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RESEARCH ARTICLE

RELATIONSHIP BETWEEN IMPORT - EXPORT GOODS THROUGHVIETNAM'S AIRPORT AND IMPORT - EXPORT TURNOVER OF GOODS IN VIETNAM

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ABSTRACT

The article studies methods to determine the amount of goods through airports and determine the relationship between export - import goods through airports and export – import turnover of goods in Vietnam. From analyzing the 27-year data series from 1990 to 2016 by a linear and non-linear regression model show that when the value of exports increased by 1%, cargo exports through airports increased 0.8205% and when the value of imports increased by 1%, cargo imports through airports increased 0.8393%. It is forecasted that Vietnam's airports will serve nearly 500 thousand tons of exported goods of about 410 thousand tons of imported goods by 2020.

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INTRODUCTION

Forecasting the import and export of goods through airports is an important basis for planning the development of airports to meet the requirements of developing air transport in particular and the development of the country in general. This article explores the method of determining cargo through airports and identifies its relationship with the import and export turnover of goods in Vietnam. To solve this problem, the research synthesizes the theoretical basis and develops the research model, collecting and analyzing data to estimate the parameters in the model. Then it will be applied to forecast import and export goods through airports by 2020. The results of the research will provide additional insight into methods of cargo identification through airports and provide information for planning the development of air cargo services through Vietnam's airports to 2020.

Overview of the research problem

Regard to the factors affecting and forecasting of air transport, so far there have been some studies at various angles, from theoretical to specific model. Hong Jiang *et al*. (2003) estimated the relationship between air freight (1000 tons) in China and total gross domestic product (GDP) by data series from 1990 to 2002 and the Ordinary Least Square (OLS) method. The result showed that when GDP increased by 1%, the air cargo volume would increase by 1.54%, while the aggregate factor was 0.0096. Extending the variables and also using the above estimation method, John D. Kasbda and David L. Sullivan (2005) estimated through the series data from 1980 to 2000 to conclude that there is a close relationship between volume of air cargo transport and GDP as well as commercial value in many parts of the world. Beside, Zia Wadud (2014) used a series of data from 1982 to 2010 in Bangladesh to conclude that there is a relationship between air cargo transport with GDP and crude oil prices. In India, Munmun Basak *et al*. (2013) used a series of data from 1998 to 2008 and established a relationship between air freight (tons) by 24.56 plus 1.57 of GDP value and 0.33 of commercial value, minus 0.33 of fuel price (GDP, commercial value and fuel price are canculated by USD). In global and with the above estimation method, Franziska Kupfer *et al*. (2009) modeled and used a series of 24-year sample data (1983-2006) to estimate the relationship between volume cargo turnover (in tons-km) wwith import and export value in the world (in USD). The results showed that: lnTKM is equal to -0.35 plus 0.99 times of world export and import value.

Theoretical basis and research design

Theoretical basis

Measure cargo through airports

Today there are a number of researchers and organizations that have studied to measure cargo through airports. According to

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the US Federal Aviation Administration (2011), cargo through airports is the number of tons of cargo transported to and from the airport in each stage, including both domestic and international flight. Next, Oliver Wyman (2012) argues that cargo through airport each year is the goods loaded or unloaded from aircraft at the airport, measured in tonnes during a year. It includes both domestic and international flights transported by airlines. Studies by Rigas Doganis (1992), IATA (2010), Nigel Halpern and Anna Graham (2013) or Andersson Granberg and A. Oquillas Munoz (2013) also showed that the number of goods served by the airport is the same goods arrive and arrive at airports on routes operated by airlines. In Vietnam, the Ministry of Transport (2009) stipulates that airlines must report shipping statistics on each route so that Civil Aviation Authority of Vietnam (CAAV) calculates air traffic through airport. The quantity of goods through the airport is determined by the total quantity of goods of the air routes to and from that airport. The amount of cargo of each flight to and from the airport is determined by the total volume of cargo of the airlines operating on that route (Formula 1).

$$T = \sum_{i=1}^{n} T_i = \sum_{i=1}^{n}\sum_{j=1}^{m} T_{ij} \quad (1)$$

Where:

T: Tons of cargo through the airport

T_i: Tons of cargo transported on the route i

T_{ij}: Tons of cargo transported on the route i by airline j

From formula (1), expanding in a country, the quantity of cargo through national airports is determined by two times the volume of cargo transported on domestic flights and one times the volume of cargo transported on international routes (Nguyen Hai Quang, 2017). Because import and export goods through airports is cargo transported by internationl route so it is determined by the total tons of cargo on the international routes going to the airports and forecasted by air cargo transport market at airport.

