Econometric Forecasting Models for Air Freight in Indonesia (And How Will It be Affected by Covid-19?)

Viktor Suryan[1], Anggi Nidya Sari[2], Direstu Amalia[3], M. Fathar Habillah[4]
[1,3,4]Palembang Aviation Polytechnic Palembang, [2]Sriwijaya State Polytechnic
*e-mail: viktor@poltekbangplg.ac.id

Abstract

Forecasting using the economic factor as indicators seems significant related. The experts also suggest predict the number of traffic in transport by approaching the econometric models. This paper predicting the upcoming number of air freight until 2030. The result shows GDP is significant related to number of air freight. However, the economic crisis also contributes to decreasing the value. Also, the Covid-19 impact the economic in the country. Predicting the number of air freight in 2020 is going down. The number seems gradually grow after two years and assume the pandemic is over soon.

Keywords: Econometric, Forecasting, Air Freight, Indonesia

INTRODUCTION

The number of air traffic cargo in Indonesia is significantly increasing from 1988 (World Bank, 2019). As archipelago country, air transport become attractive choices beside the land and sea transport. By using the aero plane, the goods and cargo become faster delivered to customers. The growth of numbers of aircraft also effected to expand the capacity of air traffic cargo. Forecasting the number of air freight is important to enlarge the airport infrastructure. By using this number, the government will consider to make good decision.

The Covid-19 also influence the global economic. According to Suryo (2020), there are three negative impact of Covid-19 in term of economic. First, people's purchasing power has decreased. Two, uncertainty causing the low investment. Three, the export commodity from Indonesia to global declining due to low demand .

This research finds the models by economic factor, forecast the demand until years 2030 and predict the growth average per year in ten years

Sahlan, Muh. Aslam (n.d) predict the demand of air cargo in Sultan Hasanudin International Airport, Indonesia, by using Linier Regression method. The method is used to analyze the models of air cargo demand until years 2020. The result shows the demand of air cargo increasing by 12 until 17 percent. However, the research seems avoid the factors of escalating the numbers of demand. Furthermore, this paper suggests to airport management to enlarge the capacity building of the human resources to effectively handling the cargo.

On this paper, Reza (2013) predict the relationship between logistic and economic factor in Indonesia. By using time series data analysis, Reza using GDP as main indicator of economic growth In Indonesia. This research using the data from Indonesia Statistic bureau agency from 1988 until 2013. However, the data for logistic from sea transport and railway are available from 2013. The conclusion shows the grow of the numbers of cargo and the economic factors are significantly related.

However, this paper considered only on GDP factor. But, Reza suggest to expand the research to using the data such as new fixed asset investment, and freight turn over.

There are many researches have forecasted the number of cargo. However, a very few the journal predicted the number by approaching the economic sector in Indonesia. GDP are strong correlation to number of air cargo (Reza, 2013), (Wadud, 2013). GDP constant Local Currency Unit (LCU) are indicator that might affected since the GDP constant LCU indicate the growth of production without influencing the inflation. As postulated by Suryani et al. (2012) describe the air cargo, trade and GDP are related
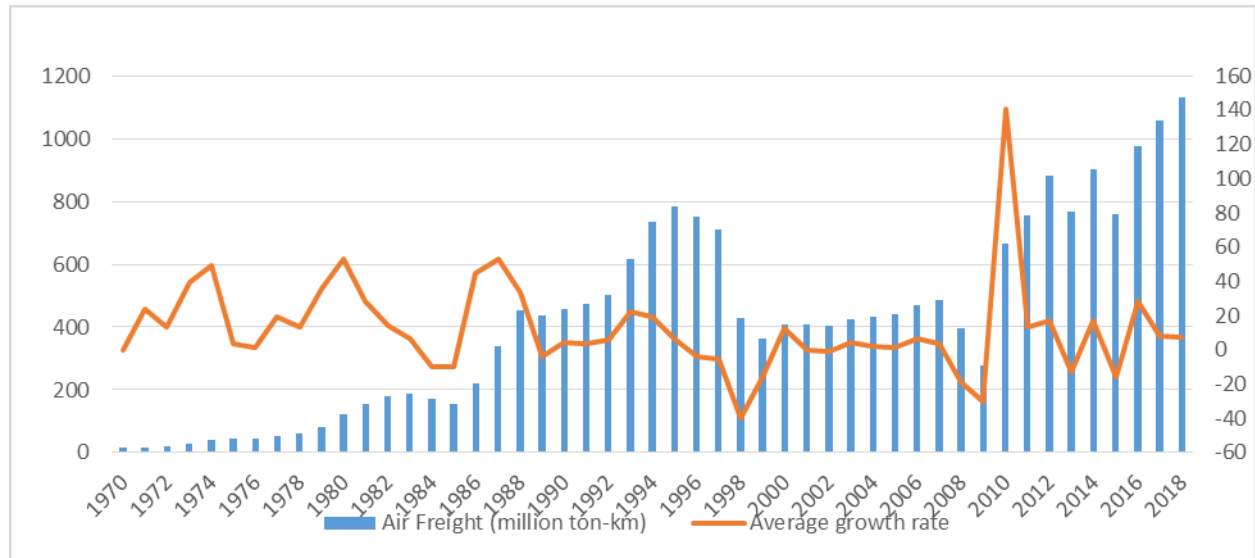

