Study of the Relationship between Macroeconomic Variables with the Aviation Industry Performance (Case Study: Iran’s airports company)

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Abstract
The aim of this study is to investigate the relationship between macroeconomic variables with the aviation industry. The case study is the nation’s airports company. The hypothesis is that there is a relationship between macroeconomic variables and aviation industry performances. For this purpose, the seasonal income of Iran’s Airports Company since 1378 until 1392 were collected and the relationship between macroeconomic variables and country airports company income using ARDL was evaluated. The results show a direct relationship between the exchange rate fluctuations with the revenue of the country’s airport, but the changes in inflation rates has a negatively relationship with it, and the price of alternative services and the investment in airport company have positive relationship with the revenue of the country's airport.

Keywords: exchange rate, inflation rate, prices of alternative services, investment, performance, Airport Company.
Introduction

Economic development of any nation is directly related to the efficiency of its transportation system (Ebrahimzadeh, 1390). Air transportation is a basis element and an important component of the cycle of production and consumption. It is considered as service sector in the national systems (Shiraz, 1386). In Iran, the need for rapid transport of people and goods and the ever-increasing demand for air transportation sector is an unavoidable necessity. On the other hand, aviation industry is an important factor in economic, social and cultural development of the Islamic Republic of Iran, therefore, knowing the challenges and opportunities that exist in the industry, offering strategies, policies, objectives, and finally leading in development and advancement (Zarrabi, 1388).

Macroeconomics is the branch of economics that the performance, structure, behavior and decisions of an economy as a whole are concerned, whether it is a country's economy or the economy of a region or the world economy. Macroeconomic study the general indices such as GDP, unemployment and price index to understand the functioning of the entire economy (Samadi, 1385). In general, organized and orderly capital market is a basic requirement of any states and nations to achieve development and progress. The effect of such capital market on the economic performance of the market is to the extent that its absence has a negative impact on economic performance. Crisis-economic problems cause widespread unemployment, declining investment, decrease in economic growth and instability in the economic indicators of the country (Hlafy, 1391).

Developing countries, including Iran, have a high degree of macroeconomic variables volatility. In these countries, exchange rates, stock prices and other macro variables to the advanced, industrialized economies are more volatile, and this volatility, in turn, has created an uncertain environment for investment and because of that, investors cannot easily and with confidence decide about their future investment decisions. In order to increase investment and thus achieve sustained economic growth, the importance of factors such as exchange rates, inflation and interest rates and uncertainty of them must be took into account (Haidar, 1391).

So one of the issues that should be investigated by financial professionals is the relationship between macroeconomic variables and their performances and functions (Gan, 2006). Today’s environment of Airports is growing and very competitive environment and Airports have to compete with several factors at the national and international level and expand their activities to survive. Airports needed Financial resources to invest, so financial resources and their uses should be determined well to be profitable (Komonen 2, 2008). In fact, if the airport directors be aware of these indicators (indices) they can make policy better in prioritizing and their time, management power and financial resources spend and use in the right direction. Given the importance of the subject, the aim of this study is to investigate the relationship between macroeconomic variables and the performance of airports. For this purpose, we sought to answer the following hypothesis: macroeconomic variables are related to performance of Airports.

In order to answer the above hypothesis, this article is organized in five sections. The second section consists of literature, theoretical and research backgrounds. In the third, the model...
used in this research is presented. The fourth section analyzes the empirical results and the final part indicates the conclusion.

**Literature of research**

1.2 theoretical foundations of research

The aviation industry has many challenges, but the most important challenges that increase the risk, cost and dissatisfaction of the fleet, include:

1. eroded fleet of air transportation, which results:

- Flights are canceled or delayed;
- increase the risk for travelers;
- lower the quality of lines;
- The level of airline passengers greatly reduced;
- Delay increases (Sadegh Amalnic, 1383).

