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Sustainable Development of Pakistan Railways Being an Environmentfriendly Mode of Transportation

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ABSTRACT

Pakistan Railways is the largest federal organization to offer transport services for passengers and cargo. The significance of this enterprise is increased due to its characteristic of environment friendly mode of transportation. As the transportation work is run through some kind of fuel, mitigation of the adverse effects of the fuel on environment is a big challenge for the concerned authorities. Pakistan Railways is making great effort to play its role as a sustainable and environment-friendly mode of transport across the country. The sustainability of this organization solely depends on its revenue generation and this revenue generation is affected by certain factors. To analyze this sustainability, the relation between economic growth, inflation, and passenger revenue of Pakistan Railways is estimated. Time series data of twenty (20) years (1999-2018) is used, derived from the database of the World Bank's World Data Indicator. The Granger causality test is used to find out the correlation among any two or more variables. Empirical results indicate that there is no casual relation between economic growth and passenger revenue of Pakistan Railways. Whereas, bidirectional relation is found between Inflation and passenger revenue of Pakistan Railways. It indicates that Pakistan Railways can play a better role to increase the economic productivity of the country by adopting competitive passenger tariff and a consolidated transportation policy. That is equally beneficial for profitability thus sustainability of Pakistan Railways and the environment.

KEYWORDS: Environment-friendly mode, Sustainable development, Inflation, Pakistan Railways, Time series data.

1 INTRODUCTION

As Pakistan Railways is the most environment-friendly mode of transport, it caters for the transportation needs of the country, for passenger and cargo both. In order to make this organization more functional, there are certain factors that may be dealt in a way that the journey of sustainable development continues in future as well.

1.1 Revenue Generation of Pakistan Railways

Pakistan Railways, being a state-owned federal organization, is the largest mode of transportation in the country which is supposed to offer economical and safe journeys to its passengers. The railway network is laid down in all parts of the country covering all major industrial and population sections and offering regional connectivity with neighbouring countries.



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1.1.1 The Deficit and Factors Leading to Deficit

Over the past few years, the deficit of PR has increased year by year mainly due to less allocation of funds by the Fed. Govt., lack of attention, internal leakage of revenue, ineffective policies, corruption, no merit policy, natural calamities like floods, less use of the latest technology, and maladministration [1]. Revenue generation is the key to survival for Pakistan Railways so that this enterprise may continue its journey towards sustainability and environment protection. The factors which are affecting the revenue generation of Pakistan Railways are multi-faceted but, in this study, the factors inflation and economic growth would be analyzed statistically.

1.2 Inflation

Inflation is such property of the economy that cannot be avoided. In simple words, inflation is a persistent increase in the general level of prices. Prof. Crowther beautifully defines the term inflation as "Inflation is a situation in which price level continuously rises and value of money falls" [2]. Inflation can arise from demand-pull forces or cost-push factor. Three indices are used to calculate inflation in Pakistan:

- i) Wholesale price index (WPI)
- ii) Sensitive price index (SPI)
- iii) Consumer price index (CPI)

Usually, a government focuses on maintaining a moderate level of inflation as it promotes competition in markets and the overall economic growth of the country [3]. In the short run, there is a negative relation between inflation and economic growth rate and in the long run, it has positive relation [4].

1.3 Economic Growth

Economic growth of a country can be defined as an increase in its economy's production capacity which helps in producing more goods and services over time. Economic growth also indicates the purchasing power of the consumers and certain factors indicate the growth rate of any country's economy. The economic growth is the leading factor towards sustainability of any country's economy.

1.3.1 Economic Growth Measurement

Economic growth can be measured in nominal as well as in real terms. It includes inflation in nominal terms while it is adjusted for inflation in real terms. Annual change in real output helps measure short-term economic growth. Long-run economic growth can be shown using potential GDP and a right shift in the country's long-run aggregate supply curve.

2 LITERATURE REVIEW

There is certain work that has been done with this approach to find out the correlation between economic growth and profitability or the volume of traffic to be carried out by railway. In a study of Indian Railways, unidirectional causality from GDP to railway freight has been found to exist



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which means that there is a positive relation between Indian railway freight and GDP for the period 1960-2009 [5].

Some of the other works concerning railway networks of other countries, like the Chinese railway by Wie Liu (2004) [6], the European railway network by Hilmola (2006), and the Indian railway by Pradhan (2010) [7] in context of the economic growth and financial sustainability of railway network enquiring the correlation between the two. Pradhan used the Granger causality method to find the relation between railway freight and economic growth wherein he found out that there is unidirectional causality between the two. Similarly, Hilmola [8] has found a strong probability between the economic growth and the volume of traffic being carried out by the European railway network thus emphasizing an increase in investment in the railway sector to earn more contributing to the GDP of the country.

In a study related to China's high-speed railway network [9], it was observed that the network of high-speed rail has considerably expanded in China since 2008 so empirical data of the period from 2002-16 were taken to see the impact of high-speed rail on economic growth. The sample data was classified as large or small cities and developed or underdeveloped cities. This study concluded that in big cities, high-speed rail had put a positive impact on economic growth but it had put no significant impact on underdeveloped cities so it was suggested that the planning of high-speed rail to boost economic growth must be done separately for every city keeping in view its social and geographical factors. Cornwell [10] has defined the subject matter as international monetary programs like IMF focus on the state-owned-enterprises like Pakistan Railways as their purpose of establishment is to increase the economic growth rate of the country which unfortunately these enterprises are not doing and that results in the grant of huge subsidies by the government to carry the operations of such enterprises.

