

Development of an Index to Better Understand Technology Import and Export Trade: Application in Singapore

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Abstract

A primary reason for measuring import and export trade indices is to track the impact they have on the economy. Movement in the technology import index can often be an indicator of future technology trends. *Objective of this paper:* To develop an import & export trade index to accurately classify international trade trends related to technology import & export airfreight volumes in Singapore. *Method:* The “Expectation Trade Index” was developed from proprietary import & export airfreight trade data and may be used as a strong overall indicator for classifying trade in terms of technology imports and exports to and from Singapore. Despite its huge potential, however, there is no trade index that shows enough credibility to classify international trade in Singapore. We hypothesize that the “Expectation Trade Index” may serve Singapore in a similar way that the Cass Freight Index serves the US and the Import and Export Price Indices serve Singapore. *Result:* The import and export trade indices indicate at regular time intervals, the likelihood of increased export or import trade for the future time interval based on historical import and export volumes. The results from this study indicate a drop in import and export technology airfreight trade from 2009 to 2012. Hong Kong, China and Thailand are the main countries that Singapore Exports technology to. Singapore is also twice as likely to import technology from China and Hong Kong compared to other countries. *Conclusion:* The technology “Expectation Trade Index” may be used as a benchmark to easily make trade comparisons by country and/or by year. More importantly, by tracking the “Expectation Trade Index”, export and import trend information will allow government and the technology industry to make proactive decisions based on the direction of the trend.

Keywords

Import, Export, Technology, Airfreight, Expectation Trade Index, International Trade, Singapore

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1. Introduction

Index numbers are very useful in measuring the relative changes in the export and import airfreight trade. With the help of index numbers, we can easily make a comparison in the trade in different time periods or in different countries. It may be very helpful for guidance and formulation of economic policies, so government may adopt the fiscal and monetary policy according to the results of the index numbers. Index numbers for import and export trade cannot be ignored.

International trade has long been a strong economic indicator. In most countries, international trade accounts for a significant share of gross domestic product (GDP). With industrialization, advanced transportation, globalization, multinational corporations, and outsourcing, the significance of international trade on global economy has been on the rise. The economy of Singapore has one distinct advantage: the location, resulting in trade and commerce being the key parts of the economy. Exports particularly in electronics, chemicals and services provide the main source of revenue for the economy.

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The purpose of this paper is to develop an import & export “Expectation Trade Index” to accurately classify international country trade trends related to technology import & export volumes in Singapore. The paper is structured into 4 sections. While Section 1 is the introduction and emphasizes the importance of understanding international trade, and more specifically, airfreight trade, Section 2 gives a brief literature review, Section 3, the Objective of the Study, Section 4, an overview on the methodology to compute the “Expectation Trade Index”, the classification rules and description of key international trade statistics, Section 5, presents the statistical analysis results, after which Section 6 presents the conclusion.

2. Literature Review

In general, the Singaporean government favours globalization and free trade. Import tariffs are low to non-existent. The tiny state is an active member of ASEAN, and other multinational trade organizations. It has entered into free trade agreements with plenty of foreign countries too [1]. In particular, according to [4], the electronics industry accounts for approximately 40 percent of the value of international airfreight itself. Airfreight clearly has a large role in the leading edges of the global economy. As airfreight expansion plays a major role to economic growth [6], and the industry is expected to triple by 2025. Further, according to [6], airfreight tends to lead to trade and higher Gross Domestic Product. The Cass Freight Index [7] has been developed specifically for the US markets and to-date, many freight transportation and logistics executives and analysts consider the Cass Freight Index to be the most accurate barometer of freight volumes and market conditions, with many analysts noting that the Cass Freight Index sometimes leads the American Trucking Associations (ATA) tonnage index at turning points, which lends to the value of the Cass Freight Index [8]. The Import and Export Trade Index developed in this paper is similar to the Cass Freight Index and has not yet been developed for Singapore.

In a recent study, the Technology Market Index was predicted using Import and Export data [2]. Generally speaking, index numbers are percentages representing changes in values, prices volumes, or other market variables. Each item is a single variable or a composite representation of more than one variable and is compared with the corresponding figure in a selected base [3]. The change being measured may be either over periods of time or current comparisons relating to some variables in certain geographical areas. Further, Statistics Singapore publishes Import and Export Price Indices for Beverages & Tobacco, Miscellaneous Manufactured Articles, Machinery & Transport Equipment, Food & Live Animals, Crude Material, Animal & Vegetable Oils, Manufactured Goods and Chemicals & Chemical Products and show

changes in these indices from the previous month and changes of these indices over the same period of the previous year [9].

