THE SOLE DETERMINANCY OF EXPECTED OUTPUT RATE ON STOCK RETURNS RATE: CAN FAMA’S MODEL BE A PACE SETTER TO INCREASE CREDIBILITY OF SECURITIES MARKET?

Abstract

The Stock Market failure can prevent new and present investors from taking active participatory role in the stock market. Because it can deteriorate the credibility of well functioning markets. To explain the large price fluctuations, behavioural economists take the subject from different view. The spiritus animals referring to the irrationality of investors and markets. Fama’s Stock Return Rate econometric model is based on a Fisherian quantity theory of Money with rational expectations. His findings show that stock return rate is explained by one of the important market fundamentals, that is, expected output rate and this may provide the reliable environment for investments. In this paper, Fama’s econometric model is retested again and similar results are reached providing more reliable investment environment.

Key Words: Efficient Market Theory, Random Walk hypothesis, Rational Expectations, Fisherian quantity theory of Money, Fama’s stock return rate model.

Özet

Ekonomi ile ilgili temel değişkenlerin hisse senedi fiyatları üzerinde belirleyiciliği önemlidir. Fiyatlar ne kadar sağlam bir zemine ve ekonominin temel göstergelerine bağlı olarak oluşursa hisse senedi piyasalarına olan güven ve bu piyasalara olan katılım o ölçüde artacaktır. Davranışçı ekonomistlere göre hisse

1 Öğr. Gör., Pamukkale Üniversitesi, Bankacılık ve Sigortacılık bölümü, niyilikci@pau.edu.tr
senedi fiyatlarındaki gerçekleşebilen büyük fiyat dalgalarını; yatırımcıların ve piyasaların irrasyonelliliğine ve yatırımcıların kararlarını belli psikolojik faktörlere bağlı olarak almalarından kaynaklanır. Fama’nın stok getiri oranlarını açıkladığı ekonometrik modeli, rasyonel beklentili Fisherian miktar teorisine dayanır onun ekonometrik bulguları; hisse senedi piyasasının doğru ve etkin bir biçimde işlediğini destekleyen kanıtlar sunmaktadır. Bu çalışmada, Fama’nın ekonometrik modeli test ederek bulguları doğrulanmıştır. Hisse senedi getiri oranları reel bir ekonomik değişken olan beklenen çıktı miktarı ile açıklanmaktadır.

Anahtar Kelimeler: Etkin Piyasa Hipotezi, Rassal Yürüyüş modeli, Rasyonel Beklentili Fisherian miktar teorisi, Stok getiri oranları, beklenen çıktı oranı

INTRODUCTION

One of the important functions of Money is being the means of exhange between traders. Thus, it should be valued only as much as the role it plays in real economic transactions. The Labor Theory of Value accepts the value as the price of a product that is measured by the unit of labor used in the production of one unit of output. The Comparative Advantage Theory says that both trading countries can derive benefits from trade if a country exports products that it produces relatively at small cost at home and import products that are produced at a lesser cost in another country. Classical economists had usually constructed their models on the basis of the use of these real variables. To them, Money World and production facilities create classical dischotomy, and they choose to structure their models on real variables relations. But the definition of value had changed many times ago. For example finding the value, the determination of price of goods and services, were like solving a physics problem before. An owner of the firm decided on the price mechanically meaning he took into account costs and reasonable profit but did nothing more than this. Because in the World of ‘Form follows function’, no better pricing strategy were able to be pursued by companies. With the changes in socio-technical environment, the provision of high quality products, and the introducing different brands, created perception value in customers. The pricing strategy of a firm now turned to a chemistry problem that requires to be focused on rival firm strategies and to satisfy personal experiences of consumers during their consume. Inclusion of this increasing importance of the subjective value weakens the links between prices and real cost of things.

Nominal values of stock prices might not always be a good indicator that reflects the true value of stocks. So, the price of a security should be analysed by taking different views into account. Altough changes in the price of the security might be attributable to real variables like expected output rate; High price volatility in stock markets has still been a real concern for many people. Stock prices sometimes fluctuate within a wide range These anamolies needs appropriate explanations to structure the stock market on solid grounds so that lots of players could get involved into the market. So it must be proved that when the security price reflects the value, it must be the the value of Market Fundamentals and all publicly available information open to investors. The well functioning of the stock market is important. Because Stock markets can be seen one of the market to realize something like ‘public capitalism’ because of the possible stock returns other than wages and salaries to ordinary citizens. It removes full responsibility away from owner of the firm and passes the responsibility of the management to
professionals and by this way, it might distribute the risk of failure on the shoulders of shareholders.

