Sustainable Cities, Transportation and Warehousing GDP

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Abstract. The development of the airport city, integrated commercial property, and the land, produces non-aeronautical income from tourists, business people, and cargo. The research uses secondary data archives that contain past (historical) events to find out several factors that affect transportation and warehousing GDP. Other data provided in the study is panel data, which is data of several airport locations (cross-section). Data analysis is then carried out by using quantitative methods. Meanwhile, sampling is done by purposive sampling that was based on individual or researcher' considerations, which often referred to as sampling considerations. Initially, the population is 299 airports that are managed by PT. Angkasa Pura I and PT. Angkasa Pura II, and UPT Air Transportation. It is then reduced to 172 airports throughout Indonesia, which later is filtered further to only 151 airports. Results of the multiple linear regression analysis show that factors that affect Transportation and Warehousing GDP are the plane arrived, the plane departed and passengers depart. ARX estimation and ARX Validation Transportation and Warehousing GDP, that produces a fit of 51.08% and a fit validation of 51.45%. Of the 90 data used for estimation, 46 data, or 51.08% of ARX, have similarities with existing data. The value is quite good because the fitness produced is > 50% that affect Transportation and Warehousing GDP are the plane arrived, the plane departed, passenger departing, departing passengers, unloading baggage, loading baggage, unloading cargo and loading cargo. All are influential on Transportation and Warehousing GDP

1. Introduction

The development of the airport city, integrated commercial property, and the land, produces non-aeronautical income from tourists, business people, and cargo. Airports in Greenfield, Hong Kong, Incheon, Kuala Lumpur, and Dubai have become crowded Aerotropolis [1]. Aerotropolis is developing in Hong Kong, Malaysia (Kuala Lumpur), United Emirate Arab (Dubai), Thailand (Suvarnabhumi), Hartsfield-Jackson Atlanta (Hapeville City, Georgia), and China (Yunnan) [1-6]. According to Pujinda [4], Amsterdam and Frankfurt show good Aerotropolis' models and have efficient gates at the airport. Meanwhile, Suvarnabhumi airport has better agricultural land than other Aerotropolis because it is surrounded by floodplains [7]. Compare to the other airports, as mention previously, Hartsfield-Jackson airport in Atlanta is the world's busiest airport. It has more than 82

million passengers and nearly half a million tons of air cargo every year[5]. Hence, Hapeville City, in Georgia, strengthens the position of Atlanta as the flight center [8].

Jian et al. [6] show that the correlation between civil aviation, Yunnan tourism development, and urban development, is very positive for the development of Yunnan. It is a combination of aviation and tourism industry development [9].

By comparing airports in Hong Kong, China, and Korea, Hong Kong's airport costs, facilities, and efficiency are higher than those of Korea (Incheon airport). Hongkong airport is more profitable because it has more than 100 links with China, more flight frequency, and better performance [6]. However, the airport has a limited number of runways, gates, goods terminals, and other facilities. Incheon has more competitive facilities but weaker operational efficiency than Hongkong. Incheon operates five logistics airport terminals, which include a new cargo terminal. It becomes the most important flight hub to Mainland China. It has efficient and reliable air cargo services, with the highest level of safety and security standards. It shows that the performance of air cargo facilities is the airport's competitive advantage.

2. Methodology

We need analysis of Sustainable Cities, Transportation and Warehousing GDP. The research uses secondary data archives that contain past (historical) events to find out several factors that affect transportation and warehousing GDP. Other data provided in the study is panel data, which is data of several airport locations (cross-section). Data analysis is then carried out by using quantitative methods. Meanwhile, sampling is done by purposive sampling that was based on individual or researcher' considerations, which often referred to as sampling considerations. Initially, the population is 299 airports that are managed by PT. Angkasa Pura I and PT. Angkasa Pura II, and UPT Air Transportation. It is then reduced to 172 airports throughout Indonesia, which later is filtered further to only 151 airports. The data used in this study is from Bank Indonesia, the Central Statistics Agency, Angkasa Pura (Angkasa Pura I and Angkasa Pura II), the Ministry of Transportation, the Provincial Government, District Governments, and City Government [9-15]

3. Result and Discussion

Multiple linear regression analysis is used to determine the effect of airport performance variables on transportation and warehousing GDP. The statistical analysis is done by using SPSS version 20 to find the regression coefficient