2. Constructing and increasing the number of airports instead of the developing and increasing the capacity of passenger fleet and economically making the airports viable(Saffarzadeh and Masumi, 1383)

3. Lack of planning and utilization of resources, and lack of a long-term strategy and effective policies and strict implementation of strategies and continuous monitoring and control tasks (Zarrabi, 1388)

**Macroeconomic variables**

Macroeconomic variables affect every economic factor of any countries (Alkadvo and Akynvnd, 2009). These variables have a significant impact on the activities of airports in the country. These variables include interest rates, economic output, employment and unemployment, population rates, inflation, government budget balance, balance of international trade and productivity (Mchyry, 2012).

**Exchange rate**

One of the variables that has large fluctuations in recent years and somehow affected the domestic economy, was the exchange rate. Exchange rate is one of the key factors for a small open economy and the rest of the world. This rate through commodity markets and asset classes and relates domestic prices and prices in the international market and it is a influencing factor on the policies, strategies and daily mechanisms, political, social and cultural structure (Mohsen Mousavi and Sobhani Pour, 1387). The real exchange rate is typically recognized as a measure of international competitiveness, and indicator of
competition of each country’s rate. There is an inverse relationship between this index (indicator) and competition (Iqbal Mahmoud, 2011).

Inflation

Inflation arises from the interaction between economy supply and demand. This means that the interaction of cost pressures side and the other of demand appeal side will lead to inflation. Types of inflation include adjusted Inflation, spiral or helical inflation, monetary inflation.

Inflation is caused by two factors: form 1 - economy aggregate demand shocks 2 - Aggregate supply side (Jalali Naini, 1389).

Effects of inflation shocks can be expressed in many different ways: (1) the right environment for investment (2) Inflation and ongoing changes of prices, 3. One of the most important economic losses caused by inflation is the uncertainty of the amount of inflation in upcoming periods, (Graham, 2009).

Investment

Generally, investment means to use available funds in order to achieve more money in the future. In other words, the investment is the postponement of current consumption for future optimization (sharp, 1995).

Investments are divided in two main forms: real and financial. Real investment is an investment that one has to sacrifice the value at the present time, to acquire a real asset. Financial investment, in exchange for sacrificing the present value, usually a financial asset, resulting in a flow of cash earned (Kathleen 7, 2005).

In general, the investment environment components can be divided into three categories: 1. financial assets 2. Financial markets 3. Intermediaries or financial institutions. In investing process the way of investment decision-making, the amount of investment and time to Invest are regarded (Abdollahzadeh, 1381, Raymond P., 1380).

The impact of macroeconomic variables on financial performance

According to Oliver (2000), macroeconomic variables are the factors related to economic at internal or national levels, and these factors affected a higher proportion of the number of selected people. Often the economic performance is evaluated and discussed by some of the main macroeconomic variables such as interest rates, the gross domestic product, exchange rates, inflation and the money which are prepared for the government, businesses and consumers (Muchiri 2013).

Fama and French three-factor model

In 1993, Fama and French studied factors related to firm characteristics such as size, book-to-market, leverage and return of stocks. According to the survey, they offered three-factor model to explain stock return. These factors include:
1. The excess of the expected return of the market portfolio to the risk-free rate of return (the market factor)

2. The difference between the expected returns of portfolios composed of stocks of large companies (corporations) and portfolios composed of small companies stocks

3. The difference between the portfolio returns of companies stocks with small caps and big caps (HML)

It should be noted that Fama and French (1992) expand Fama and Macbeth analysis (1974), and they found that over the last 40 years, stocks which have greater role in the variability of the capitalization-weighted NYSE Index provide higher rates of return. They observed that after controlling the firm size there is a positive and negative relationship between average return and beta.

Fama and French by taking account most of the parameters proposed in the literature, concludes that between 1963 and 1990, while taking beta and other variables, there is no relationship between the average stock returns and beta, and actually two dominant variables are size and book-to-value ratio to market value.