Stock Markets lead companies to make high profits especially during huge swings. Their investment costs can be partially or fully covered by this way. Besides, many people can buy and sell stocks in the security market and this might because people retire comfortably, earn additional revenue other than wages and salaries. For this reason, the market for stocks is undoubtedly the financial market that receives most attention.

2. Case study: What past performance tells about the credibility of the US Stock Market

The average shares prices increased five times from 1920 to 1929. In the following years, it completely fell down during the years 1930 and 1932. The true fundamental value of the stock market doubled between 1954 and 1973. After that time, the market completely returned to its original level. Between the years 1973 and 1974, the true value lost half of its value. The true (fundamental) value increased more than eight times between the years 1982 and 2008 and then between 2000 and 2008 it lost half of its true value.

Despite these frustrating figures in US stock market, nobody can prove the irrationality of the stock market with great certainty. Because financial Markets are considered to have self functioning system to ensure the predictability of losses and gains under certain conditions hence increase the participation of many players.

3. Market-based Theories and hypothesis for explaining security price returns

In order to persuade investors continue to invest in stock markets, some hypothesis were introduced such as efficient market hypothesis and random walk. To make persuasive explanations for price fluctuations in stocks markets, fundamental values of economies were addressed to explain anomalies. Changes in interest rates, changes in dividend payments, changes in earnings or any other different changes could be explanatory in this respect. As it is well known, two hypotheses were developed to prove that the stock market does not function abnormal. It is possible that Irrationality of some players in their decisions and high price volatility may create frustrations but according to efficient market advocates there is no need to worry about these because all anomalies could be explained by efficient market hypothesis and random walk.

3.1 Efficient Market Hypothesis

The efficient market hypothesis is based on the assumption that prices of securities in financial markets fully reflect all available information. Many financial economists forward the efficient market hypothesis one step further in their analysis of financial markets. Not only do they define efficient markets as those in which expectations are rational - that is equal to most suitable forecasts using all available information - but they also add the condition that an efficient is one in which prices reflect the true fundamental (intrinsic) value of the securities. Thus, in an efficient market all prices are always correct and reflect market Fundamentals.

The stronger view of market efficiency has several important implications in the field of finance. First it implies that in an efficient capital market, one investment is as good as any other because the securities prices are correct. Second, it implies that a securitie’s price reflect all available information about intrinsic value of the security. Third, it implies that managers of both financial and nonfinancial firms to assess their cost of capital (cost of financing their investments) accurately and hence that security prices can be used to help them make the correct decision.
3.1.1 Evidences supporting the Efficient Market Hypothesis

Several evidences were presented to support the efficient market hypothesis. Most important three are as follows

- Performance of Investment Funds and Mutual Funds
- Shock Prices reflect Publicly Available Information
- Random Walk Behaviour of Stock Prices

Of the three explanations, random walk behaviour of Stock Prices needs to be explained in detail.

3.2 Random Walk Hypothesis

Random Walk behaviour of Stock Prices: The term random walk describes the movements of a variable whose future changes cannot be predicted (that are random) because, given today’s value, the variable is just as likely to fall as to rise. An important implication of the efficient market hypothesis is that future changes in stock prices should be unpredictable.

Random Walk: Financial Economists have used two types of test to support the hypothesis that stock prices move random walk. In the first one, they examine stock market records to see whether changes in stock prices are systematically related to past changes or not? The second type of test examines prices to see if publicly available information, other than past stock prices, could be used to predict changes?

In his book ‘Undercover Economists’ Tim Harford tells the success story of Amazon.com, its rapid growth and its struggle for being highly profitable. 18 dollar initial price had been charged for Amazon shares in 1997. In spite of the share division, stock prices jumped over 100 dollar. In those days, it is said that Amazon.com was more valuable than the sum of all standard book-stores. But, in 2000, Amazon’s stock stock prices fell down below 18 dollar. Amazon shares were exchanged at the price of 18 dollar in 2001 summer. Some articles that were taken place in financial media in 2002, was thought to appreciate Amazon’s share prices but stock prices were still stayed below %80 of the top price. Then it concluded its voyage at 40 dollar price. Was the correct price 18 dollar, 100 dollar or both?