Multiple linear regression equation:

$$Y = a + b1X1 + b1X2 + b3X3 + b4X4 + b5X5 \quad (1)$$

The variables of the multiple linear regression equation. Airport Performance variables that affect the variable of transportation and warehousing GRDP are: (as in equation 2)

$$Y = 467.251 - 1.878\ X1 + 1.826\ X2 + 0.004\ X3 \quad (2)$$

where:
Y = Regional GDP of transportation and warehousing
X1 = the plane arrived
X2 = the plane departed
X3 = passengers depart

Results of the multiple linear regression analysis show that factors that affect Transportation and Warehousing GDP are the plane arrived, the plane departed and passengers depart.

One approach in quantitative dynamics modeling, which is often used in the analysis of time series, is Autoregressive exogenous input (ARX) modeling structure. The Autoregressive Exogenous (ARX) modeling technique is a successful method for completing system identification. ARX can map the relationship between input (u) and output (y) data that are available based on the desired model order.

In general, AR is the Auto-Regressive nature of a model, while X is an exogenous input. The following equation can generally represent the relationship between the input-output of this ARX models:

$$Y(t)+a\_i\ y(t-1)+\cdots+a\_n\ y(t-n\_a\ )=b\_0\ u(t-d)+..+b\_n\ b\_u\ (t-d-n\_b\ )+e(t) \quad (3)$$

Where y (t), u (t), and e (t) is output, the input and error process, n_a is autoregression, n_b is exogenous regression. The structure of the ARX model can be displayed as follows:

$$A\ (q)\ *\ y\ (t) = B\ (q)\ *\ u\ (t) + e\ (t) \quad (4)$$

where:
A (q)= 1 + a1q-1 + a2q-2 + ... + anaq-na
y (t) = output
B (q)= b1 + b2q-1 + b3q-2 + ... + anbq-nb + 1
u (t) = input
e (t)= error

while predicting the output of the ARX model at time t is found in equation 5

$$y\ (t) = F\ (x\ (t)) \quad (5)$$

Where:
y (t) = prediction
x (t) = regressor
F = nonlinear function

The third output sought is Transportation and Warehousing GDP. The first step is to look for one of the system's input-output relationships, which is the input that influences Transportation and Warehousing GDP. After searching on each input, it turns out that the inputs that affect Transportation and Warehousing GDP are the plane arrived (z1), the plane departed (z2), passenger departing (z3), departing passengers (z4), unloading baggage (z5), loading baggage (z6), unloading cargo (z7), and loading cargo (z8). All are influential on Transportation and Warehousing GDP.

$$ARX = \text{Discrete-time ARX model: } A\ (z)\ y\ (t) = B\ (z)\ u\ (t) + e\ (t) \quad (6)$$

$$A\ (z) = 1 + 0.4645\ z\text{-}1 - 0.6897\ z\text{-}2 + 0.06538\ z\text{-}\ 3 + 0.03476\ z\text{-}4 - 0.004795\ z\text{-}5 - 0.1582\ z\text{-}6 - 0.04944\ z\text{-}7 - 0.0607\ z\text{-}8 \quad (7)$$

$$B1\ (z) = 4.889e04\ z\text{-}1 - 5.948e05\ z\text{-}2 \quad (8)$$

$$B2\ (z) = -4116\ z\text{-}1 + 7{,}813e05\ z\text{-}2 \quad (9)$$

$$B3\ (z) = -1.778e05\ z\text{-}1 - 2.878e04\ z\text{-}2 \quad (10)$$

$$B4\ (z) = 1.269e05\ z\text{-}1 - 1.171e05\ z\text{-}2 \quad (11)$$

$$B5\ (z) = 5.338e04\ z\text{-}1 + 2374\ z\text{-}2 \quad (12)$$

$$B6\ (z) = -3210\ z\text{-}1 - 6.494e04\ z\text{-}2 \quad (13)$$

Status:
The estimation using ARX on time domain data "z2".
Fit to estimation data: 51.08%
Fit to data validation: 51.45%
FPE: 1.148e + 07, MSE: 6.078e + 06

Na, nb, and nk values produces the optimum fit of 8, 2, and 1, respectively. It produces a fit of 51.08% and a fit validation of 51.45%. Of the 90 data used for estimation, 46 data, or 51.08% of ARX, have similarities with existing data. The value is quite good because the fitness produced is > 50%.

