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MACROECONOMIC INFLUENCE ON SHARES' RETURN STUDY CASE: ARBITRAGE PRICING THEORY (APT) APPLIED ON BUCHAREST STOCK EXCHANGE

Abstract. *The aim of the paper is to present the influence of macroeconomic environment over the evolution of shares' return through Arbitrage Pricing Theory (APT). As shown in previous papers, the significant macroeconomic factors differ between national economy and their influence varies over time.*

We applied the APT on the Bucharest Stock Exchange and determined the macroeconomic factors with influence over shares' return. We compare our results with results of previous papers that studied the problem in other economies – the finding sustain that each economy has its own set of determinant factors. There were analyzed several sets of economic factors and results are consistent with previous papers, sustaining the importance of researcher ability to correctly determine the factors.

There were identified several significant factors that explain the evolution of shares' returns; and the amplitude of their influence. The factors that affect the shares returns are the market evolution, inflation, interest rate, currency trades, exchange rate, industry and trades evolutions.

Key words: *Arbitrage Pricing Theory (APT), share return, macroeconomic factors, multifactor model*.

JEL Classification: **G12, D40**

INTRODUCTION

The financial crises started in 2008 brought a highly devaluation of assets, inclusive a large decrease on shares' prices. Many studies and papers debated the topic of assets evaluation and the appropriate model to be used in this perspective.

Evaluation of financial assets prices did not make exception, the issue of fair valuation of returns occupying a large number of pages on the economic literature; many models being analyzed, adjusted, tested, adapted and further developed. One important area analyzed and adapted to nowadays financial crises data are the multifactorial models. The intent is to determine the factors with significant influence to evolution of financial assets returns.

In our paper we considered the Arbitrage Pricing Theory (APT), part of multi-factorial models, in order to highlight the factors that induce variation from the expected return of financial assets. Usually, the factors included in the multi-factorial models tested in the scientific literature are from within the companies or factors external to companies (Saeed, 2014). Some papers consider the company financial situation as determinant for the share price evolution (Deaconu, 2011); while others treat the issue considering that the information is already included in the share price, as in the studies concerning the informational efficiency of the stock markets (for example, papers of Dragotă, Mitrică (2004), Dima et al (2006)).

Only the information coming from within the company is not enough to explain the continuous variation of the shares' price on the stock market. From this perspective, there were developed models that linked the shares' price variation to the market evolution – such a model is the Capital Assets Price Model (CAPM), and models that add others economic variables to explain the evolution of shares' prices – as Arbitrage Pricing Theory (APT). These models are simple to understand and easy to apply, so they gathered many supporters.

For the purpose of our research, we used the APT model, in order to determine the macroeconomic factors that influence the evolution of shares' price. In 1976 Stephen Ross introduced the Arbitrage Pricing Theory (APT), which considers that shares price is determined by a multitude of factors. These factors could be variables from within the company, market or activity domain indexes, variables from the economy such as GDP, inflation or any other relevant factors considered by the analyst (Ajao, 2012, Luthra, Mahajan, 2014, Bianchi, Guidolin, Ravazzolo, 2013).

We intent to establish the macroeconomic factors that may explain the shares' prices using APT and to analyze how these factors influence. The empirical case study is performed on data from Bucharest Stock Exchange (BSE, Romanian name: Bursa de Valori Bucureşti – BVB), considering several relevant macroeconomic factors from the Romanian economy.

1. LITERATURE REVIEW

Since its appearance, the APT generated numerous discussions debating pros and cons arguments regarding the model and the applicability of the model to stock markets. At the beginnings, there was the unanimous feeling that the new theory shall clarify and bring an explanation for the stock market and assets prices evolutions and their interactions with the economy. Due to easiness in

understanding and application, the theory was rapidly adapted and implemented by researchers and business people; and in spite of the arguments opposing to its application, the theory is still used.

Compared with previous models, Ross's model is better adapted to the reality of the economy and describes the relation between the financial assets returns and factors within or without the company. The model is usually computed in relation with factors from economy, but variables from within the company may be also used. The model considers several potential sources of influence and determines their impact over the evolution of assets' returns. APT might seem complex but it is easy to use, permitting to accomplish detailed analyses of the factors impact.