3.2.1 How the Random Walk Hypothesis proceeds?

In real situations, reasonable investors can predict the future direction of predictable price movements when holding specific shares or analysing securities market. When the risky money is concerned, will they predict them? Certainly they will. But, this also means that if these investors are really rational, no changes in stock prices should be expected then. Since all these publicly available information is incorporated into the analysis, does this mean that there will be no room left for high profit margins? The situation is different than it looks. The importance of unpredictable news on prices should not be forgotten. As a result, random news can move stock prices, and affect indices in the securities market that fluctuates randomly. Mathematicians define this behaviour as random walk. More accurately, securities market should exhibit random walk with tendency. In other words, as months passes, when compared to other potential investment instruments like money in the saving account and home ownership, security prices shows a tendency of increased prices on average. If prices were expected to increase more than tendency, it had already happened. If prices were expected to show small increase or fall, stock prices had already performed poor. This is the reason why people buy and sell shares. In spite of this, the tendency does not change the fundamental analysis and is pressured by random movements in some future day. Although not all the players in the stock market is rational, this theory should be valid. Because, other investors participate in change in the direction of money
by trading poor performance stocks with good ones. Rational investors are strong enough to pressure the market to random walk. Once the better informed investors earn high returns, it must not difficult to predict the change the direction of Money.

Some Economists don’t expect the accuracy of Random Walk theory all the time. If it really were, this would become a paradox. Better informed investors might have created a random market that gives rewards to everyone who mimicks their behaviour. So for many people, spending time and energy to analyse the market and extracting new information would not have been valuable. On the other hand, the market with unexploited opportunities can provide high profit potential to all investors who are willing to search and react to changes on the right time and place. As more people behave predictably rational way, this chain reaction diminishes the unexploited profit opportunites and makes them scarcer. There has to be an equilibrium point somewhere in the middle. What keeps the market random is highly random market in which unexpceted behaviours are possible, like rewarding fully informed investors. Many economists believe in the superiority of the market theories over other theories in explaining anamolies in securities markets.

The increase in general validity of the random walk hypothesis is also because of timely technological advances of this era like Internet, mobile phones, computers and other latest technological improvements and generation of new profit opportunitites. Many Internet users really find reasonable to spend great amount of money for Amazon.com and similar dot companies. Because they think that Internet has been transforming everything.

Stock prices will rise if there is a sufficient reason to believe in the stock rate returns to rise like increasing profits. As it is well known, High profits is usually generated from using scarce and unexploited resources and huge increase in share prices will accompany them. **Alternative Explanations for High Volatility in Security Prices: Behavioural Economics approach to the problem**

If a farmer invests in his own business, you will not find any other person on earth who knows better than him about the needs and the requirements of his own business. Because he can calculate the costs and benefits of his investment, and invest the amount that is just required to stay in the business. However, in today’s World, people buy stocks and other financial papers and are not really aware of the net potential returns of their investments and where their invested Money is channelized into. Health insurance, mortgage is sometimes offered in the form of the security that is blended with other financial derivatives to investors and they are sometimes reselling again to other investors. The reality is that these intangible assets would trigger the economic problems and make economic situations worser unless financial auditing and government regulations were not strictly be implemented. Now, %90 of the foreign capital is channelized into speculative investments and only %10 remaining part finances real physical production.

Up to the present, nobody could have developed rational explanations to big changes in the price of the financial securities. However, these prices may be signals guiding investment decisions. So, exlaining this large fluctuations has an utmost importance because risk-averse investors will be gained If the playground is thought to be fair. Corporation investments are more volatile in total gdp. And have a considerable impact on the economy. What makes the two issues unified is that either the investor is big or small, risk-averse or risk-seeker, their decisions are largely determined and sometimes consciously manipulated by the state of the economy which great majority thinks we are in.
If we look at this phenomena from the point of view of this economic indicator, (corporate investments), the necessity of new theoretical approaches to the problem will come as true. This approach explains large up and downs in stock prices by Spiritus Animals in Humans on their Corporation and individual level investments.