Factors affecting the quantity of cargo exported and imported through airports

From the theory of economics about the factors that affect market demand, Nguyen Hai Quang *et al*. (2013) have developed factors affecting the demand for airfreight market, including: Quantity of air transport users, income of air transport users and change in tastes of air transport users, the price of air transport services and the competition between modes of transport. Research on air cargo market demand, Dao Manh Nhuong *et al* (1997) as well as Tae Sung Hwang (2014) argue that freight demand between regions is defined by economic growth and trade relationships between those regions.Studies by John D. Kassrda and David L. Sullivan (2005), Franziska Kupfer *et al*. (2009), Munmun Basak *et al*. (2013) also argue that GDP and trade value are important variables to forecast the cargo transport market. On the international market, the value of imports and exports among countries is the most aggregated factor reflecting the demand for freight between countries. Although there are some theories supose that foreign direct investment (FDI) is also a factor that affects the demand for freight markets between countries, but it can be seen that FDI is just a factor to stimulate exports and imports. This argument has been used by Franziska Kupfer and colleagues (2009) in their research.

For cargo transport, the choice of air transport depends on many factors such as cost (price), location and capacity of airport, transport time, etc. It can be said that transport time is a factor in the advantages of air transport and less change. Considering the cargo through the airport, the airport factor has been defined so at the macro level, the freight rate for 1 ton-km of cargo (yield) is the most general factor affecting the quantity of cargo through airport. This is also considered an important factor affecting the supply of air cargo transport. Above all, at the macro level, it is possible to summarize that the two most general factors affecting the quantity of goods exported and imported through airports are the value of import and export turnover and the freight rate for 1 ton-km of goods transported. This theory has also been used by Katsuhiro Yamaguchi (2007) to analyze the relationship between export value and air freight in the United States.

Design research model

This study examines the relationship between import-export goods through airports and import-export turnover and assumes that other factors are relatively stable. The relationship is assumed to be linear (Formula 2) and nonlinear (Formula 3).

Linear model: $Y = b + aX + \varepsilon$ (2)

Non-linear model: $Y = b.Xa.\varepsilon$

or $\text{Log}(Y) = \log(b) + a\log(X)\ \log(\varepsilon)$ (3)

Where:

Y:The quantity of goods exported or imported through the airport

X: Value of export turnover or import turnover

a and b: Parameters to estimate in the model

ε: Factors outside the model.

MATERIALS AND METHODS

Source data

Data collected over period of 27 years from 1990 to 2016 on tones of export and import cargo through airports as well as value of export and import turnover in Vietnam. Data on tones of export and import cargo through airports is compiled from the report of CAAV on the results of transportation on air routes. Data on value of import-export turnover is taken from statistical data of the General Department of Vietnam Customs and the General Statistics Office of Vietnam. The datas show that the value of import-export turnover and the volume of goods exported and imported through Vietnamese airports increase relatively high, but the trend tends to decrease gradually (Table 1). Imports and exports through airports are mainly through Tan Son Nhat International Airport and Noi Bai International Airport. Da Nang International Airport and some other international airports only occupy a very small, negligible amount. Major import and export goods are textile, footwear, seafood, electronics, pharmaceuticals and consumer goods with high value. By 2016, the total volume of export and import cargo through Vietnam's airports has reached over 700 thousand tons. Of which, exports account for 52%. In terms of structure, the average of 6 years from 2011 to 2016 export cargo from Vietnam's airports is the largest (account for 22.47%); followed by ASEAN (18.55%), Europe (16.17%), Japan (10.52%), China (8.26%), South Korea (7.32%), Hong Kong (6.13%), Taiwan (3.86%). The other markets account for

