of treasury bonds in relation to Reversible. These results are consistent with many field studies. However, the fluctuation of the exchange rate and the parallel market for the exchange rate affected some variables.

Mots clés:

modèle de tarification de
l'arbitrage,
Action de BIOPHARM,
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Résumé:

Cet article vise à connaître les facteurs affectant le rendement de l'action BIOPHARM, cotée à la Bourse d'Alger, en utilisant le modèle de tarification de l'arbitrage, et en utilisant le modèle de régression linéaire multiple, l'effet de la masse monétaire, du prix à terme du pétrole brut, avec un relation positive, et l'effet du taux d'intérêt des bons du Trésor par rapport à Réversible. Ces résultats concordent avec de nombreuses études de terrain. Cependant, la fluctuation du taux de change et le marché parallèle du taux de change ont affecté certaines variables.

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1- The introduction:

In 1976 Stephen Ross introduced a model that is concerned with the valuation of capital assets, as an alternative to the capital asset pricing model, as the latter assumes that markets are effective, while the Ross model assumes that markets mistake stock pricing before they are corrected and returned to their fair value. This model has been called an arbitrage pricing model.

While the capital asset pricing model takes one factor for evaluation, which is market risk, the weighted pricing theory takes into account a set of factors, such as gross national product, market indicators, the exchange rate, inflation rate, treasury bond interest rate, trade balance, and general budget, among others. Of the macroeconomic factors.

In order to apply the average pricing model to the Algerian financial market, the BIOPHARM stock price, which was quoted on the Algiers Stock Exchange, was taken to find out the factors affecting BIOPHARM's returns.

Therefore, the problematic of this empirical study is:

What are the determinants of BIOPHARM stock returns in the Algiers Stock Exchange?

The previous problem is addressed in two main axes, namely:

- Theoretical side, interested in giving an overview of the weighted pricing model;
- The applied side, which includes an empirical study on the returns of the BIOPHARM stock, following the methodology of the empirical study.
- Analysis of the results.

2- Theoretical framework for the arbitrage pricing model (APT)

The arbitrage pricing model for financial assets is designed by Ross (1976) as an alternative to the capital asset pricing model, based on several assumptions in order to form an arbitrage portfolio.

2-1- Presentation of arbitrage pricing model

The arbitrage pricing model for capital assets was introduced by Stephen Ross (1976) (Ross, 1976, p. 341), where Ross proposed it as an alternative to the mean/variance model for capital asset pricing, a model that has become a major analysis tool for explaining the observed phenomena in the capital markets for risky assets.

The Arbitrage pricing theory is similar to the theory of capital asset pricing in some of the assumptions, but it differs in the principle of conclusion. The capital asset pricing model depends on an efficient market portfolio, and it is among the most criticisms of Sharp's model and his colleagues. The financial markets are either incompetent for long periods, This means that investors reject the opportunities available for profit in the long time, or that financial markets are efficient in the long time, but there

is a flaw in the theory of capital asset pricing. Ross's theory relies on an arbitrage portfolio that does not earn any additional wealth or additional investment for it.

Ross emphasized in the arbitrage pricing theory that it is necessary to go to the main sources of risk and not reduce them to one intermediary source, and he also emphasized that the fluctuations in the returns of the market portfolio result from several factors and not a single factor.

2-2-.Assumptions of arbitrage pricing model (APT)

The arbitrage pricing model suggests the existence of several economic factors that affect the returns of financial assets, and these factors are divided into two parts, one that includes a number of factors that affect all financial assets without discrimination, which are systemic factors, and factors that affect a financial asset or a special homogeneous group of financial assets. And the financial assets returns to those factors respond to an increase or decrease. This proposal is the principal and basic premise of a weighted pricing model.

The arbitrage asset pricing model is based on several assumptions, partly similar to the Marcowitz portfolio theory and the capital asset pricing theory.