Economists try to make persuasive explanations about price fluctuations by taking all present and past economic fundamental values into account, but up to the present they couldn’t be successful. These fluctuations do not appear to move together neither with interest rates, dividend earnings nor any other change in the economy.

Usually, what makes us to feel more secure is to have the knowledge that these changes follow the changing fundamental values of the economy. If prices do really reflect these fundamental values, it may also be reliable to forecast securities price in the future as it did in the past. In theory, the true value of stock prices can be predicted with the aid of future profit shares, future earnings and discounted value of the future income stream. But, for real situations stock prices are highly volatile.

Some economists do not accept the view that the stock price reflects the true value of the security. They think of the stock price more volatile than it is usually thought. But they couldn’t persuade efficient market advocates by showing the failures of the theory. They think they could account for the large price fluctuations by the efficient market hypothesis and assert that this overshooting is attributable to the big event that was not happened randomly and whose effects still have been affecting fundamental values. Their defense is that not realizing the occurrence of a big event that had happened in the economy before could support the view that markets do not behave irrationally. It can be true. Because nobody can claim that stock market is irrational in anyway. On the other hand, nobody has some kind of proof about the rationality of the high volatility.

**Beauty contest metaphor by Keynes against the rationality of security markets**

It became clear that price changes come after various social changes. In his book that was published in 1936, Keynes compared equilibrium in the stock market with the contest whose readers of a highly popular newspaper of its time were demanded to choose the most beautiful six faces out of 100 photos. According to the rule of the game, participants who made the closest choice to the average reader’s choices would win the game. In order to win, their strategy were not be programmed as choosing the most beautiful face they liked but rather selecting the most beautiful faces that they thought other people liked most. But the strategy was still not the best possible one because others would have followed the same strategy. So, it would be better to choose faces which they thought others would choose faces that other others would like most. Probably, this way of thinking could have been extended one or two steps further. Securities investments are something like this. As the strategy in the beauty contest. An individual did not extract benefit by investing in company whose success in the long run was most likely but preferred to make short-term profits by choosing the stock that offers highest probability of market value in the short-run.

**Other explanation for high price volatility in line with market-based theories**

Behavioural Economists attack the efficient market hypothesis that they are not generally applicable real world phenomenas. They criticize the theoretical backgrounds of the hypothesis and find the model, and its assumptions, inconsistent and oversimplified to explain the real World conditions. Their way of looking at things is to make correct assumptions and includes
true understanding of human beings. The low explainability of the efficient market theory corresponding stock market tendencies is not a real phenomenon. These anomalies can be explained by staying within the range of the theory. Small-firm effect, January effect, market overreaction, excessive volatility, mean reversion, new information that is not always immediately incorporated into stock price are some explanations and these are found to explain the anomalies in the stock market.

Explaining the dominant role of well functioning markets is important. If these fluctuations did not find a persuasive answer by Market Fundamentals and publicly available information, the credibility of stock market would weaken.

**The Fama’s Model and its contribution:**

The Fama’s model provided a reliable investment atmosphere to investors in this respect. In Fama’s Model, the expected rate of return of the security is explained by the expected output. Econometric results provides a solid ground for trustability of the stock market since they connected expected returns to the real variable, that is, Expected Output.

Fama showed that expected rate of return of securities was explained by the expected increase in output in the economy.

**Theoretical backgrounds behind Fama’s Stock Return Rate Model:**

In the classical approach, Money is treated as no different as a mask that quickens the real transactions. Real variables are indicators of the basis of all production, consumption and other related relations and defined in terms of physical units different than monetary and nominal variables. For example, wages and salaries are redefined as a real purchasing power that refers to the amount of physical quantity of goods and services that can be bought with this amount.

Nominal variables might create Money illusion, Once the printing money was increased and distributed equally to all people that is called as the parachute effect, ordinary citizens perceives this increase as if their real income has increased and they might think they are richer now. However, general price increase follows the Money supply increase. The coexistence of same amount of increase in prices and Money supply, leave the value of all economic transactions unchanged. This situation does not produce any improvements in living standards. No change in real purchasing power parity is expected and nor does change in welfare increase. Parallel to this, considering what the true value really means is important and should be accepted as a mean not an end on the way to the well-being of individuals.