Figure 1. The Number of Air Freight in Indonesia (Million Ton-km)

The graph in figure 1 shows the air freight are gradually increasing. the year of 1998 was the monetary crisis in Indonesia. It seems impact to air transport in Indonesia. also, in 2008 was global crisis. In 1998, 2008, 2009 the growth rate decreasing by 39%, 18%, 29% respectively. Furthermore, the year of 1998, 1999, 2008, 2009 are dummy variable for Economic Crisis.

METHODS
The Econometric Model
This are following general linear regression models:

$$CAR_t = \alpha + \beta_1 GDP_t + \beta_2 POP_t + \beta_3 D_t + \varepsilon_t$$

α, β_i	Regression coefficients, where i: 1,2,3
t	Year t
CAR_t	Number of Air Freight year t
GDP_t	Gross Domestic Product per capita year t
POP_t	Total Population (people) year t
D_t	Dummy Variable for

economic crisis (value: 1 for the year 1998,1999, 2008, 2009)

RESULT AND DISCUSSION

There are two formula to identify the best formula for predicted the air freight, which are:

$$CAR_t = \alpha + \beta_1 GDP_t + \beta_2 POP_t + \beta_3 D_t + \varepsilon_t \qquad (1)$$

$$CAR_t = \alpha + \beta_1 LnGDP_t + \beta_2 LnPOP_t + \beta_3 D_t + \varepsilon_t \qquad (2)$$

Table 1. Regression Statistic and Coefficients

Regression Statistics	1	2
Multiple R	0.903487	0.943783
R Square	0.816288	0.890726
Adjusted R Square	0.804041	0.883441
Coefficients		
Intercept	-380.039	10162.39
GDP Constant LCU	5.13E-14	-175.141

31

Population	*3.19E-06*	*1515.615*
Dummy Variable	*-225.645*	*-3351.29*

From statistic descriptive in table 1, the second formula are closer to predict the actual number of air freight. However, it seems the cargo and the population are invers related. So, the population will be unconsidered and the statistic descriptive will be showed in table 2.

Table 2. Value of R Statistic, Coefficients and P-Value

Regression Statistics		
Multiple R	0.914194816	
R Square	0.835752162	
Adjusted R Square	0.828610952	
	Coefficients	*P-value*
Intercept	-13447.7	4.15E-19
Dummy Variable	-250.894	0.000512
Ln GDP	389.1341	1.24E-19

From the table 2, the formula to predict upcoming year until 2030 is:

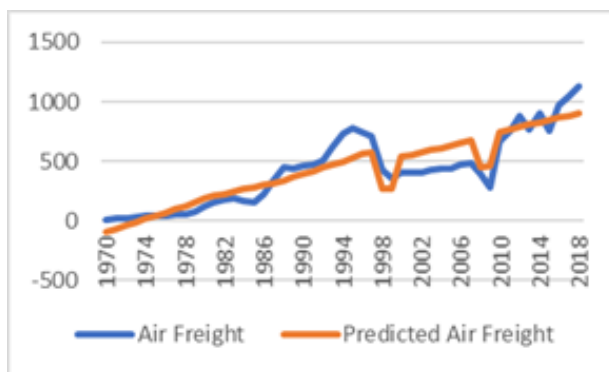$$CAR_t = -13447.7 + 389.134\, LnGDP_t - 250.894 D_t + \varepsilon_t$$

Figure 2. Actual vs Predicted Number of Air Freight

Forecasting the Number of Air Freight
GDP

The growth rate annually GDP from 3.2 -8% and the result of forecasting air freight demand show in table 3 and figure 3.