The ARX produces several input-output relationships, as illustrated in the equation below.

$$y(t) = [B(s) / A(s)]\, u(t) + e(t) \quad (14)$$

B1 (s) = 1.363e05 s8 + 2.981e06s7 + 2,461e07s6 + 1.1e08 s5 + 1.711e08 s4 - 8.115e08 s3 - 5.313e09 s2 - 1.279e10 s - 1.206e10 (15)

B2 (s) = -9.631e04 s8 - 2.933e06 s7 - 2.247e07 s6 - 8.741e07 s5 + 3,355e 07s4 + 1,844e09 s3 + 8,655e09 s2 + 1,896e10 s + 1,718e10 (16)

B3 (s) = -2,416e05 s8 - 2,799e06 s7 - 2,836e07 s6 - 1,658e08 s5 - 7,658e 08 s4 - 2.37e09 s3 - 5,278e09 s2 - 7,088e09 s - 4,565e09 (17)

B4 (s) = 1.884e05s8 + 2,503e06s7 + 2,409e07s6 + 1,331e08s5 + 5,377e08s4 + 1.358e09 s3 + 2.223e09 s2 + 1.694e09 s + 2.163e08 (18)

B5 (s) = 7.326e04 s8 + 8.634e05s7 + 8.692e06s6 + 5.045e07s5 + 2.295e08s4 + 6.965e0 + s3 + 1.515e09 s2 + 1.975e09 s + 1.232e09 (19)

B6 (s) = 3112 s8 + 1.858e05 s7 + 1.285e06 s6 + 3.892e06 s5 - 1.805e07 s4 - 1,992e08 s3 - 8.183e08 s2 - 1.703e09 s - 1.506e09 (20)

A (s) = s9 5307 s+8 +s 89.277 + 373.1s6 + 2631 s5 7271 s+4 +2.562e04 s3 + 3.403e04s2 + 5.105e04 s + 1.33e04 (21)

y(t)=(1.363e05 s^8 + 2.981e06 s^7 + 2.461e07 s^6 + 1.1e08 s^5 + 1.711e08 s^4 - 8.115e08 s^3 - 5.313e09 s^2 - 1.279e10 s - 1.206e10)/(s^9 + 5.307 s^8 + 89.27 s^7 + 373.1 s^6 + 2631 s^5 + 7271 s^4 + 2.562e04 s^3 + 3.403e04 s^2 + 5.105e04 s + 1.33e04) u1(t)+(-9.631e04 s^8- 2.933e06 s^7- 2.247e07 s^6- 8.741e07 s^5 + 3.355e07 s^4+ 1.844e09 s^3+ 8.655e09 s^2+ 1.896e10 s+ 1.718e10)/(s^9 + 5.307 s^8 + 89.27 s^7 + 373.1 s^6 + 2631 s^5 + 7271 s^4 + 2.562e04 s^3 + 3.403e04 s^2 + 5.105e04 s + 1.33e04) u2(t)+(-2.416e05 s^8- 2.799e06 s^7- 2.836e07 s^6- 1.658e08 s^5- 7.658e08 s^4 - 2.37e09 s^3- 5.278e09 s^2 - 7.088e09 s - 4.565e09)/(s^9 + 5.307 s^8 + 89.27 s^7 + 373.1 s^6 + 2631 s^5 + 7271 s^4 + 2.562e04 s^3 + 3.403e04 s^2 + 5.105e04 s + 1.33e04) u3(t)+ (1.884e05 s^8 + 2.503e06 s^7 + 2.409e07 s^6 + 1.331e08 s^5 + 5.377e08 s^4+ 1.358e09 s^3+ 2.223e09 s^2+ 1.694e09 s+ 2.163e08)/(s^9 + 5.307 s^8 + 89.27 s^7 + 373.1 s^6 + 2631 s^5 + 7271 s^4 + 2.562e04 s^3 + 3.403e04 s^2 + 5.105e04 s + 1.33e04) u4(t)+(7.326e04 s^8 + 8.634e05 s^7 + 8.692e06 s^6 + 5.045e07 s^5 + 2.295e08 s^4+ 6.965e08 s^3+ 1.515e09 s^2+ 1.975e09 s+ 1.232e09)/(s^9 + 5.307 s^8 + 89.27 s^7 + 373.1 s^6 + 2631 s^5 + 7271 s^4 + 2.562e04 s^3 + 3.403e04 s^2 + 5.105e04 s + 1.33e04) u5(t)+ (3112 s^8 + 1.858e05 s^7 + 1.285e06 s^6 + 3.892e06 s^5- 1.805e07 s^4 - 1.992e08 s^3 - 8.183e08 s^2 - 1.703e09 s - 1.506e09)/(s^9 + 5.307 s^8 + 89.27 s^7 + 373.1 s^6 + 2631 s^5 + 7271 s^4 + 2.562e04 s^3 + 3.403e04 s^2 + 5.105e04 s + 1.33e04) u6(t) (22)