Fama showed in his article that stock returns is dependent on a real variable, expected output increase, and it is independent of monetary variables. There are two structural situations clarifying the stock return. The first one is related with the situation pointing out positive relationship between the stock return and output increase. Second structural situation refers to the situation where there exists negative relationship between inflation and expected output. According to Famas’ model; expected output determines inflation rate. The theoretical grounds of the model are based on the rational expectations version of the Fisherian quantity theory. In Famas’ Money demand theory, Money demand is the function of expected production rather than current production. Fama treats the future output as exogeneous relative to the current Money growth and takes Money supply exogeneous relative to prices. As a result, inflation is taken endogeneous subject to prices and expected future output. According to the theory, in a given Money increase, Money demand increases at a rate dependent on expected output. For this reason, increase in expected output increases Money demand and this increase in Money
demand increases the output rate and this process eliminates the effect of inflation from the equation.

Briefly, expected output rate affects inflation and that’s why current inflation is less likely the result of current production but rather it is the result of expected production. It can be concluded that, Inflation variable that has been thought to have an effect on stock returns before must be only a result. With the disappearance of relationship between inflation and current production, current inflation becomes no more an explanatory variable that has an effect in explaining today’s stock returns. Fama constructed the econometric model that stock return was regressed to expected output and current inflation rate. He founded all parameter values statistically significant in determining stock returns. But after that, with some needed revision in data like increasing the number of observations and excluding two outlier observation years - 1954 and 1955 - from the data set, he frees the model from the determinacy of inflation variable. This is consistent with the theoretical grounds at the beginning. The findings indicate that stock returns do not necessarily depend on sole determinacy of monetary variables but rather it depends on a real variable that is expected output rate in this model. The other model that takes place in this paper was constructed by other follower economists who support Fama’s arguments. They also found the dependability of stock return to, a real variable expected output rate, and reject the inflation variable explainability. But these authors attributed the findings of their assertions to ‘the real balance effect’.which is also generally known as‘pigou effect’in the literature. But Authors do not have sufficient information to prove this. They added monetary base growth variable into the Fama’s regression model that contained information set belong to years between 1954 and 1976 and run the regression again. But the problem with their model is that they couldn’t mention from which resource they acquired Monetary base growth information. Because, it had been obtainable from FED, Federal Reserve bank, resources only after 1960. So, it was difficult for others to test their econometric models. That was left their study unresponded due to the untestability of their models by other economists.

As it is mentioned before, In their regression model, the proposition that current Money demand is the function of expected production not the function of current production is evidenced in line with the rational expectation theory and the sole determinacy of expected output is shown. The other two followers would face with the attacks of opponents of real balance effect altough their constructed model produced statistically significant parameters and pass all the econometric tests.

II- The Stock Returns Model:

The population regression function is defined as E(Y/Xi) in the theory... f (Xi), indicates a function of explanatory variable X. Shortly, population regression line of Y shows that population mean distribution of Y has functional relationship with Xi, given Xi’s values.

Q=F(X1, X2, X3,)
E(Q/Xji)=Bo+B1X1i+B2X2i+B3X3i
Qi=Bo+B1X1i+B2X2i+B3X3i+Ui
For the conditional expected value of Q.

An E (Qi/Xji) term gives the expected conditional value or mean value of Q with given or fixed values of X1, X2, and X3.

The Model:
Qi: Rate of return
X1:%Pt (inflation) X2:%Qt+1(expected output)
In the tested model, the sign of inflation parameter is expected to be negative. Because the quantity theory assumes this relationship. But this expectation and negative relationship could be spurious. This negative relationship can be explained by a special Money demand model. Fama’s regression model’s finding results supports this special Money demand model. Consistent with the theory, Fama showed that the inflation variables’ parameter value is statistically insignificant and should be omitted from the model, although the inflation parameter firstly is put into the model as an explanatory variable in his studies.

The sign of expected output, that is another explanatory variable, is expected to be positive because increase in output and in earnings raises the current return rates. This is also consistent with the traditional theory.