Performance measurement indices can be divided into financial and non-financial indices of performances. Non-financial indices also can be divided into manufacturing indices, marketing indices, and administrative indices. Bihmani(1993) divided evaluation or measurement indices of performances into manufacturing, quality and marketing indices. Financial indices proposed in the Behmani model include working capital, cash flow, payment of debts, debt collection period, earnings per share, earnings per share, price-earnings ratio per share, profit ratio on sales and return on employed capital.(Islami Bidgoli,2002)

There are several methods to assess financial performance in different aspects. In one of categories, the methods of evaluating financial performance are divided into following four categories (Asghari, 1385).

1. The ways in which the accounting information is used to evaluate performance.

2. The ways in which a combination of accounting and market information used to assess performance Such as different versions of Tobin's Q, or P / E ratio.

3. Ratios which are used by financial management data such as return on per share (proportions) and excess return per share

4. Ratios which are economic criteria despite the use of accounting information such as (EVA) and (REVA) and (MVA)

A review of the literature

Sadeghi Shahdani and et al (1391) conducted a study entitled "Study of the relationship between market structure and Capital structure in the Tehran Stock Exchange ". The results
suggest that the relationship between market structure and capital structure is a non-linear relationship and it may be due to the complex relationships in the market, issues of representation and bankruptcy costs. In Among the variables studied, a significant negative relationship of profitability, and a significant positive relationship of size with capital structure are confirmed. This means that the more the companies are profitable, they fund more than retained earnings and capital increases.

Pashayi and et al (1388) in a study entitled “study of Effect of inflation on real returns in the Iran’s economy founded that the exchange rate and inflation rate have a negative impact on real returns of stocks in the long term, but the effect of variable of oil price fluctuation and oil price respectively in the short-term and long-term on real return of stocks has been positive.

Kia(2013) in his studies titled "The determinants of the real exchange rate in a small open countries: based on data from Canada " creates real exchange rate a monetary model that shows the real exchange rate in the long term is a function of the real money supply, internal and external real interest rates, real GDP, real state expenditure, deficit of GDP, domestic and foreign debt in GDP, external financing in GDP and commodity prices. This model for quarterly data of Canada over the period 1972- 2010 is tested. The results show that all variables except the real money supply, internal and external interest rates and foreign financing in GDP statistically have significant impact on Canada's real exchange rate. However, in the short term, domestic financial variables have no effect on the real exchange rate. Changes in interest rates, money supply growth, commodity prices and debt to America in GDP, in the short-term have negative impact on real exchange rate.

Shen et al (2009) in a research entitled "The impact of capital and operational risk on the profitability of life insurance in Taiwan" studied the structure of Investment companies providing life insurance and proposed a theoretical model. They concluded that capital structure has a significant negative effects on the operational risk, and they also founded that operational risk has a negative relationship with the profitability of life insurance companies.

Teker (2008) in his article “ macro-economic factors determining the capital structure” studied the impact of macroeconomic factors on decisions of the Company's leverage; this study have been done in Turkey’s Stock exchange during 2000-2007. macroeconomic factors include tangible assets, size of companies, growth and profitability opportunities, which showed that the profitability has negative relationship with leverage.

Research model

The study investigated the relationship of macroeconomic variables with the Airports Company performance with the use of theoretical arguments and empirical considerations and the special requirements of Iran's economy based on a self-explanatory econometric model with distributed lags (ARDL) proposed by the boys and Shin, using income information, as well as the macroeconomic variables during the period 1999-2013. the model introduced as follow:

\[ ACI = C + \alpha_1 ER + \alpha_2 INR + \alpha_3 INV + \alpha_4 PT + \alpha_5 PB + \alpha_6 PA + \varepsilon \]
In the above equation, ACI stands for operating income of airport company; ER stands for exchange rate; INR: inflation rate; INV: investment in the aviation industry, PT: price of train replacement services, PB: prices of bus replacement services and PA stands for airplane prices.