Table 3. Forecasting the number of air freight (Low, Moderate, High Scheme)

Year	Low	Moderate	High
2019	*917.0042*	*923.7329*	*936.4926*
2020	*929.2614*	*942.7189*	*968.2381*

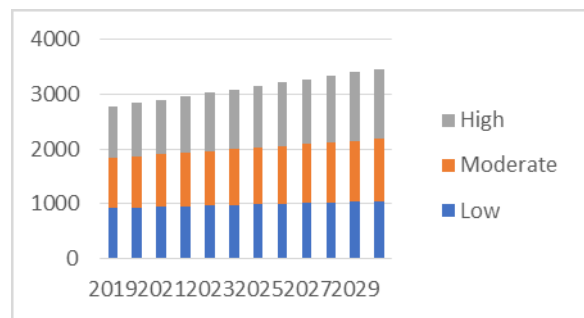| Year	Low	Moderate	High
2021	*941.5186*	*961.7048*	*999.9837*
2022	*953.7758*	*980.6907*	*1031.729*
2023	*966.033*	*999.6766*	*1063.475*
2024	*978.2903*	*1018.663*	*1095.22*
2025	*990.5475*	*1037.648*	*1126.966*
2026	*1002.805*	*1056.634*	*1158.711*
2027	*1015.062*	*1075.62*	*1190.457*
2028	*1027.319*	*1094.606*	*1222.203*
2029	*1039.576*	*1113.592*	*1253.948*
2030	*1051.833*	*1132.578*	*1285.694*

Figure 3. Forecasting the Number of Air Freight until 2030 (in Low, Moderate and High Scenario)

Covid-19 Impact

The covid-19 have been affected in global business and economics. The experts predict the global economic is struggling facing the crisis. In this paper shows how covid-19 effected in terms of economic crisis. 2020 and 2021 are year that dummy variable is added. The covid-19 scenario shows in figure 4.
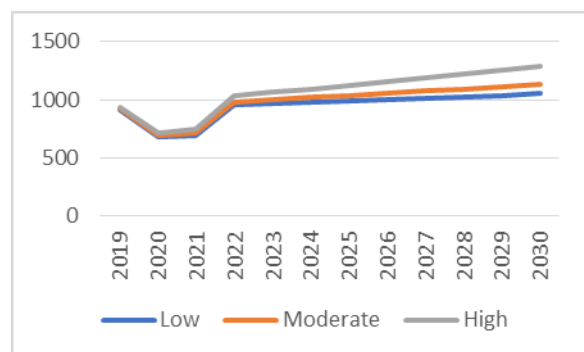

Figure 4. The Covid-19 Impact Scenario

The prediction number of air freight decreasing up to 36-40% in 2020 and 33-38% in 2021 from the actual number in 2018. However, in 2022, the total value is gradually increasing.

CONCLUSION

The forecasting models using the econometrics for air freight in Indonesia are related with GDP and economic crisis. However, the population seems unconsidered to predict the number. The covid-19 scenario might impact in number of freights since the covid-19 contribute the global crisis. By 2030, the total number of air cargo grow -14% (low), 0% (moderate) and 14% (High) respectively. Furthermore, the researchers need to expand the data and methods.

REFERENCES

Reza, M. (2013). The Relationship between Logistics and Economic Development in Indonesia: Analysis of Time Series Data. *Jurnal Teknik Industri*. https://doi.org/10.9744/jti.15.2.119-124

Sahlan, Muh. Aslam, S. D. A. dan Su. H. A. (n.d.). *Demand Forecasting Analysis on Air Cargo At Sultan Hasanuddin Internasional Airport Udara Internasional Sultan Hasanuddin Demand Forecasting Analysis on Air Cargo At Sultan*. 1–11.

Suryani, E., Chou, S. Y., & Chen, C. H. (2012). Dynamic simulation model of air cargo demand forecast and terminal capacity planning. *Simulation Modelling Practice and Theory*, *28*, 27–41. https://doi.org/10.1016/j.simpat.2012.05.012

Suryan, V. (2017). Econometric forecasting models for air traffic passenger of indonesia. In *Journal of the Civil Engineering Forum* (Vol. 3, No. 1, pp. 33-44).

Wadud, Z. (2013). Simultaneous Modeling of Passenger and Cargo Demand at an Airport. *Transportation Research Record: Journal of the Transportation Research Board*, *2336*(1), 63–74. https://doi.org/10.3141/2336-08