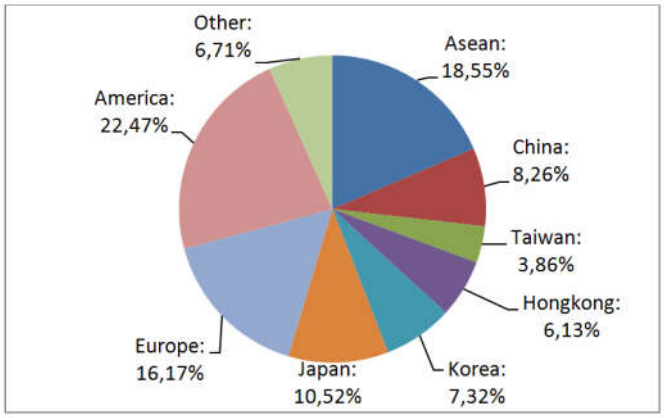
only 6.71% (Figure 1). For import cargo through Vietnam's airports, the largest is from ASEAN (account for 29.6%); followed by Europe (13.86%), China (11.27%), South Korea (10.97%), Hong Kong (7.47%), Japan (6.19%), Taiwan (5.93%). The other markets account for 8.41% (Figure 2).

It means that comparing the coefficient of determinant of the linear regression model (adjusted R^2) with the correlation coefficient (r) between the actual value and its estimated value through the logarithm function, the model having better coefficient will be chosen (Nguyen Trong Hoai, 2005).

Table 1. Export and import goods through airports and value of import-export turnover

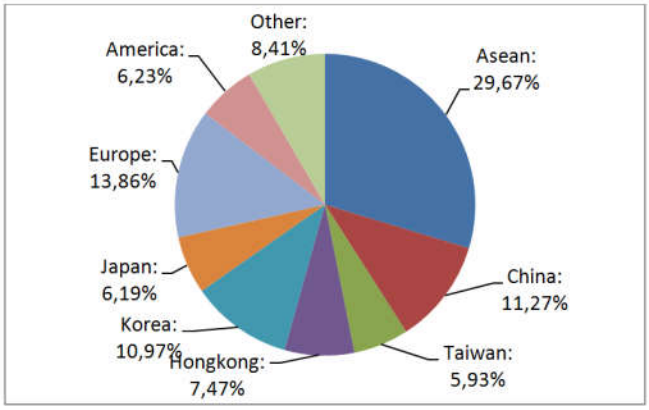
Year	Cargo through airports (tons)			Turnover value (million USD)		
	Export goods	Import goods	Total	Of export	Of import	Total
1990	6,630	6,370	13,000	2,404	2,752	5,156
1991	7,884	7,500	15,384	2,087	2,338	4,425
1992	12,224	11,512	23,736	2,581	2,541	5,122
1993	13,617	12,696	26,313	2,985	3,924	6,909
1994	16,612	15,335	31,947	4,054	5,826	9,880
1995	21,215	19,388	40,603	5,449	8,155	13,604
1996	26,739	24,192	50,931	7,256	11,143	18,399
1997	32,723	29,312	62,035	8,756	11,151	19,907
1998	31,557	27,985	59,542	9,324	11,494	20,818
1999	32,598	28,618	61,216	11,520	11,622	23,142
2000	42,482	36,923	79,405	14,449	15,635	30,084
2001	44,305	38,122	82,427	15,027	16,162	31,189
2002	57,739	49,185	106,924	16,706	19,733	36,439
2003	71,688	60,562	132,250	20,176	25,227	45,403
2004	84,766	70,591	155,357	26,504	31,954	58,458
2005	82,380	67,628	150,008	32,442	36,978	69,420
2006	103,802	83,998	187,800	39,826	44,891	84,717
2007	112,252	101,038	213,290	48,561	62,682	111,243
2008	132,804	119,078	251,882	62,685	80,714	143,399
2009	130,127	117,671	247,798	57,096	69,949	127,045
2010	190,812	149,188	340,000	72,237	84,839	157,076
2011	186,111	161,889	348,000	96,906	106,750	203,656
2012	212,100	191,900	404,000	114,529	113,780	228,309
2013	254,617	235,031	489,648	132,033	132,033	264,066
2014	300,448	277,337	577,785	150,186	148,049	298,235
2015	322,544	297,733	620,277	162,110	165,650	327,760
2016	364,453	336,418	700,871	176,630	174,110	350,740
2016-1990	16.66%	16.48%	16.57%	17.97%	17.29%	17.62%
2000-1990	20.41%	19.21%	19.84%	19.64%	18.97%	19.29%
2010-2000	16.21%	14.99%	15.65%	17.46%	18.43%	17.97%
2016-2010	11.39%	14.51%	12.81%	16.07%	12.73%	14.33%