The Arbitrage Pricing Theory operates with a pricing model that factors in many sources of risk and uncertainty. Unlike the Capital Asset Pricing Model (CAPM), which only takes into account the single factor of the risk level of the overall market, the arbitrage pricing theory model looks at several macroeconomic factors that, according to the theory, determine the risk and returns of the specific asset?

These factors provide risk premiums for investors to consider because the factors carry systematic risk that cannot be eliminated by diversifying.

The arbitrage pricing theory suggests that investors will diversify their portfolios, but that they will also choose their own individual profile of risk and returns based on the premiums and sensitivity of the macroeconomic risk factors. Risk-taking investors will exploit the differences in expected and real returns on the asset by using arbitrage. (Zvin, Ales, & Alla, 2009, p. 324)

The assumptions can be summarized as follows:

- The theory is based on the principle of capital market efficiency and hence assumes all market participants trade with the intention of profit maximization
- It assumes no arbitrage exists and if it occurs participants will engage to benefit out of it and bring back the market to equilibrium levels.

- It assumes markets are frictionless, i.e. there are no transaction costs, no taxes, short selling is possible and an infinite number of securities is available.

2-3- Arbitrage pricing theory model

Depending on the main hypothesis of the model, according to which there are two parts that can be on the returns of financial assets, a section that includes systemic factors and a special factors section, you can formulate an arbitrage pricing model as follows:

$$R_{it} = E_t + \beta_{i1}f_{1t} + \beta_{i2}f_{2t} + \dots + \beta_{ik}f_{kt} + \xi_{it}$$

Where:

- R_{it} : The returns, recorded at a later time in time t, for the origin calculated in time t-1, t.
- β_{i1} : Asset sensitivity coefficient i for the first factor, or estimated first risk measure.
- β_{ik} : Asset sensitivity coefficient i for factor k, or the estimated k risk.
- f_{1t} : The value given to the first factor in time t.
- f_{kt} : The value given to the k factor in time t.
- ξ_{it} : Unanticipated returns due to systemic factors in time t.

With: $E(f_{kt}) = 0$, $E(\xi_{it}) = 0$ and $E(\xi_i, \xi_j) = 0$.

The portfolio returns is equal to the sum of the weighted returns by the relative weights of all the financial assets that make up this portfolio w_i . And considering that $\beta_{ik} \neq 0$, The portfolio returns can be written as follows:

$$R_p = (w_1R_1 + w_2R_2 + \dots + w_nR_n) + (w_1\beta_1 + w_2\beta_2 + \dots + w_n\beta_n)F + (w_1\xi_1 + w_2\xi_2 + \dots + w_n\xi_n)$$

Considering that F is a ray of irregular or private factors affecting the returns on financial assets.

It is noted from the previous mathematical formula, the case of uncertainty is found in the third part of the equation, which can be dwindled in the large and varied portfolios.

This analysis is consistent with the capital asset pricing model, but with a fundamental difference, the arbitrage pricing model assumes that the beta coefficient β as an indication of market risk is the only factor that expresses the regular risk of financial assets, while the arbitrage pricing model assumes multiple sources of risk even if the relationship is linear In both models.

3- The empirical study

After examining the theoretical aspect, a pilot study will be conducted on the returns of the BIOPHARM stock listed on the Algiers Stock

Exchange, in order to find out the factors affecting the returns on the BIOPHARM stock on the Algerian Stock Exchange.

3-1- Methodology

In the methodology, BIOPHARM will be presented, then previous empirical studies, data, variables and statistical description.

3-1-1- Presenting the company of study

BIOPHARM, Algerian pharmaceutical laboratory, is an industrial and commercial group which has invested at the beginning of the 1990s in the pharmaceutical sector and which today has a production unit conform to international standards and a distribution network to wholesalers and pharmacies.

After nearly two decades of intense activity, BIOPHARM achieves an important stage of its development which required reorganization.