Relative to Capital Assets Price Model (CAPM), APT replaces one single factor that is the market evolution with several influence factors, each with a different impact over the financial asset price. For each factor there is calculated a beta coefficient that shows the impact of that factor over the financial asset return. This allows the financial information user to have more detailed data and to decompose the impact of economy evolution in real influencing factors such as inflation, GDP, interest rate, price of commodities (petrol, gold) and so on. One can understand the modification induced by the variation of a factor over the evolution of the assets included in his portfolio.

Ross (1978) referring to CAPM mentioned that "there is, in fact, an alternative model, the arbitrage pricing theory (APT for short) that appears to offer the hope of retaining the simplicity of CAPM and its positive empirical orientation while avoiding many of the theoretical difficulties and empirical problems…". The cumulative impact of economic environment reflected in CAPM by global market evolution, is split in APT between several economic variables that do not necessary have the same direction or amplitude of evolution. There can be understood which factors have a significant influence over the financial asset return, together with the intensity and the direction of influence. Due to the extend number of factors included in the model, the APT model is more elaborated than CAPM, necessitating larger computation power for analyzing larger data volumes.

Even from beginning there were issued some arguments against the APT model. Reinganum (1981) performed tests on the impact of the company size and obtained similar results for both APT and CAPM. He concluded that APT is not such a useful model, being more complex than CAPM regarding data computation, but conducting to similar results as the one obtained with a much simple model like CAPM. But, in spite of the critics addressed to APT, the model has many followers both from the scientific and from the business world. This is because the model is easy to understand, not too complex and complicate to use, offering a set of interesting information with lower cost of time, resources and computing power.

Contraire to arguments against its utility, after half of century from model creation, it is still under continuous research and use, with scientific papers that test the model, comment and argument on its advantages and disadvantages. Business people and researchers sustain its usefulness and expand it to approaches that straighten the model and its utility. The area of application of APT has enlarged and adapted over time, due to its simplicity and easiness in usage. Solnik (1983) has extended APT to portfolio created from assets issued on foreign markets and created the International Arbitrage Pricing Theory considering the difference between national and foreign economic variables.

Dhrymes, Friend, Gultekin (1984) noted as a weak aspect of the APT the impossibility to determine the influence factors included in the model based on a reliable method. This issue is probably the most delicate aspect of the theory, which generates numerous critics from people considering the theory difficult to apply and not with certain results. Determination of factors included in the model in an accurate and comprehensive manner raises several questions, this being one point that was and shall be continuous studied. There is still no viable manner to determine the exhaustive list of significant factors influencing the financial asset return; the list of factors included in the model remaining at the researcher / user latitude. Based on the ability of the person who selects the influence factors, there are determined the beta coefficients that shows the factor influence power, the autocorrelation between factors, the error of estimation and the premium return for assets in the portfolio. This step has a high importance and based on the precision and knowledge of the person selecting factors, the model can better predict the evolution of financial asset return. Otherwise, some factors may be omitted, while factors included may have a limited power of explanation. If the factors included in the model are correlated, based on their correlation some adjustments to beta coefficients have to be performed. Huberman, Wang (2005) consider the determination of factors based on empirical tests as not fully trustworthy, mentioning that factors are included in the model tested based on the user free will. The freedom in selecting the factors presumes a high level of theoretical and practical expertise from the model constructor, obtained previously to model building.

In 1980, Roll, Ross, after studying the impact of macroeconomic factors on financial assets returns and their evolution for several decades, concluded that there are a limited number of significant macroeconomic factors that influence the financial assets returns. They also point out that an exhaustive list of factors cannot be established without a detailed analysis. On a later study, Chen, Roll and Ross (1986) underline a number of four economic factors that may explain the evolution of financial assets returns: inflation, interest rate, modification in industrial production and modification of premium risk rate. Other factors that were theoretical candidates as important parts in the model like the evolution of consumption or petrol price resulted in not being relevant factors. Also, the factors

influencing the financial asset return modify under the changes manifested in the economy. Hasan (2010) apply APT method proposed by Chen, Roll, Ross (1986) on an extend database and concluded that factors modify over time. Resuming the results of previous studies, he summarize that in models tested there were used an extend variety of factors that prove to be significant or not for each tested model. The selection of factors has to be made mainly on an economic logic and with a correct theoretical approach and not just on a mathematic base. The factors included in models depend on the chosen of the researcher and the list is neither limited nor exhaustive, but there can be determined several sets of factors that can be right both from mathematic and economic perspective.

