Research Paper *IJBARR*
Impact Factor: 4.729 *E- ISSN -2347-856X*
Refereed, Listed & Indexed *ISSN -2348-0653*

A STUDY ON EXPORT PERFORMANCE AND TIME SERIES ANALYSIS OF FROZEN SHRIMPS FROM INDIA.

Dr. Vatsal B. Patel* **Dr. Vinod B. Patel****

*Assistant Professor, Department of Business and Industrial Management, VNSGU, Surat, India.
**Professor, Department of Business and Industrial Management, VNSGU, Surat, India.

Abstract
Indian aquaculture has demonstrated a six and half fold growth over the last two decades, with freshwater aquaculture contributing over 95% of the total aquaculture production. The production of carp in freshwater and shrimps in brackishwater form the major areas of activity. In terms of the overall Marine exports, shrimps are the major export oriented marine product which continues to contribute a major share in India's overall marine export. As the demand from the developed nations in the world continues to increase, there is a huge upside potential for the Indian aquaculture industry in the coming years. The aim of this study is to understand and analyze the trend of frozen shrimp exports from India and its performance in recent years.

Key Words: Export, Aquaculture, Shrimps, Trend Analysis.

Introduction

Aquaculture is an organized production of crop in an aquatic medium. The crop may be of an animal or a plant.

FAO defines aquaculture as "The farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated."

The word 'aquaculture', though used rather widely for the last two decades to denote all forms of culture of aquatic animals and plants in fresh, brackish and marine environments, is still used by many in a more restrictive sense. For some, it means aquatic culture other than fish farming or fish husbandry, whereas others understand it as aquatic farming other than mariculture.

The definition distinguishes aquaculture from capture fisheries and, in fact, the growth potential of aquaculture lies primarily in its fundamental differences from capture fisheries where far greater control can be exerted over inputs and production

Following Are The Two Essential Features That Distinguish Aquaculture From Capture Fisheries

1. Intervention to enhance the stock
2. Ownership of the stock.

Aquaculture in India has a long history; there are references to fish culture in Kautilya's Art hashastra (321 – 300 B.C.) and King Someswara's Manasoltara (1127 A.D.). In India the traditional practice of fish culture in small ponds in eastern parts is known to have existed for over hundreds of years.

India's aquaculture production basically can be classified into freshwater and brackish water production. Some of the important species cultured in India are the Indian major carps and shrimp. Besides these, ornamental fish culture and seaweed farming, are slowly gaining importance in the aquaculture scenario in the last few years as alternative livelihood supporting sectors as small scale activities. Aquaculture as a sector has been witnessing increased interest in diversification with the inclusion of high valued species, including medium and minor carps, catfishes, murrels etc.

Frozen shrimp continued to be the major item of export in terms of quantity and value, accounting for a share of 39.53 % in quantity and 66.06% of the total USD earnings. Shrimp exports during the period increased by 4.58% in terms of quantity. However unit value realization decreased to 8.28 USD/Kg from 10.38 in 2014-15 with a depreciation of 2.09%.

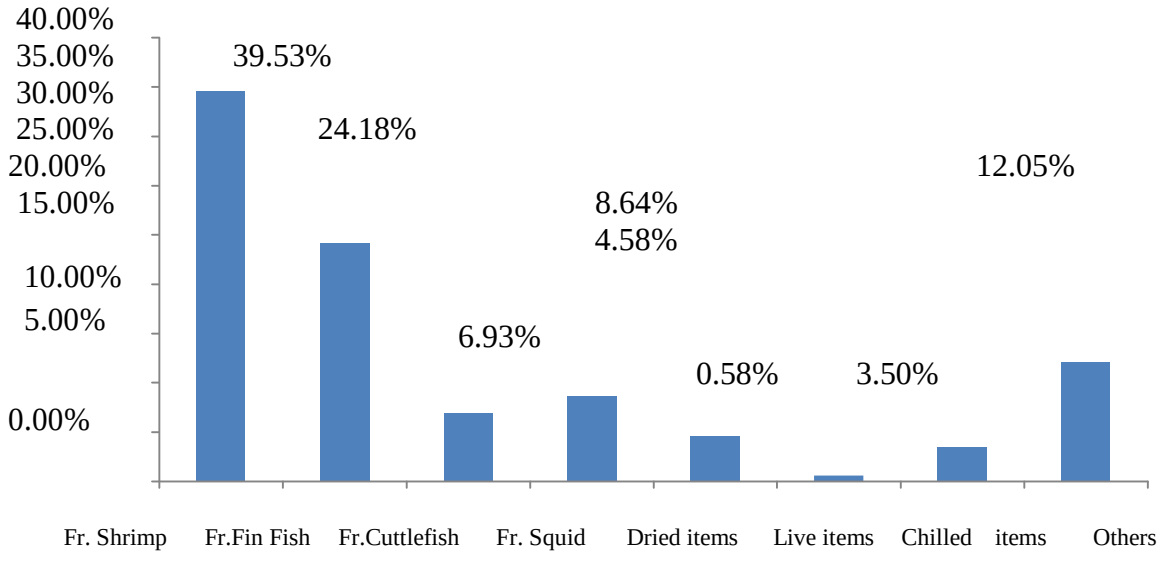
The overall export of shrimp during 2015-16 was to the tune of 3, 73,866 MT worth USD 3,096.68 Million. USA is the largest market imported (1, 34,144 MT) for frozen shrimp followed by European Union (81,849 MT), South East Asia (65,188 MT), Japan (34,204 MT), Middle East countries (17,477 MT), China (9542 MT) and Other Countries (31,464 MT).