The sustainable growth of any organization is made possible through adopting better revenue management techniques. There are several research studies on this subject. In one such study [11], the authors have explanined that how the customer heterogeneity puts an impact on determining the passenger tariff and seat allocation for the raiwlay service and proper analysis of customer heterogeneity may increase revenue by 20%. In another study [12], that authors proclaimed that the pricing affects demand factor and keeping in view the fluctuating trends of demand, a stochastic non-linear integer programming model was used (in their study for one Iranian train service) to integrate the pricing and capacity management. In China, a study [13] was conducted to analyze the revenue generation of the High Speed Rail. The demand division among different groups of passengers was analysed and sorted on the basis of survey data. The simulated annealing algorithm was designed for the optimisation model which resulted in increase of revenue by 3.52% with demand division and 1.5% without division of demand.

3 METHODOLOGY

3.1 Variables and Estimation Tool

In this study, three variables, i.e. Inflation, Economic Growth, and Passenger Revenue of Pakistan Railways are taken to study their causation. The causation between any two or more variables can



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be unidirectional, bidirectional or no relation. To represent economic growth; net national income is used. To represent inflation; the GDP deflator is used. To represent railways; the revenue of Pakistan Railway is used as the number of passengers carried.

To estimate the relationship between two variables, certain tests like OLS Regression, Johnsons co-integration, etc. are used. To use OLS Regression, the variables must be stationary at level. To use Johnsons co-integration, the variables must be stationary at first difference or the variables must be stationary at second difference. Whereas, to estimate the causation between the variables, the Granger Causality test is used so the Granger Causality test is used here. In the Granger causality test, a linear relationship between two variables can be found. Time series data from the year 1999 to 2018 is used in this study while the data is collected from WDI (world data indicator). E-views as an estimation tool software was used to identify the nature of the relationship between variables.

3.2 Null and Alternative Hypothesis

The hypothesis which is made for possible rejection is called the null hypothesis whereas any hypothesis other than the null hypothesis is called an alternative hypothesis.

3.2.1 Null Hypotheses

- H_0 1: Railways passenger revenue does not granger cause Economic Growth
- H_0 2: Economic Growth does not granger cause Railways passenger revenue
- H_0 3: Railways does not granger cause inflation
- H_0 4: Inflation does not granger cause Railways

3.2.2 Alternative Hypotheses

- H_A 1: Railways passenger revenue granger cause Economic Growth
- H_A 2: Economic Growth granger cause Railways passenger revenue
- H_A 3: Railways granger cause inflation
- H_A 4: Inflation granger cause Railways

The lowest level of significance at which a null hypothesis can be rejected is called P value. In this study, five per cent is taken as the lowest significance value.

4 DATA ANALYSIS

After the empirical study of time series data of twenty years related to the above three variables; the following results were found:

4.1 Relation between Railways and Economic Growth



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Null Hypothesis:	Obs.	F-Statistic	Prob.
RAILWAYS does not Granger Cause GROWTH	18	0.94213	0.4149
GROWTH does not Granger Cause RAILWAYS		2.02019	0.1722

Table 1: Null Hypothesis of relation between Railways and Economic Growth

In the above Table 1, the first p-value is 0.4149 which is higher than 5% hence first null hypothesis has been accepted and the first alternative hypothesis has been rejected which indicates that Railways does not granger cause economic growth. The second p-value is 0.1722 which is also higher than 5% hence second null hypothesis has been accepted and the second alternative hypothesis has been rejected which indicates that economic growth does not granger causes Railways. Hence with the help of the above results, one can conclude that there exists no casual relation between railways and economic growth.

4.2 Relation between Railways and Inflation

Table 2: Null Hypothesis of relation between Railways and Inflation

Null Hypothesis:	Obs.	F-Statistic	Prob.
RAILWAYS does not Granger Cause INFLATION	18	8.50377	0.0044
INFLATION does not Granger Cause RAILWAYS		7.14105	0.0081

In Table 2, the first p-value is 0.0044 which is lower than 5% hence third null hypothesis has been rejected which means that railways granger cause inflation. The second p-value in the above e-views window is 0.0081 which is also lower than 5% hence fourth null hypothesis has been rejected which means that inflation granger cause railways. With the help of the above results, one can conclude that there exists bidirectional relation between inflation and railways passenger revenue.

5 DISCUSSION OF RESULTS

The relation between the passenger revenue of Pakistan Railways and Inflation has bidirectional relation which means that railways' profitability is very much affected by inflation (mainly the rise in fuel price). In order to save PR from potential loss due to inflation or rise in fares of PR, it must devise its passenger tariff as per the market dynamics so that railways may lead the transportation of passengers across the country in an environment-friendly mode.

Another very important variable, economic growth, carries no causal relation with passenger revenue of railways. So, this may be implied that Pakistan Railways is not yet able to make its existence prominent in the economic growth of the country being a small size industry. But prospects are there that if a consolidated transportation policy is formed and implemented, Pakistan Railways would be able to contribute in the economic growth of the country in a better way thus saving the environment from harmful carbon emission by other modes of transport.



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6 CONCLUSIONS

Based on the above analysis, it is concluded that:

- The causation between the variables, Inflation and Railway is bidirectional which manifests the significance of this variable for PR.
- The optimization of passenger tariff of PR is the need of the hour for better revenue management.
- The passenger tariff must be aligned with the market dynamics and competitive in nature.
- PR may play its part in economic growth of the country in a better way through adopting the latest revenue management techniques for its passenger sector.

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