The subject of building models based on researcher free-will in selecting factors lead to large number of tests for APT model, some with very interesting results and conclusions. The number of factors included in the model is another subject debated in the scientific papers. Huberman, Wang (2005) tested the portfolio structure and concluded that the number of assets included in the portfolio directly influence the number of factors included in the model, noting that the number of factors affecting a portfolio is increasing with the number of assets forming the portfolio. Connor, Lorajczyk (2009) propose a limitation for the number of factors included in a model – for each new factor included there must be performed more statistical tests, resulting in large consumption of time and resources with no significant improvement in explanation of the regression analyzed.

Another topic of interest after determining the factors included in the analyses, is the possibility offered by the model to create portfolio sensitive to some predefined factors and with no react to evolution of other economic variables. Shanken (1982) showed that the portfolio structure of assets predetermine the factors that have influence over the portfolio evolution. Changes performed on the portfolio structure of assets shall determine modification on factors – factors deleted or added, changing on beta coefficients. He sustain the conclusion that a pre-defined set of factors cannot be determined in advanced, but the factors chosen must be adequate to the analyze scope. Shanken observe that APT model does not help the portfolio manager to determine the portfolio structure of assets, but allow him to detect the specific factors that may influence the portfolio created. The aspect is mentioned also by the recent study of Hasan (2010), which confirm that the factors that influence a portfolio evolution depend on the assets selected to form that specific portfolio. Through combining assets in diversified portfolios, some factors may lose the importance they had in explaining individual assets evolutions (for example: the activity domain) and some factors may intensify their influence (for example: inflation). There can be created portfolios of assets immune to variation of a set of economic factors; and vice versa, a manager can create portfolio sensitive to several factors.

APT model is closer to the economic reality because it presumes a continuous activity from the analyst to update and interpret the information available on the market. APT also allows the development of other connected activities – activity of searching, gathering and interpreting available information, advising the investor based on the information processed, selling the essential information already interpreted.

2. THE ARBITRAGE PRICING THEORY MODEL

The Arbitrage Pricing Theory model highlights the factors that influence the variation of shares or portfolios returns from their normal expected returns. Being a multifactorial model, for each factor there is determined a beta coefficient that shows the measure of influence – how much is the variation of portfolio return from the normal expected evolution if the factor F varies.

Equation 1. Equation of multifactorial model APT
(*Source:* after Ion Stancu (2007) „Finanțe", IV edition)

where is the estimated return for asset i, is the expected return of asset i, represents the evolution of factor f which induces variation on the asset return, being the error of estimation normal distributed with null average and finite standard deviation . Beta coefficient , as measure of sensitivity, reflects the impact of variation of factor f on the variation of estimated return of financial asset . reflects the information assimilated by shareholders, the value of asset anticipated based on all known information coming from the company. is the systematic risk return that can be generated by variation of factors evolutions – this information generates uncertainty that shareholders cannot anticipate (van Rensburg, 1997).

Equation 2. Uncertainty in the APT model
(*Source:* after van Rensburg (1997))

where is the total unexpected risk that the shareholders cannot predict and is the systematic risk that can be explained by variation of factors evolutions. does not include only those significant factors who's influences cannot be eliminated by diversification, considering also the cost of

diversification. The influence of these factors requires an extra-return for the shareholders due to the unpredictable risk that they assumed.

The expected evolution of each factor f is that the factor will not vary and that the estimated return of asset is equal to the expected return resulted from information that the portfolio managers access related to the shares forming the portfolio . The assumption is made because the investors cannot predict the systematic risk generated by variation of factors evolutions; because this risk exists, shareholders require a premium that covers the uncertainty resulting from factors evolutions: . There is also the unsystematic risk that cannot be predicted or explained that adds to the systematic risk and determinate the total uncertainty risk .