BIOPHARM adapts gradually its organizational structure as a group around its different occupations:

- The production of drug across BIOPHARM, which remains the core of the Group;
- The wholesale distribution of pharmaceutical products through BIOPHARM distribution;
- The distribution to pharmacies through BIOPURE;
- Promotion and information Medical, through HHI (Human Health Information);
- The logistics for the pharmaceutical industry through BIOPHARM LOGISTIC.

In addition, and in order to ensure its development and strengthen its governance and managerial skills, BIOPHARM has opened its capital to an international consortium. This formula of association encourages and committed, at the same time, the partners in the long-term development of the Group.

BIOPHARM entered the Algiers Stock Exchange in April 2016, where it offered 20% of its capital, and the number of stocks is 5,104,375 stocks valued at DZD 1102.5 per stock for the wage and 1225 Algerian Dinars for the non wage earners.

3-1-2- Previous empirical studies

Macroeconomic indicators are considered as independent variables that clearly affect the returns of securities. The following are the macroeconomic variables in previous empirical studies (MEKHDAR, 2020) and their effect on securities.

3-1-2-1- Inflation

Inflation is a quantitative measure of the rate at which the average price level of a basket of selected goods and services in an economy

increases over some period of time. (BABA & ADJRI, 2017) It is the rise in the general level of prices where a unit of currency effectively buys less than it did in prior periods. Often expressed as a percentage, inflation thus indicates a decrease in the purchasing power of a nation's currency.

Many empirical studies have proven a direct correlation between inflation and stocks, (LAACHACHI, BEN KADOUR, & YEBRIR, 2019) because companies increase the prices of their products in times of inflation while many of their obligations remain constant, such as distributing dividends to preferred stocks, rents, and others. On the other side, many researchers emphasized the inverse relationship between inflation and stock prices, because inflation leads to higher interest rates, which motivates investors to go towards bonds, making bonds more preferred than stocks.

Fama (1971) and Balduzzi (1955) (Balduzzi, 1995, p. 74) confirmed an inverse relationship between inflation and stock prices, while Kaul (1987) (Kaul, 1987, pp. 254-255) established a direct but very weak relationship.

3-1-2-2- Money supply

The money supply is the entire stock of currency and other liquid instruments circulating in a country's economy as of a particular time. (DJEMAI, MENAGOU, & KARA, 2016) The money supply can include cash, coins, and balances held in checking and savings accounts, and other near money substitutes. Economists analyze the money supply as a key variable to understanding the macroeconomic and guiding macroeconomic policy. (McConnell & Brue, 2008, pp. 229-231)

The relationship between money supply and stock prices is clear through the central bank's policy. If the central bank reduces the required reserve ratio from commercial banks, this policy will lead to an increase in liquid funds with banks, which leads to a decrease in the cost of borrowing, and encourages investment, including increasing the demand for Investing in stocks and their high prices.

Then, an increase in the money supply leads to an increase in liquidity, thus providing funds for consumption and investment as well.

The Positive relationship between money supply and stock prices has been confirmed by several empirical studies, among them Vejzagic and Zarafat (2013) (Vejzagic & Zarafat, 2013, p. 97).

3-1-2-3- Balance of trade

The balance of trade is the difference between the value of a country's imports and exports for a given period. The balance of trade is the largest component of a country's balance of payments. Economists use the BOT to measure the relative strength of a country's economy. The balance of trade is also referred to as the trade balance or the international trade balance.

The large trade deficit indicates a slowdown in GDP growth, and if the deficit is contradicted by exports, this indicates a large activity for

companies, and thus an expected increase in returns, and this variable plays a significant role in small economies compared to large economies. (Grigoris, 2008, p. 9)

3-1-2-4- Exchange rate

An exchange rate is the value of one nation's currency versus the currency of another nation or economic zone. (Delong & Olney, 2006, p. 20) Exchange rates affect the volume of exports and imports. When the value of exchange rates increases, the purchasing power decreases significantly, and thus savings are transferred to consumption rather than investment, which leads to a decrease in stock prices and capital returns.