In this study all financial variables, have been calculated based on fixed price of 1390 to demonstrate the relationship between macroeconomic variables with performance of airports on the statistical data. All data required for research collected from published official sources. In ARDL method for estimating long-term relationship, the two-stage method can be used. In the first phase, a long-term relationship between the studied variables will test (Boys et al., 2001). The second, the long-term relationship between the variables under investigation by means of calculating the F statistic to significantly test the lagged variables levels, are examined in the form of error correction (boys and Shin, 1996). The number of optimal timeouts(lags) for each of the explanatory variables can be identified with the help of criteria such as Akaike Criter (AIC), Schwarz Criter (SBC), Hannan-Quinn Criter (HQC) or adjusted determination coefficient.

Given that the time series for the examination of the macroeconomic are unstable and this instability provide the possibility of the spurious regression in empirical studies, so the stability of the parameters have been examined by using unit root tests Augmented Dickey Fuller (ADF) and the co-integration degree have been determined. With regard to the co-integration between sets of aggregate economic variables, statistical basis has provided the use of error correction model. The important advantage of ARDL method among the Co-integration methods is that this method is applicable regardless of variables of sustainable model are in grade of (0) or (1). In other words, this method does not require dividing variables by the variables of grade one and zero (Tashkiny, 1384). In this study the Eviews and Micro fit software are used to analyze and estimate the model.

The empirical analysis of experimental results

Before examining the long-term relationship, the stationary of variables using generalized Dickey - Fuller investigated. According to the results, the company's focus in terms of airport revenues, exchange rate, inflation rate, the price of the aircraft, the price of the bus, the price of the train are stationary. The results of this test have been reported in Table 1.

<table>
<thead>
<tr>
<th>Result</th>
<th>Prob</th>
<th>MacKinnon critical values 5%</th>
<th>Statistics</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static</td>
<td>0/00</td>
<td>-3/48</td>
<td>-7/70</td>
<td>dACI</td>
</tr>
<tr>
<td>Static</td>
<td>0/05</td>
<td>-1/98</td>
<td>-1/87</td>
<td>dER</td>
</tr>
<tr>
<td>Static</td>
<td>0/00</td>
<td>-3/48</td>
<td>-7/73</td>
<td>dINR</td>
</tr>
</tbody>
</table>
The results of estimating the short-term dynamic equation using software Microfit have been shown in Table 2.

Table 2. The results of the estimation of dynamic models

<table>
<thead>
<tr>
<th>Possibility</th>
<th>T-statistic</th>
<th>Standard deviation</th>
<th>Coefficient</th>
<th>Variable name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/000</td>
<td>5/68</td>
<td>0/08</td>
<td>0/48</td>
<td>ACI(-1)</td>
</tr>
<tr>
<td>0/000</td>
<td>6/61</td>
<td>78/93</td>
<td>521/87</td>
<td>ER</td>
</tr>
<tr>
<td>0/006</td>
<td>-2/90</td>
<td>29/72</td>
<td>-86/21</td>
<td>ER(-1)</td>
</tr>
<tr>
<td>0/000</td>
<td>-9/41</td>
<td>15243/6</td>
<td>-143521</td>
<td>INR</td>
</tr>
<tr>
<td>0/006</td>
<td>2/87</td>
<td>15671/7</td>
<td>45073/3</td>
<td>INR(-1)</td>
</tr>
<tr>
<td>0/000</td>
<td>5/12</td>
<td>0/086</td>
<td>0/44</td>
<td>INV</td>
</tr>
<tr>
<td>0/000</td>
<td>4/21</td>
<td>1/05</td>
<td>4/43</td>
<td>PT</td>
</tr>
<tr>
<td>0/000</td>
<td>4</td>
<td>104/46</td>
<td>418/36</td>
<td>PB</td>
</tr>
<tr>
<td>0/000</td>
<td>-4/68</td>
<td>141/61</td>
<td>-663/73</td>
<td>PA</td>
</tr>
<tr>
<td>0/000</td>
<td>5/01</td>
<td>519414</td>
<td>2606007</td>
<td>C</td>
</tr>
</tbody>
</table>

**R-Squared: 0/94**

\[ F(9,47):95/94(0/000) \]

A: Serial correlation \[ F = 0/51(0/72) \]