If consider that a portfolio return can be measure starting from a free-risk asset and adding premium according to the risk variables influencing its evolution, then (Berry, Burmeister, McElroy 1988). The complete equation of APT becomes:

Equation 3. Extend equation of APT
(*Source:* after Berry, Burmeister, McElroy 1988)

Beta coefficients and factors influencing the portfolio return may vary over time due to adaptation to the conditions in the economy (Sabetfar, Fah, 2013). Therefore there is used matrix to express the evolution in time for beta, considering the entire set of factors that may influence the shares' return in time (Stephan, Maurer, Durr, 2001):

Equation 4. APT matrix considering variation in time of beta
(*Source:* after Stephan, Maurer, Durr, 2001)

3. DATA USED IN THE EMPIRICAL STUDY

There were used data from three sources of information: shares quotations and index values from the stock market, monetary and financial data from the National Bank and macroeconomic information from the statistic institute, as follow:

- Bucharest Stock Exchange – the values of BET index and the closing quotations for the shares traded

- National Statistical Institute – statistical data of macroeconomic variables published in monthly and quarterly statistical publication issued
- National Bank of Romania – data related to financial and monetary variables published

Data cover the period between January 2002 and December 2010, including first three years of financial crises between 2008 and 2010. There were considered only factors that on a theoretical base could have an influence on the shares returns.

3.1. Factors tested in the APT model

The factors included in tests of APT application on the Bucharest Stock Exchange, sorted on the frequency of the data series, are (in brackets their notation):

- Factors with daily data series
  - index of Bucharest Stock Exchange (BET)
  - quotation of foreign currency EUR / USD (EUR / USD)
  - price of gold (AUR)
  - volume of transactions with bonds issued in ron (TTZronNr)
  - value of transactions with bonds issued in ron (TTZronVal)
  - interest rate ROBOR (BZ_BOR) on various periods: overnight (ON), one week (1W), one month (1M), three months (3M)
  - interest rate for interbank deposits (PMZ_RD)
  - volume of interbank deposits (PMZ_VD)
- Factors with monthly data series
  - average quotation of foreign currency (EURm/USDm)
  - last quotation for foreign currency (EURsf / USDsf)
  - interest rate for interbank deposits (PML_RD)
  - volume of interbank deposits (PML_VD)
  - inflation (INFL)
  - inflation for services sector (INFL_SERV)
  - monetary policy interest rate on National Bank (BNRDOBL_DPM)
  - credit facility interest rate on National Bank (BNRDOBL_DFC)
  - deposit facility interest rate on National Bank (BNRDOBL_DFD)
  - reference interest rate on National Bank (DOBREFL_DREF)
  - banks foreign currency exchange – buy from clients (PVL_E_CCI)
  - banks foreign currency exchange – sell to clients (PVL_E_VCI)
  - banks foreign currency exchange – volume of trades (PVL_E_TV)
  - banks foreign currency exchange – interbank trades (PVL_E_OI)
  - financial behavior – volume of credits in ron (CR_ron)
  - financial behavior – volume of credits in foreign currency (CR_val)

- financial behavior – volume of short term deposits in ron (DEPved_ron)
- financial behavior – volume of short term deposits in foreign currency (DEPved_val)
- financial behavior – volume of term deposits in ron (DEPterm_ron)
- financial behavior – volume of term deposits in foreign currency (DEPterm_val)
- Broad money (ANL_M3)
- Intermediate money (ANL_M2)
- Narrow money (ANL_M1)
- Currency in circulation (ANL_M1NC)
- Overnight deposits (ANL_M1ON)
- Balance of payments – net current account (BOPL_N_1)
- Balance of payments – net capital and financial accounts (BOPL_N_2C)
- External debt – short-term (DEL_DTS)
- External debt – short-term service (DEL_SDTS)
- Deposits existing in sold (N14RL_DS)
- Credits existing in sold (N14RL_CS)
- Deposits new (N14RL_DN)
- Credits new (N14RL_CN)
- National Bank – cash and other values (BNRL_AINUM)
- National Bank – deposits (BNRL_PID)
- National Bank – overnight deposits (BNRL_PIDO)
- National Bank – term deposits (BNRL_PIDT)

- Factors with quarterly data series
  - gross external debts of government on long term bonds (TDET_GGLTB)
  - gross external debts of government on long term loans (TDET_GGLTL)
  - gross external debts of banks (TDET_BK)
  - international investment position – net assets position (PIIT_NA)
  - international investment position – net passives position (PIIT_NP)
  - international investment position – direct investments of foreigners in Romania (PIIT_PEID)
  - international investment position – portfolio investments (PIIT_PEIP)
  - international investment position – portfolio investments of the nature of shares (PIIT_PEIPAC)