Thus, the relationship between the exchange rate and stock returns is assumed to be negative. (Issahaku, Ustarz, & Domanban, 2013, p. 1046)

3-1-2-5- Interest rate

Interest rates and their future expectations are among the most important inputs to an investment decision. (KHIARI & BOUDEH, 2016) If an individual expects an increase in interest rates, he will not move to long-term investment, and vice versa.

In a study by Maysami and all (2004), it confirmed an inverse relationship between interest rate and equity returns, due to the following: (Maysami, Howe, & Atkin, 2004, pp. 53-54)

- The high interest rates affect the level of corporate profits due to the high cost of debt, and, consequently, the decrease in what investors want to pay to buy the stocks of these companies due to lower expectations regarding dividends.
- High interest rates indicate a shortage of money in the economy, which causes investors to switch from stocks to treasury bonds, which makes the bond market more attractive to investors, and thus low volume of demand for stocks.

3-1-3- Data

Through the Algiers Stock Exchange, monthly data were obtained related to the BIOPHARM average monthly price, using the bi-weekly price average, and then the BIOPHARM stock returns was calculated as follows:

$$R_{it} = \frac{Cours_{it} - Cours_{i,t-1}}{Cours_{i,t-1}}$$

Where:

- R_{it} : BIOPHARM stock returns in time t.
- $Cours_{it}$: BIOPHARM stock price at time t.

Consequently, BIOPHARM stock rates have been obtained from May 2016 to the end of 2019

As for the other data, the monthly inflation rates for Algeria were obtained for three years, from January 2016 to December 2019. Likewise

for the exchange rate, according to Bank of Algeria publications, the average monthly average exchange rate corresponding to the US dollar was obtained (given that exports and The gross national product is calculated in US dollars) for a period of three years, and also through Bank of Algeria's publications, the money supply of Algeria was calculated from January 2016 to March 2019, and the monthly interest rate of treasury bonds (BTC 26 Weeks), from January 2016 to September 2019.

Considering that more than 98% of Algeria's exports are represented in hydrocarbons (BASDAT, 2016) (and given the inability to obtain the monthly trade balance during the study period), the price of crude oil futures contracts was approved instead of exports, and the average monthly price was obtained from January 2016 to December 2019. Accordingly, the study time period (according to the available data) will be from May 2016 to March 2019, which is monthly data, i.e. the number of views is 35 views.

3-1-4- Variables

Depending on the available data, the variables will be as follows:

- MM: Monthly money supply in Algeria (unit 10^{12} Algerian dinars);
- TC: Average monthly exchange rate of the US dollar against the Algerian dinar,
- BT: The interest rate of the monthly treasury bonds (the free-risk rate);
- IN: Monthly inflation rate ;
- WTI: Monthly average futures prices for crude oil contracts;
- R: The monthly average returns per stock of BIOPHARM on the Algiers Stock Exchange (dependent variable).

The following table shows descriptive statistics of the variables.

Table No 1 Descriptive statistics of the variables

	N	Min	Max	Average	Standard deviation	Variance
R	35	-,098639	,165079	-,00081129	,046054810	,002
MM	35	13,8163	17,3145	15,143014	1,0985517	1,207
TC	35	108,4008	118,9239	113,362594	3,7342415	13,945
WTI	35	41,60	74,15	55,6300	8,85747	78,455
IN	35	,01800	,08300	,0499571	,01870458	,000
BT	35	,01060	,02900	,0196286	,00474320	,000

Source: The table was prepared on the basis of SPSS outputs.

3-2- Multiple linear regression model

After knowing the dependent variable and the independent variables, it remains to determine the multiple linear regression model, and to know the variables affecting the returns of the BIOPHARM stock, which have a significant effect.

3-2-1- The significance test

Table (2) shows the analysis of the variance of the multiple linear regression model, to test the overall significance of the parameters simultaneously using the Fischer statistic.