B: Functional form \[ F = 0/45(0/53) \]

C: Normality \[ \chi^2 = 0/11 (0/95) \]

D: Heteroscedasticity \[ F = 0/28 (0/59) \]

Source: research findings

*: It is viable at %10 error level
According to what the table (2) is shown, since the dependent variable factor(coefficient) of model (ACI) is less than one, the pattern tends toward the long-term equilibrium model. In addition, these results show the significance of all the variables studied, and also the F statistic is significant at 99% that indicates the significance of entire pattern, and the coefficient of determination 94/ implies the explanatory power of the model and. According to the ARCH test, the model has no variance heterogeneity, because of F statistic of test was 28/0 (59/0) and the null hypothesis of homogeneity of variance does not reject. As well as model did not have serial autocorrelation, because LM test showed that F statistic is 0/51 (0/72) and the null hypothesis that there is no autocorrelation problem does not reject. Statistic of JB test showed the normality of the model, because it statistic $2\chi$ is 0/11 (0/95) and the null hypothesis of normal distribution of residuals does not reject. The results suggest that the problem is not clear bias because the F statistics of the functional model test is equal to 0/45 (0/53) that shows the null hypothesis that there is no clear bias problem does not reject.

The long-term relationship of variables using the t-statistic surveyed, and long-term relationship between variables verified. So that after the estimation of dynamic equation, the sum of the coefficients of the lagged dependent variable was smaller than one and it is divided by its standard deviation divided. Computational statistic is equal to -6/5, because the calculated value of number due to the absolute value of this statistic is higher than the critical value of Banerjee Table, Mester and Dolado (-3/64), therefore the null hypothesis that there is no co-integration among variables of model has been rejected and the existence of a long-term equilibrium relationship between the above model was confirmed. The results are shown in the table(3).

Table 3: results of the Long-term estimation of model

<table>
<thead>
<tr>
<th>Possibility</th>
<th>T-statistic</th>
<th>Standard deviation</th>
<th>Coefficient</th>
<th>Variable name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/000</td>
<td>8/26</td>
<td>102/16</td>
<td>844/79</td>
<td>ER</td>
</tr>
<tr>
<td>0/000</td>
<td>-8/36</td>
<td>22810/5</td>
<td>-190901/9</td>
<td>INR</td>
</tr>
<tr>
<td>0/000</td>
<td>7/19</td>
<td>0/11</td>
<td>0/85</td>
<td>INV</td>
</tr>
<tr>
<td>0/000</td>
<td>6/35</td>
<td>1/35</td>
<td>8/60</td>
<td>PT</td>
</tr>
<tr>
<td>0/000</td>
<td>4/78</td>
<td>169/51</td>
<td>811/26</td>
<td>PB</td>
</tr>
<tr>
<td>0/000</td>
<td>-7/09</td>
<td>181/43</td>
<td>-1287/1</td>
<td>PA</td>
</tr>
<tr>
<td>0/000</td>
<td>12/17</td>
<td>415149/3</td>
<td>5053357</td>
<td>C</td>
</tr>
</tbody>
</table>
As can be seen, all variables are significant at the 95% level. Exchange rate (ER) is directly related to airport company income (revenue). It means that an increase in the exchange rate, the revenue of airports increases. Coefficient of inflation rate (INR) is negative, indicating an inverse relationship between inflation and Airports Company income. It means that an increase in inflation rate, reducing income of Airports Company. Investment in the aviation industry has a significant positive relationship with income of Airports company, it means when the investments in this industry increase, the company's revenues increase. The average price of a bus (PB) and average price of train (PT) have also a positive and significant association with Airports Company income, means with increase in the price of bus and train prices airports income increase, so it can be concluded that aviation transportation can be replaced by bus and train. The results of long-term also show an inverse relationship between the average price of a plane (PA) and Airports Company income and represent the negative relationship between average price and Airports Company income. Given the fixed rate of passenger toll and the non-fluctuations in the price changes, the increase and decrease of passengers affect the airport company income. the for each long-term relationship, there is an error correction model (ECM) that relate the short-term volatility of variables to the their amounts of long-term. The results of the estimation of error correction model are shown in table (5).