- international investment position – portfolio investments of monetary policy instruments (PIIT_PEIPIM)
- gross domestic product – price indices (PIB_IP)
- Balance of payments – net current account (BOPT_N_1)
- Balance of payments – net capital and financial accounts (BOPT_N_2C)
- Gross added value (VAB)
- Agriculture, hunting, forest and fishing economic sector (AGR)
- Industry and energy economic sector (IND)
- Construction economic sector (CONSTR)
- Trades, services for vehicles and domestic articles, hotels economic sector (TRADES)
- Financial activities, real estate, rentals and services (FIN)
- Gross domestic product (GDP)
- Final consumption (FC)
- Effective individual consumption of domestic householders (PIC)
- Individual consumption of public administration (GIC)
- Fixed capital gross formation (GFfc)
- Exports of goods and services (EXP)
- Imports of goods and services (IMP)

We used (where available) the abbreviations operated by the data series issuer. For data series that do not have abbreviation, we construct our own, considering the intention that the abbreviation to be clear and explicit.

3.2. Transformation from daily, monthly to quarterly frequency for data series

Because data sets have different frequencies (daily frequency as BET index, monthly frequency as inflation or quarterly frequency as GDP) we need to transform all data to similar frequency in order to be comparable. We transformed the daily and monthly data frequency to quarterly frequency, using the following formula:

$$F_T = \ln\left(\frac{1}{n}\sum_{t=1}^{n}\frac{V_t}{V_{t-1}}\right) = \ln\left(\frac{\frac{V_n}{V_{n-1}} + \frac{V_{n-1}}{V_{n-2}} + \ldots + \frac{V_{n-(n-1)}}{V_0}}{n}\right)$$

Equation 5. Transformation of daily, monthly frequency to quarterly frequency

where F_T is the lognormal variation of factor for quarter T, V_i is the value of the factor for period i within the quarter T (i could be day or month). We considered several models for transforming data from daily / monthly frequency to quarterly

frequency and test them on several sets of data. The model for transforming data series proposed better fitted data using simple calculation algorithm.

This model determines the lognormal average variation of the quarter, considering data of daily or monthly frequency. All data in the model were computed so to be comparable and compatible for included in the statistical model.

3.3. The model tested empirically

The model tested based on theoretical description of APT and on data collected from the sources mentioned above is:

$$F_T$$

Equation 6. APT model tested on BVB data

where is the variation of BET for tested case i at quarter T, is the expected variation of BET anticipated by investors for the quarter T in test case i, represents the variation of factor F for quarter T that may induce variation on the BET. There were considered several way of estimating , that determined the studied cases i.

To avoid the specific of each share, the financial asset selected for study is the index of stock market BET. The index, as a diversified portfolio of the shares traded on the stock market, eliminates the specific risks of shares. The factors influencing BET are factors inducing variation to overall the market; each share could have supplementary factors of influence.

3.4. The anticipated variation of BET :

The factor is what the investor expects to be the normal variation of BET if there would be no variation in factors evolutions. For representation of we considered several possible cases. The anticipated variation of BET was considered:

- ✓ the average variation for the entire period analyzed (BETm), considering that BET has a general variation that is valid for all periods and that the deviation from the average is determined by variation of influencing factors
- ✓ the variation of the same quarter of the previous year (BETmAn-1). For example, the variation of BET for quarter 1 of year 2009 is similar to variation of BET for quarter 1 of year 2008. We used the assumption that

the market evolution is influenced by periodical effects (as Monday effect, weekend effect, New Year's Eve effect, monthly effect, so on)

- ✓ the mobile average of variation for previous 3 years (BETmMobil3ani), considering that quarterly value varies from the average due to factor evolution and that there is an average variation of BET that is stable over time
- ✓ the average variation for an interval of 3 years (BETmInterval). The database was split in 3 years intervals, having the financial crises as stone mark. There is a 3 years period of financial crises started in first quarter of 2008, there is a period of 3 years before financial crises between 2005 and 2007 that represented the maturity of the stock market and a previous period when the Romanian market learn to act as a stock market. While the mobile average moves every quarter to a period of 3 years previous to current quarter, the interval of 3 years considers the same variation for all the 12 quarters composing it.
- ✓ the average variation for an interval of 3 years previous to the present interval (BETmInterval-1). The logic is similar to the point above except that the average variation applicable to the 12 months in the current interval is the average of the 12 months composing the previous interval. If the history repeats, then the average variation of the previous interval might be valid value for the current interval.