**The Model, The Methodology And Findings**

The Least Squares Method is the estimation of B parameters by minimizing the sum of sample residuals squares. In the stocks return model under investigation, parameter values are estimated with the least squares method. The first regression model that explains real stock returns by Fama is as the following:

\[
1954-1976
RST= -0.42+6.50\%Qt+1 -2.91\%Pt
\]

\[
\begin{align*}
T \text{ values:} & \quad (-0.42) \text{ for constant,} & \quad (5.28) \text{ for expected output} & \quad (-1.71) \text{ for inflation} \\
R^2: & \quad 0.71, \text{ d.w:2.01} & \quad \text{S.E.:} \quad 118 \text{ p:.48}
\end{align*}
\]

The Stock returns model includes the observation years between 1954-1976, both inflation parameter and output parameter were found statistically significant. This was not an expected situation for Fama. Because inflation could not be a variable that explains stock returns in an efficient market. This was seen as the result of the conditions between 1954 and 1955. These mentioned two years were ignored and after remaking the analysis for the years 1956-1976, Fama reached the following results below. In this model inflation has lost its explanatory power.

\[
1956-1976
RST= -0.116+6.04\%QT+1-1.05\%PT
\]

\[
\begin{align*}
T \text{ values:} & \quad (-1.50) \text{ for constant,} & \quad (5.17) \text{ for expected output} & \quad (-0.88) \text{ for inflation} \\
R^2: & \quad 0.70, \text{ d.w:1.70} & \quad \text{S.E:} \quad 0.106
\end{align*}
\]

According to these results, the parameter value of inflation variable was no more statistically significant and the expected output rate remained the only independent variable that could explain the expected stock return.

After Fama had increased the number of the observation years as years passed and extended the analysis including the years between 1956-1981 he reached similar findings. These findings are as the following.

\[
1956-1981
RST= -0.124+5.23\%Qt+1 +0.19Pt
\]

\[
\begin{align*}
T \text{ values:} & \quad (-1.49) \text{ for constant,} & \quad (4.12) \text{ for expected output} & \quad (0.17) \text{ for inflation} \\
R^2: & \quad 0.47, \text{ d.w:1.71} & \quad \text{S.E:} \quad 1.33
\end{align*}
\]

**The Interpretation Of The Coefficients:**

In the Stock Returns Model, the interpretation of the second regression model including the period 1956-1976 is as the following. The coefficient of the parameter of the constant is \(B_0 = -0.116\). This shows the mean stock returns when \(X_1=X_2=0\). \(B_1 = 6.04\) parameter shows the effect
of X1 variable on stock return rate when holding the X2 variable constant. The positive sign indicates that there is a positive relationship between stock returns and expected output. The sign of B2 parameter is found negative as expected. According to the Quantity Theory, output increase is followed by the negative reaction of inflation to keep the equation equalization unchanged. But, this negative sign of the inflation parameter indicates the effect of expected output on current inflation. It is a result. For this reason current inflation is not treated as an explanatory variable in the model. As it is seen, current inflation parameter is statistically insignificant that is theoretically expected finding result.

In this paper, the stock return regression model of Fama is tested by running the same regression obtained from reel GNP figures, RST from Ibbotson-Sinquefield database, inflation figures from personal consumption expenditure deflator. RST includes latest December in t-1 time period and latest December in t time period. Inflation figures is between t-1 time period and t time period. Output includes between the t time period and t+1 time period. According to the results, B1 coefficient is 6.012020. It is consistent with the theory and shows the positive relationship between expected output and stock return rate. The sign of B2 coefficient is found negative as the reasons explained before. Findings of the paper verify the finding results of Fama.

CONCLUSION

Efficient Market Hypothesis and Random Walk sometimes fail to explain anomalies and large price fluctuations in stock markets. This market failure can prevent new and present investors from taking participitory role in the stock market. Because it can deteriorate the credibility of well functioning of markets. To explain the anomalies, counter arguments were developed emphasizing the spiritus animals that refers to irrationality of investors and markets. They could be right. But strong theories do not necessarily to have strong arguments. Nobody can prove The irrationality of markets. Some anomalies are explained with staying within the range of the market theory. This paper retested Famaya’s stock return variable and verify his finding result that expected stock returns is explained by expected output. It frees the stock market return from the sole determinacy of monetary variables.

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