Table 5. Results of the estimation of error correction model

<table>
<thead>
<tr>
<th>Possibility</th>
<th>T-statistic</th>
<th>Standard deviation</th>
<th>Coefficient</th>
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</tr>
</thead>
<tbody>
<tr>
<td>0/000</td>
<td>6/61</td>
<td>78/93</td>
<td>521/87</td>
<td>dER</td>
</tr>
<tr>
<td>0/000</td>
<td>-9/41</td>
<td>15243/6</td>
<td>-143521</td>
<td>dINR</td>
</tr>
<tr>
<td>0/000</td>
<td>5/12</td>
<td>0/08</td>
<td>0/44</td>
<td>dINV</td>
</tr>
<tr>
<td>0/000</td>
<td>4/21</td>
<td>1/05</td>
<td>4/43</td>
<td>dPT</td>
</tr>
<tr>
<td>0/000</td>
<td>4</td>
<td>104/46</td>
<td>418/36</td>
<td>dPB</td>
</tr>
<tr>
<td>0/000</td>
<td>-4/68</td>
<td>141/61</td>
<td>-663/73</td>
<td>dPA</td>
</tr>
<tr>
<td>0/000</td>
<td>5/01</td>
<td>519414</td>
<td>2606007</td>
<td>dC</td>
</tr>
<tr>
<td>0/000</td>
<td>-6/05</td>
<td>0/08</td>
<td>-0/51</td>
<td>ECM(-1)</td>
</tr>
</tbody>
</table>

Source: researcher’s findings

Coefficient of error correction in this model is 0/51 and statistically it is significant. It indicates that it is adjusted in every period of 0/51 percent of imbalance (lack of equilibrium) in airport company and be close to its long-term trend.
In the final stage of structural stability tests by means of two statistic using the cumulative sum (CUSUM) and squared residual cumulative (CUSUMSQ), the stability of model coefficients is investigated. As the graphs (1) and (2), the results of this test showed that the stability of estimated coefficients and due to it is placed in 95 percent of confidence interval, there is no possibility of structural failure in model.

**Diagram 1.** Stability of coefficients (CUSUMSQ)

Source: research findings

**Diagram 2.** Stability of coefficients (CUSUM)

Source: research findings

**Conclusion**

In this study, the relationship between macroeconomic variables with the performance of airports in the country using the self-explanatory with distributive lags methods and income information, as well as the macro-economic variables have been studied over the years 92-1378. The results obtained from ARDL model showed the results of short-term and long-term models indicate that the variables of exchange rate, investment in airports, bus and train prices have a significant positive impact on airport company income. However, the variables of the
inflation rate and the price of the airplane does not show a significantly negative impact on airports incomes.

ECM coefficient indicates that each year about 51 percent of macro variables placed in its long-term trend. It shows the good speed of short-term adjustment toward the long-term adjustment.

**Practical suggestions**

1. Airports Company managers in their decision-making criteria for investment in addition to changes in macroeconomic variables such as exchange and inflation rate, should consider and have special attention to the changes of micro-economic variables such as price of alternative service, the amount of investments.

2. Due to the long-term effects of variables and the fact that inflation in the long term has negative effect on Airports Company income, managers have to consider necessary and strategic policies to implement and institutionalize income from non-aviation element.

3. The directors of the company airports due to fluctuating economic variables such as income Airports in front of the exchange rate, inflation, etc. clever strategy to attract investment and sector.

4. Due to positive fluctuation of airport company incomes against changes in exchange rates in recent years, the managers should pay more attention to the foreign exchange market and they have to design and apply the necessary policies for floating exchange rate system.

5. Due to significant changes in airports incomes against the alternative service prices of train and bus, managers of aviation industry have to improve the quality level of service and service strategies, satisfaction of passenger and to maintain the competitive context.
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