4. RESULTS OF EMPIRICAL STUDY

This part of the paper is dedicated to the results obtained by computing data according to the model described. The first step performed consists in eliminating factors that are not explaining the evolution of BET, for each case of . There are factors that do not explain the evolution of BET in neither cases of anticipated evolution of BET, but there are factors that explain the evolution only in some cases. There were determined the regression for each case of anticipation of BET considering the factors selected as adequate.

4.1. Models and the factors that explain BET evolution

From the entire list of factors only a few explain the variation of BET. For each case of expected variation of BET (**)** we detected those factors and included them in the most suitable regression using the least squares (LS) method.

Table 1. Results on models tested

Expected BET:	R-squared	S.E of regression	Sum squares resides	AIC*	DW**
BETm	0.918841	0.001527	0.000187	-9.882705	1.899919
BETmInterval	0.698369	0.005433	0.000059	-7.874343	1.787521

BETmInterval-1	0.824092	0.004149	0.000034	-8.413590	1.858389
BETmMobil3ani	0.717389	0.002527	0.000076	-8.823653	1.110441
BETmAn-1	0.987766	0.001547	0.000002	-10.94600	1.752968

*AIC = Akaike information criterion, measure the relative quality of the model, as a trade-off between model complexity and its goodness of fit. AIC reflects the information entropy: relative estimate of the information lost for representing a process through a model. The fitted model minimizes the AIC value

** DW = Durbin – Watson test, statistical test used to detect the autocorrelation. The value of DW test lies in range of [0,4] and the optimal value is 2 in order to indicate no autocorrelation.

The best suitable models to describe BET evolution have the expected variation of BET based on the average variation for the entire period or variation of the same quarter of the previous year. So, for or the resulting regression have more explanatory power (R-squared is over 0.9). The model with has the highest value of Durbin – Watson test, meaning that the error are not correlated between periods. Akaike information criterion (AIC) presents the model constructed starting from as the most fitted model from the five models created and also the sum squares resides point out the same model.

Reverting from the general image of the models to the factors explaining each model, the results are different. Considering only the factors that have the level of confidence higher than 90% (significance level lower then 0.10) the models have the following results:

Table 2. Factors explaining models with confidence level over 90%

	Factors with significance level of …	
	5%	10%
BETm	PMZ_VD, EURM, VAB	-
BETmInterval	PMZ_RD, BNRL_A, INFL, PVL_E_TV, TDET_GGLTB	EURSF, IND, CNSTR, TRADES
BETmInterval-1	IND	-
BETmMobil3ani	CNSTR, TRADES, FIN, PIIT_NA	-
BETmAn-1	-	-

Considering the factors that explain each model, the last model cannot be considered – it has no valid factor that explains the model with a significance level of 5% or 10%. The model best explained by factors is the model having as anticipated variation **.** For this model, there are 4 more factors included in the model, all having over 75% confidence level (significance level : DEPTERM_VAL with 0.25, DEPTERM_RON with 0.20, GIC with 0.15 and EUR with 0.11), being the best explained model by the factors included**.** The model best explained by factors is the last model classified considering the general information

about the model (R-square, AIC and DW tests). Hasan (2010), resuming previous studies, insist on selecting the factors priority on an economic reasons and not just on the mathematical values.

The fairytale of models best explained (such as those having or **)** was too good to be true. Although the model having has R-squared only 0.70, the sum squared resides is low and AIC and DW tests have suitable values, in order to recommend the model for farther analyses. A too perfect explained model (with R-squared too high) is almost a miracle and hard to believe it really exists; a model with moderate value for R-squared and good values for tests criterion is a more trusted and reliable model.

4.2. Alternative regressions for models

As mentioned in several papers (Dhrymes, Friend, Gultekin, 1984, Huberman, Wang, 2005, Bruce, Thilakaratne, 2014) the selection of factors does not have only one solution and their selection depends on the researcher ability to include the appropriate factors in the APT model. The selection of factors does not have a reliable method; the factors to include are on the model builder latitude and experience. Hasan (2010) specifies that list of factors included in a model is not exhaustive and one can build models based on several sets of factors that can be right both from mathematic and economic perspective.

From the same list of factors there can be build several models with good explanation for the evolution of the financial asset analyzed. As example, for the model with **,** we ordered all factors based on data frequency and for each frequency the factors were sort in alphabetic order.