Table No 2 Analysis of the variance of the multiple linear regression model

Model	Sum of squares	ddl	Average of squares	D	Sig.
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Regression	,033	5	,007	4,941	,002 ^b
1 Residue	,039	29	,001		
Sum	,072	34			

a : Dependent variable: R

b. Predicted values.: (constants), IN, WTI, TC, BT, MM

Source: The table was prepared on the basis of SPSS outputs.

According to the previous table, the significance level of the model is 99%, so the coefficients of the variables are not equal to zero.

As for the variables, using the Student statistic, Table No. (3) shows the coefficients of the model.

Table No 3 The coefficients of the model.

Model	Non-standardized coefficients		Standardized coefficients	t	Sig.
	A	Standard error	Beta		
(Constant)	-1,009	,499		-2,024	,052
MM	,071	,023	1,699	3,045	,005
TC	,001	,006	,076	,150	,882
WTI	,004	,001	,718	3,711	,001
BT	-20,375	5,155	-2,098	-3,952	,000
IN	,328	,566	,133	,580	,566

Source: The table was prepared on the basis of SPSS outputs.

Observed through Table No. (3), the significance of both the money supply, the oil price and the treasury bond interest rate, at the level of significance of 99%, while excluding both the exchange rate and inflation.

Before formulating the model, it must be verified that the residues follow the normal distribution, as well as that there is no autocorrelation between the rest.

3-2-2- Autocorrelation detection test for errors.

The Durbin-Watson test is one of the most important tests used to detect autocorrelation of the first degree, and since the conditions for performing the test are available, Table No. (4) shows the DW statistic.

Table No 4 DW statistic.

Modèle	Durbin-Watson
1	1.939

Source: The table was prepared on the basis of SPSS outputs.

Given that DW is close to the value 2, the hypothesis of no autocorrelation between random residues can be accepted.

3-2-3- Error contrast homogeneity test

The homogeneity or heterogeneity of the error variance can be known graphically. The following table (5) shows statistics about random residues.

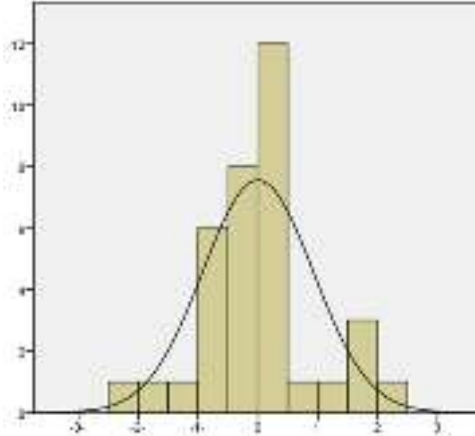
Table No 5 Residue statistics

	Min	Max	Average	Standard deviation
Predicted value	-.0612871	.0854613	-.0008113	.0312395
Residue	-.0847039	.0796178	.0000	.0338399

Standardized predicted value	-1.936	2.762	.000	1.000
Standardized forecast	-2.312	2.173	.000	.924

Source: The table was prepared on the basis of SPSS outputs.
 The following diagram distributes the remaining randomness.

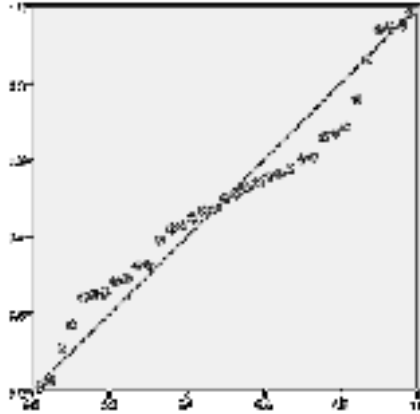
Figure No 1 Residual distribution (dependent variable R)



Source: The graph was prepared on the basis of SPSS outputs.