Figure 1 and Figure 2 are ARX estimation and ARX Validation Transportation and Warehousing GDP, that produces a fit of 51.08% and a fit validation of 51.45%. Of the 90 data used for estimation, 46 data, or 51.08% of ARX, have similarities with existing data. The value is quite good because the fitness produced is > 50%.

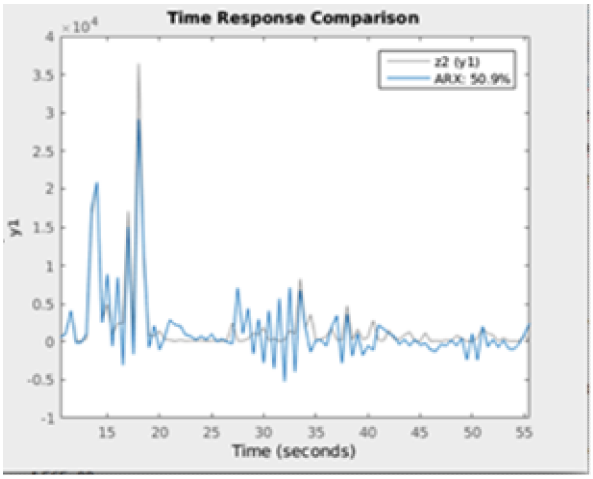

Figure 1. ARX estimation Transportation and Warehousing GDP

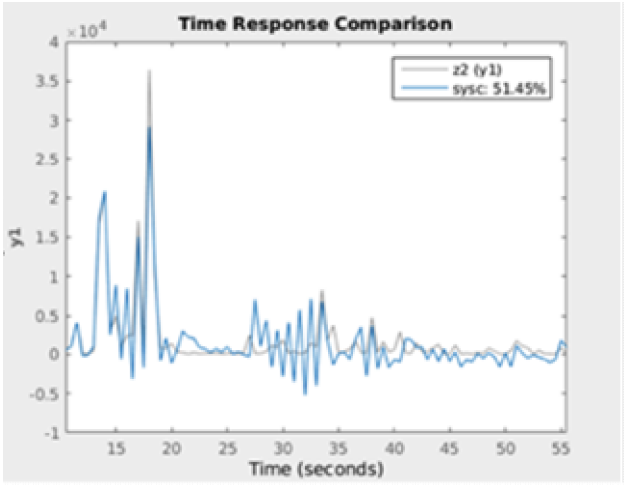

Figure 2. ARX Validation Transportation and Warehousing GDP

4. Conclusion

The development of the airport city, integrated commercial property, and the land, produces non-aeronautical income from tourists, business people, and cargo. The research uses secondary data archives that contain past (historical) events to find out several factors that affect transportation and warehousing GDP. Other data provided in the study is panel data, which is data of several airport locations (cross-section). Data analysis is then carried out by using quantitative methods. Meanwhile, sampling is done by purposive sampling that was based on individual or researcher' considerations, which often referred to as sampling considerations. Initially, the population is 299 airports that are managed by PT. Angkasa Pura I and PT. Angkasa Pura II, and UPT Air Transportation. It is then reduced to 172 airports throughout Indonesia, which later is filtered further to only 151 airports. Results of the multiple linear regression analysis show that factors that affect Transportation and Warehousing GDP are the plane arrived, the plane departed and passengers depart. ARX estimation and ARX Validation Transportation and Warehousing GDP, that produces a fit of 51.08% and a fit validation of 51.45%. Of the 90 data used for estimation, 46 data, or 51.08% of ARX, have similarities

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Acknowledgments
INDONESIA Grant of Ministry of Research and Technology, Director of Research and Society Development, Number 10/E1/KPT/ 2020