Table 3. Alternative models for

	Data frequency	No. of factors	R-squared	Sum squares resides	AIC	DW
A1	Daily	11	0.7248	0.00006	-9.09	1.77
A2	monthly	14	0.9402	0.00001	-9.54	2.56
A3	monthly	15	0.9986	0.0000003	-13.1	2.65
A4	monthly	13	0.7548	0.00004	-8.25	2.15
A5	quarterly	11	0.7133	0.00006	-8.91	1.74
A6	quarterly	13	0.6074	0.00010	-8.64	2.30

It results six portfolios from including factors grouped by their frequency and for each frequency sorted alphabetical. The portfolios have better general characteristics than the results obtained at the previous point for the portfolio, having . At the previous point the R-squared of the model has a value of 0.70; five of the six portfolios have R-squared greater.

Table 4. Comparing results for models with

Model	R-squared	Sum squares resides	AIC	DW	Factors with significance level < 10%
Initial	0.698369	0.000059	-7.87	1.78	PMZ_RD, BNRL_A, INFL, PVL_E_TV, TDET_GGLTB, EURSF, IND, CNSTR, TRADES
A1	0.7248	0.00006	-9.09	1.77	PMZ_VD
A2	0.9402	0.00001	-9.54	2.56	BNRL_A, CR_RON
A3	0.9986	0.0000003	-13.1	2.65	-
A4	0.7548	0.00004	-8.25	2.15	-
A5	0.7133	0.00006	-8.91	1.74	VAB, AGR
A6	0.6074	0.00010	-8.64	2.30	GDP, GIC, PIIT_NP

From table 4 it is obvious that for the initial portfolio with the general characteristics (R-squared, sum of squares resides, AIC, DW) are not among the best. But if we look at the numbers of factors that have a significance level lower or equal to 10%, this model is way in front of the other models. Economically speaking, passing over the mathematical aspect, this model is more reliable and gives several factors that can explain BET evolution with a reduce error of judgment. Considering for example model A3, the overall picture is the best, with a R-squared almost 1, the sum of squares resides the lowest and the AIC test indicating the model as the most viable. But none of the 15 factors included in the model have a significance level lower or equal to 10% - this mean that the researcher would highly be mistaking putting BET variation on any of the factors variation. So, from an economic point of view, the initial model is the best model explaining the BET variation based on several factors evolution.

From points 4.1 and 4.2 above, it results that there can be created alternative regressions to explain a financial asset variation based on various sets of factors, whose selection depends on the researcher good understanding of economic environment.

5. CONCLUSIONS

The financial markets are important part of the economy in which they perform. During the present financial crises the financial assets value degrade as well as the rest of the economic assets value. The scientific literature published numerous papers debating the evaluation of fair value of financial assets, and the multifactorial models (among which the APT model) were frequently used in data computation.

We applied the APT model on data from the Bucharest Stock Exchange using macroeconomic factors from the Romanian economy. The results are consistent with previous studies analyzing APT on foreign financial markets and highlight the specific of Romanian economy.

In our opinion the difficult issue in applying APT model diverges from the process of selecting factors. Investor expectation and the factors included in the model depend mainly on the user ability, knowledge and free-will. We tested several models with respect to the two aspects mentioned and the results are in line with previous scientific literature. Selection of factors is an essential step in constructing the model and must to be performed by user based on a vast experience, good knowledge of financial market and of the economic environment, with accent on the economic aspects of the model.

Based on the same set of macroeconomic factors, there can be build several econometric models, all with good power of representation, eligible from economic and mathematic point of view, as the previous scientific literature highlights. Even if the APT model does not directly indicate the portfolio structure and data analyses generates several possible models, the researcher has to follow the clues given and select the model that is most reliable and correctly constructed from economic aspect and in correlation with his research aims. There is no exhaustive or limited list of factors included in the models, but their selection have to be made based on good understanding of economic problematic.

The Romanian economy specificity is revealed by presenting the local macroeconomic factors influencing the Bucharest Stock Exchange. Some factors like inflation, interest rate and industrial production are common to papers researching the APT model on foreign economies. Others, like exchange rate, volume of currency exchange or trading activity are specific to Romanian economy. We have to agree to previous papers and mention that the set of factors explaining the model varies over time, this issue reflecting the link between the evolutions in the national economy and the local stock market.

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