We hypothesize that the “Expectation Trade Index” may serve Singapore in a similar way that the Cass Freight Index serves the US and the Import and Export Price Indices serve Singapore. As the electronic industry accounts for approximately 40 percent of the value of international airfreight and the industry is expected to triple by 2025, we believe that by tracking the “Expectation Trade Index”, whether by day, week, month or country, it will allow the government and the technology industry to make decisions based on the movement of the “Expectation Trade Index”. In particular [10], demonstrate that managing demand and supply result in bringing value to the customer and increased customer satisfaction, efficiency in business operations, responsiveness in business design and technological innovation. It is believed that in a similar way, the “Expectation Trade Index” will assist businesses in managing their demand and supply of technology import and export goods and thereby increase their efficiency in business operations and bring about increased customer satisfaction.

3. Objective of Study

A primary reason for measuring import and export trade indices is to track the impact they have on the economy. Movement in the technology import index can often be an indicator of future technology trends. The objective of this study is to develop an import and export “Expectation Trade Index” to accurately classify international trade trends related to technology import & export volumes in Singapore. The import and export “Expectation Trade Indexes” will indicate at regular time intervals, the likelihood of increased export or import trade for the future time interval based on historical import and export volumes. More importantly, by tracking the “Expectation Trade Index”, export and import trend information will allow government and the technology industry to make proactive decisions based on the direction of the trend.

4. Methodology: Computation of the Import and Export Trade Index

The technology data in Singapore is classified as group 85 and consists of electrical machinery and equipment, parts, telecommunication equipment sound recorders, television recorders, etc. Export and import technology data from 75 countries was collected in the period 4 May 2009-16 August 2012 for analysis.

The ‘Expectation Trade Index’ is the overall indicator and

measure of the technology exports from Singapore to other countries. Each country will have its own 'Expectation Trade Index'. An 'Expectation Trade Index' less than one will indicate which countries have low volumes of technology export from Singapore relative to other countries, while an 'Expectation Trade Index' greater than one will indicate which countries have high volumes of technology export from Singapore relative to other countries. An 'Expectation Trade Index' equal to one will indicate that the country has average volumes of technology export from Singapore to other countries. 'Expectation Trade Index' values will differ and also help Singapore to determine the good countries to import from or export to. The higher the 'Expectation Trade Index' the more Singapore should spend time, offer incentives and look at improving relationships with those countries.

The 'Volume Export Rate' defines the proportion of export volume from Singapore to a particular country relative to the total export volume from Singapore to all countries that Singapore exports technology to. The 'Volume Export Rates' help to identify which countries Singapore mainly exports technology to. Countries identified with large 'Volume Export Rates' will indicate to Singapore to grow their relationship with these countries as exports contribute to Singapore's GDP and economy considerably. In fact, the higher the 'Volume Export Rate' the better will be Singapore's economy. To compute the Volume Export Rate, we require the following:

$$\text{Volume Export Rate} = \text{Volume Export} / \text{Total Volume Export}$$

$$\text{i.e. } \text{VER} = \text{VE} / \text{TVE} \quad (1)$$

The 'Average Volume Export Rate' may be used as a benchmark for Singapore to understand when the economy is doing good and when it is not doing so good. For example, when the 'Average Volume Export Rate' for a particular time period, goes below the "usual" 'Average Volume Export Rate', this will indicate to Singapore that its economy is contracting and some action should be taken to help improve and increase the technology export activity.

To compute the Average Volume Export Rate, we require the

following:

$$\text{Average Volume Export Rate} = \text{Average Volume Export} / \text{Average Total Volume Export}$$

$$\text{i.e. } \text{AVER} = \text{AVE} / \text{ATVE} \quad (2)$$

Essentially, Singapore can group countries by their 'Expectation Trade Index' scores and then categorize their Customer Relationship Management with all export technology countries and align Export Incentive Programs with the different Customer Relationship Categories.

To compute the Average Volume Export Rate, we require the following:

$$\text{Expectation Trade Index (ETI)} = [(1 + \text{AVER}) * \text{VER}] - 1 \quad (3)$$

5. Results and Discussion

Descriptive statistics such as the average, standard deviation, minimum, maximum and total, provide important information for business and government users to compare different country import volumes into Singapore from 2009-2012. For the top 10 countries, total technology imports into Singapore have dropped considerably from 3 793 278 (2009) to 2 682 194 (2012). A drop of 29% over the 3 years. The average import volume dropped from 22 445 (2009) to 19 578 (2012). A drop of almost 13%.