According to the previous diagram, it can be said that there is a homogeneity between the residues in the model, and the next diagram confirms this result.

Figure No 2 Normal regression Standardized residues(dependent variable R)



Source: The graph was prepared on the basis of SPSS outputs.

3-2-4- Submit the model

After making sure that there is no autocorrelation as well as the homogeneity of the residues, it is possible, according to Table No. (2) to formulate the multiple linear regression model as follows:

$$\hat{R} = -1.009 + 0.071.MM + 0.004.WTI - 20.375.BT$$

$t \text{ Student} \quad (3.045) \quad (3.711) \quad (-3.952)$

Consequently, the increase in the monetary mass of MM by one unit (10¹² Algerian dinars) leads to a rise in the returns of the BIOPHARM stock

by 7.1% (positive relationship), at the level of significance of 99%. Likewise with the price of WTI crude oil futures contracts, the rise in the price of crude oil by one unit (one dollar) leads to a rise in the returns of the BIOPHARM stock by 0.4% (positive relationship), at a level of 99%. As for the rise in the interest rate of BT Treasury bonds by 1%, it leads to a decrease in the yield of BIOPHARM by 0.2037% (negative relationship), at a level of 99%.

The other variables, represented by the exchange rate TC and inflation IN, have no statistical significance and are therefore excluded from the model and from the analysis.

3-2-5- Model quality

The following table (6) shows the quality of the linear regression model to explain the cost-effectiveness of BIOPHARM.

Table No 6 The quality of the linear regression model

Model	R	R-square	R-square adjusted
1	.678 ^a	.460	.367

a. Predicted values: (constant), IN, WTI, TC, BT, MM

Source: The table was prepared on the basis of SPSS outputs.

The correlation coefficient shows that the relationship is direct, where $R = 67.8\%$, and the determination coefficient, which is the ratio of variation in the dependent variable that can be predicted through the independent variables $R^2 = 46\%$, that is, the independent variables explain 46% of the dependent variable, but The remaining percentage is due to other variables that were not included in the model, either because it was not obtainable, or because of behavioral reasons due to the investor itself.

3-3- Analysis of the results

Based on the arbitrage pricing model, the returns on financial assets responds to the sensitivity of several factors, not just systemic risks, as is the case with the capital asset pricing model.

After obtaining several data related to the origin of BIOPHARM on the Algiers Stock Exchange, and some of the macro factors that are considered to be independent variables, and after conducting the multiple linear regression, the effect of both the money supply, the price of crude oil futures and the interest rate of the treasury bonds were finally eliminated, while excluding Both the exchange rate and the inflation rate from the analysis.

With respect to treasury bond interest rates, the negative impact on earnings per stock has been confirmed in a strong sense, and it is consistent with several previous empirical studies, such as Hendry (1986) (Hendry, 1986), Islam (2003), Chong and Goh (2003) (CHONG & GOH, 2003, p. 15) and Vuyyuri (2005) study.

This inverse relationship can be explained between the interest rate of the treasury bonds and the returns of the BIOPHARM stock, in two aspects.

The first side belongs to the BIOPHARM Foundation, as the high rate of the treasury bond interest leads to an increase in the cost of borrowing in the corporation, and thus an increase in the cost of capital, and considering the negative relationship between the value of the institution and the cost of capital, The value of the corporation will decrease, which leads to the reluctance of investors to invest in the stock, and since the alternatives on the Algerian Stock Exchange are very limited, as well as the effect of the interest rate on all securities on the stock exchange, this leads to the investors' orientation towards secured securities. Which are treasury bonds.

On the other side, it is on the investor's side. The high rate of treasury bonds' interest leads to the investors' orientation towards these bonds, because they give better returns with free-risk (irregular risk). The trend towards investing in securities, which explains the negative relationship between the interest rate of treasury bonds and the returns of BIOPHARM.