The export of Vannamei shrimp has improved from 2, 22,176 MT to 2, 56,699 MT in 2015-16 with a growth of 16%. In value terms about 50.18 % of total Vannamei shrimp was exported to USA followed by 17.25% to South East Asian countries, 15.78% to EU, 4.55% to Japan, 3.62% to Middle East, 2.23% to China and 6.40% to Other Countries. Japan is the major market for Black Tiger shrimp with a share of 37.04% in terms of value followed by USA (20.56%) and South East Asia (19.28%).

Table: 1 Total Marine Exports From India During The Year 2015-16

	Fr.	Fr.Fin	Fr.Cuttlefish	Fr.	Dried	Live	Chilled	Others
2015-16	373866	228749	65596	81769	43320	5493	33150	113949
% of	39.53%	24.18%	6.93%	8.64%	4.58%	0.58%	3.50%	12.05%

Figure: 1 Percentage Share Of Total Marine Products In Year 2015-16
% Of Total Marine Exports 2015-16



Frozen shrimp accounted for maximum proportion of marine exports from India in the year 2015-16, at more than 39% of the total exports.

USA continued to be the major importer of Indian seafood with a share of 28.46% in terms of USD. USA imported 153695 MT of seafood in the current financial year. Export to USA had registered a growth of 18.53% in terms of quantity but in value it showed a decline of 2.23% in INR and 8.52% in USD terms.

Frozen Shrimp continued to be the principle item exported to USA with a share of 94.01% in USD value. Exports of Vannamei shrimp to USA showed an increase of 22.48% in quantity, but the value dropped by 5.32% in USD terms. Similarly exports of Black Tiger Shrimp improved by 6.56% in quantity but decreased by 30.35% in USD earning Compared to previous year Chinese market shows a recovery with a positive growth in Indian Rupee value by 6.17% but in quantity and USD terms showed a negative growth of 15.92% and 0.34% respectively.

Exports of frozen shrimp improved by 80.17% in quantity and 49.51% in USD terms. Exports of Vannamei and BT shrimp also improved substantially. This shows a shift from low value fish items to high value shrimp in Chinese market. Exports to Middle East and Other Countries showed a negative growth in quantity as well as in value terms when compared to previous year. Marine products were exported through 30 different sea/air/land ports. Vizag, Kochi, JNP, Pipavav and Calcutta are major ports handled the marine cargo. Exports improved from Mundra, Hyderabad, Trichy and Hill Land Customs when compared to last year 2014-15.

Review of Literature

In a study entitled 'The export market for Thai frozen shrimps in the European Union' by Suluxama Ongsritrakul & Lionel Hubbard, the researcher discusses the recent performance of exports of Thailand's frozen shrimps in the EU market. The study points out how it benefited from the overall growth in the EU market.

In a paper 'Export Performance of Indian Fisheries in the Context of Globalisation' the researchers S.S. Shyam, C. Sekbar, T K. Uma, and S.R. Rajesh focuses on the global business environment and policy measures that affects the export performance of India's fisheries sector. The researchers used past performance in order to calculate the growth rate, which was used to find out the trend in the exports of major marine products in pre and post liberalization period.

'Export Performance of Indian Fisheries

Strengths and Challenges Ahead' by Anjani Kumar highlights the growth in exports of Indian fisheries along with an added diversification among the exported marine products over the period of time. The study also covers the need of taking necessary actions in order to be consistent with the WTO guidelines and changing scenario of the international markets.

'Export performance of Indian ornamental fish - an analysis of growth, destination and diversity' by Prathvi Rani, Sheela Immanuel, P. S. Ananthan, S. N. Ojha, N. R. Kumar and M. Krishnan focuses on the export performance of Indian ornamental fishes and its growth in the recent past. It also highlights the new schemes of the Marine Products Export Development Agency (MPEDA) and research support can soon make India a major player in international ornamental fish trade thereby, greatly increase the foreign exchange earnings, employment and rural livelihood.