The Export Technology to the top 10 countries have also dropped considerably. This could be due to the fact that the technology export trade is highly dependable on the technology import trade as most of the technology imports redistributed as exports out of Singapore. Total technology exports into Singapore have dropped considerably from 4 136 086 (2009) to 3 219 669 (2012). A drop of 22% over the 3 years. There was a small average export volume dropped from 24 474 (2009) to 23 501 (2012). A drop of 4%. Table 1 below, shows the daily export and import summary statistics for the top ten countries Singapore imported from and exported to for the period 5 May 2009 – 17 July 2012.

Table 1. Export & Import Trade Indexes for Daily Airfreight.

Country	Export Index 2009	Export Index 2010	Export Index 2011	Export Index 2012	Import Index 2009	Import Index 2010	Import Index 2011	Import Index 2012
Hong Kong	2.42	2.34	2.44	2.29	2.15	2.21	2.09	2.00
China	1.45	1.38	1.39	1.38	2.13	2.08	2.05	2.01
Thailand	1.28	1.02	0.98	1.20	0.60	0.53	0.41	0.30
Japan	0.93	0.96	0.90	0.77	1.64	0.161	1.45	1.34
United States	0.82	1.02	0.83	0.79	0.88	1.00	1.13	1.13
India	0.73	0.86	0.91	0.97	0.21	0.17	0.13	0.13
Indonesia	0.68	0.73	0.97	0.91	0.19	0.12	0.11	0.13
Germany	0.64	0.66	0.62	0.75	0.44	0.51	0.68	0.77
Korea	0.61	0.62	0.54	0.53	0.59	0.57	0.58	0.60
Taiwan	0.44	0.43	0.41	0.42	1.17	1.19	1.60	1.59
National	0.97	1.00	0.98	0.93	1.00	1.00	0.94	0.87

Hong Kong, China and Thailand are the main countries that Singapore Exports technology to. In fact, Hong Kong is twice as likely to import and export from Singapore compared to other countries. Singapore is also twice as likely to import technology from China and Hong Kong compared to other countries. This means that Singapore's relations to these countries needs to be superior to other countries. Singapore should have or develop strategies that can build relations that exceed Hong Kong, China and Thailand's expectations. This way, Singapore may likely be able to further increase technology demand from these countries.

Further, 70% of the top ten countries that Singapore exports technology to, had a decline in their trade index from 2009-2012. India, Indonesia and Germany are the only countries of the 10 whose export trade indexes have risen from 2009-2012. We need to determine why some countries have an increase in technology while other countries have a decrease in technology exports in the same time period. Was it cheaper for Singapore to export technology to Indonesia, India and Germany during 2009-2012 than to the other 7 countries? Or, was the demand for technology simply higher from these 3 countries than the other 7? Who are the key companies that are buying Singaporean technology exports? What are the actual Singaporean technology products or components that these 3 countries enjoy? Can Singapore do something to even further increase exports to these 3 countries? How can Singapore try to increase technology exports to the other 7 countries?

Based on the Technology Import Indices, Hong Kong, China, Taiwan, Japan and the United States are the main countries that Singapore imports technology from. In the period 2009-2012, 60% of the top ten countries that Singapore imports technology from, have generally declined in their trade index. The United States, Germany, Korea and Taiwan are the only countries of the top 10 whose import trade index did not generally decline.

6. Conclusion

At the airfreight organisational level, the import and export technology trade indices are needed as essential inputs to many decision activities in various functional areas such as building new cargo aeroplanes, new container terminals, operation plans, marketing strategies, as well as finance and accounting. The technology "Expectation Trade Index" may be used as a benchmark to easily make trade comparisons by country and/or by year.

We need to determine the factors that drive some countries to increase their import trade index while other countries have a declined import trade index. Was it cheaper for Singapore to

import from Hong Kong, China, Taiwan Japan and the United States? Or is it because Singapore has better relations with Hong Kong, China, Taiwan Japan and the United States and therefore, import more from these countries. Or, does Singapore prefer the technology that these countries provide based on certain specific quality and functional factors. Or is there just a larger demand for specific technology from Hong Kong, China, Taiwan Japan and the United States? Who are the key companies in Singapore that are buying these imported technology goods? What are the actual technology products that are being imported from these countries? Is it better for Singapore to even further increase their import trade with these countries? If so, how can Singapore increase their import trade with these countries? How can Singapore try to increase their technology trade index with countries whose import trade index is low?

The changes in the technology import and export indices may have a direct effect on the economy. Further, the technology import and export indices may indicate social and economic trends and therefore help government in framing policies with respect to them. The technology import and export indices may be very helpful in tracking the economic condition across different time periods and different countries. In addition, the international technology import and export indices may be used for comparing developed and under developed countries. The technology import and export indices may also indicate to the producer whether he should expand production or reduce production. If the Index is rising it could mean that the profit rate is high.

This research developed a unique import and export trade index for Singapore, by leveraging the proprietary Singapore airfreight trade data.

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