As for the money supply, it has a direct and statistically significant effect on the payoff of BIOPHARM, which has been reached in many empirical studies, such as Nozar and Taylor (1988) (Nozar & Taylor, 1988, p. 1609), Mukherjee and Naka (1995) (Mukherjee & Naka, 1995, p. 133) and Gunasekarage and all (2004).

The relationship shows that the increase in the money supply in the Algerian economy leads to a high returns on the stock of BIOPHARM, this can be explained by knowing that the legal money ratio constitutes an important proportion of the money supply in Algeria, and the high monetary mass means an increase in legal money among members of society, i.e. high liquidity, Consequently, purchasing power, which provides funds for investment, including the trend towards the financial market for investment, which explains the positive relationship between the cash mass and the returns of the BIOPHARM stock.

As for the third variable, it is the price of crude oil futures contracts. The relationship is positive. This can be explained by the fact that the large proportion of Algeria's exports is represented in hydrocarbons, (Chekouri, Chibi, & Benbouziane, 2020, pp. 3-4) and the rise in crude oil prices necessarily means higher exports, and thus a decrease in the trade deficit. Given that the Algerian economy is small, the effect of the balance Trade is big compared to big economies. (MHIDI & BOUDERAF, 2018, p. 126) On the other hand, the increase in exports motivates the Algerian investor to invest, thus increasing the profitability of BIOPHARM.

On the contrary, the inflation rate and the exchange rate do not affect the profitability of the BIOPHARM stock, and this can be attributed to the fluctuation and significant change that the inflation rate is witnessing in Algeria, (BEN AISSA & BEN YECHOU, 2015) and therefore the Algerian investor ignores this inflation in making the investment decision in the stock. As for the exchange rate, the market The parallel greatly affected the official

market, and the absence of exchange mechanisms, except for commercial banks.

4- Conclusion:

The arbitrage pricing model is considered as an extension of the capital asset pricing model, by entering several factors that affect the returns of assets in the financial markets, instead of affecting only systemic risks represented by the beta coefficient, and among the factors affecting the returns of the assets are the macroeconomic variables, as demonstrated by Ross and many empirical studies That came after the appearance of the arbitrage pricing model.

Several empirical studies on the arbitrage pricing model have demonstrated the effect of money supply, trade balance, exchange rate, inflation and treasury bond interest rate, even if they differ in the nature of the impact, but they confirmed the existence of this effect.

In an experimental study conducted on the returns of the BIOPHARM stock price, which is quoted on the Algiers Stock Exchange, using the multiple linear regression model, this model demonstrated the effect of some variables and the exclusion of some factors.

Among the variables affecting the profitability of the BIOPHARM stock, there is the money supply, the price of crude oil, and the relationship is positive, and many empirical studies have proven this relationship. The explanation for this is that an increase in the money supply in Algeria leads to the provision of cash from consumption to investment, which leads to an increase in investment in financial stocks, and thus an increase in the returns on the stock of BIOPHARM.

As for the relationship between the price of crude oil and the returns of BIOPHARM's stock, the increase in the price of crude oil necessarily leads to an increase in Algeria's exports, because a very large proportion of exports are represented in hydrocarbons, thus stimulating the economy, which encourages investors to invest in securities, which confirms the positive relationship between the price of crude oil and the returns of BIOPHARM stock.

The negative relationship between the treasury bond interest rate and the yield of BIOPHARM can be explained. The high interest rate stimulates investors to move from investing in risky assets to riskless assets, and vice versa.

The exchange rate and inflation are excluded from the model, because inflation in Algeria is witnessing severe fluctuations, between high and low, and future inflation rates cannot be expected, while the parallel market has greatly affected the exchange rate market in Algeria, which has led to the exclusion of these two variables in the study.

Finally, it can be concluded that the arbitrage pricing model to explain the returns of BIOPHARM stocks was compatible with several empirical studies, except in relation to inflation and the exchange rate. Despite the limited and ineffective Algiers Stock Exchange.

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