Source: CAAV, General Department of Vietnam Customs and the General Statistics Office of Vietnam



*Source:*From CAAV

Figure 1. Structure of exported goods from Vietnam's airports to areas



*Source:*From CAAV

Figure 2. Structure of imported goods from areas through Vietnam's airports

Method of estimating the parameters of the model

The parameters of the formulas in models 2 and 3 are estimated by the Ordinary Least Square (OLS) method of Eview software. The models are tested through significance level α = 5%. Parameters are accepted when statistic values $|$t-Statistic$|$ $\geq$ 2 or Prob. $\leq$ 0.05. The model is accepted when the value of Adjusted $R^2 \geq$ 50% and the statistical value of F-statistic $\geq$ 2 or Prob(F-statistic) $\leq$ 0.05. In case both linear and non-linear models are accepted, they will be based on the coefficient of determinants to see which one is better.

RESULTS AND DISCUSSION

Research results

The results of the estimation of the parameters and the test values in the model of relations between import and export goods through airports with the value of import and export turnover by OLS method are as follows:

Goods exported through airports andvalue of export turnover

Linear model:

Y_1 = 15683.47 + 1.9094 X_1 (4)
t (4.8362) (42.3405)
Adjusted R^2 = 98.5696%
F-statistic = 1792.72

Non-linear model:

$Log(Y_1)$ = 2.8361 + 0.8205 Log (X_1) (5)
t (15.3317) (44.7111)
Adjusted R^2 = 98.7155%
F-statistic = 1999.09
Correlation coefficients r =99.3981%

Where:
Y_1: Tons of goods exported through the airport
X_1: US $ million export turnover of goods

Goods imported through airports and value of import turnover

Linear model:

Y_2 = 4916.67 + 1.7459 X_2 (6)
t (1.5752) (41.7715)
Adjusted R^2 = 98.5310%
F-statistic = 1744.86

Non-linear model:

$Log(Y_2)$ = 2.4040 + 0.8393 Log (X_2) (7)
t (12.0642) (43.0572)
Adjusted R^2 = 98.6162%
F-statistic = 1853.919
Correlation coefficients r =98.7779%

Where:

Y_2: Tons of goods imported through the airport
X_2: US $ million import turnover of goods
Because the t values of the corresponding parameters in the models for the variables X are greater than 2 so the correlation patterns between the imports and exports through the airport with the import and export turnover are accepted. Both correlation coefficients (r) between the actual value and its estimated value through the logarithm function are both higher than the coefficients in the linear regression so the nonlinear functions are chosen (Formula 8).

$Y_1 = 17.0491*X_1^{0.8205}$
and $Y_2 = 11.0673*X_2^{0.8393}$ (8)

Conclusions and policy implications

From the research results show that the import-export turnover is an important factor in forecasting the international air cargo market to and from Vietnam. Demand for import and export of goods through Vietnamese airports is proportional to the value of import and export turnover. To be more specific, when the value of exports turnover increased by 1%, cargo exports through airports would increase 0.8205%. Besides, the value of import turnover increased by 1%, the goods imported through airports would increase 0.8393%. In the period from 2016 to 2020, Vietnam strives to balance its trade balance and increase its import-export value by an average of 12% per year (Prime Minister of Vietnam, 2011). With this target, the value of Vietnam's exports or imports will be about $ 275 billion in 2020. Therefore, it is forecasted that by 2020 Vietnam's airports will serve nearly 500 thousand tons of exported goods and about 410 thousand tons of imported goods. The results of this study are important grounds for Airports Corporation of Vietnam, cargo service companies at Vietnamese airports and international air cargo carriers flied to Vietnam plan its policy to meet the needs of import and export goods by air as following:

- For the Airports Corporation of Vietnam and cargo service companies in the airport, it is necessary to plan the expansion of the air cargo terminal as well as the equipment for transportation of goods, processing, storage, packaging and security inspection services, customs at international airports.
- For airlines that operate international freight transportation to and from Vietnam, it is also important to plan the fleet for freight. On the other hand, airlines should also have lower freight rates for import goods than export goods to balance supply and demand for air cargo transportation to and from Vietnam, as well as to improve the load factor and balance the efficient of tons supplied on flights to and from Vietnam.

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