Objective of The Study

1. To Study the export performance of frozen shrimps from India.
2. To study the trend in frozen shrimp exports from India.

Scope of The Study

1. The study focuses on the trend in the export performance of frozen shrimps which is one of the major components in the overall marine exports of India.
2. The study covers a period of 21 years from 1995-96 to 2015-16.
3. 1995-96 is considered to be the base year for the trend analysis, thereby calculating the percentage growth rate for a period of 20 years.

Limitations of Study

1. Frozen shrimp is one of the many aquaculture products that constitute the overall marine exports of India. This study does not cover the performance of the overall marine exports for India during these periods.
2. A longer period of study could offer a better understanding of the export performance of frozen shrimps from India.

Research Methods

1. Type of study: Descriptive study.
2. Type of data: Secondary data.
3. Method of Analysis: Trend analysis.
4. Method of forecast: ARIMA model.

Data Analysis

Following below are the export figures for Frozen Shrimps from India during the period of 1995-96 to 2015-16.

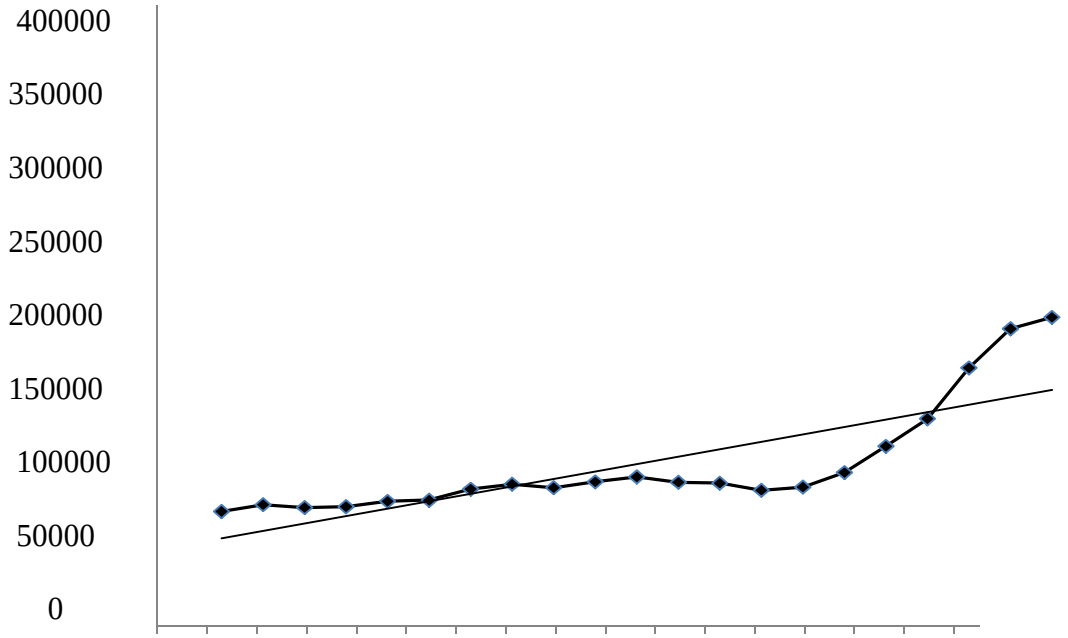
Table: 2 Export Figures For Frozen Shrimps

Item	**Fr. Shrimp**		
	Quantity in ton	**Value in Crore**	**US$ Million**
1995-96	95724	2356.81	748.19
1996-97	105427	2701.76	755.74
1997-98	101318	3140.56	866.36
1998-99	102484	3344.91	798.75
1999-00	110275	3645.22	846.62
2000-01	111874	4481.51	985.00
2001-02	127709	4139.92	871.03
2002-03	134815	4608.31	953.44
2003-04	129768	4013.07	876.64
2004-05	138085	4220.67	938.41
2005-06	145180	4271.51	970.43
2006-07	137397	4506.08	997.64
2007-08	136223	3941.62	980.62
2008-09	126039	3779.80	839.28
2009-10	130553	4182.35	883.03
2010-11	151465	5718.13	1261.81
2011-12	189125	8175.26	1741.20

2012-13	228620	9706.36	1803.26
2013-14	301435	19368.30	3210.94
2014-15	357505	22468.12	3709.76
2015-16	373866	20045.50	3096.68

Source: mpeda

Figure: 2 Export Quantity of Frozen Shrimps (In Tons)
Quantity in Ton



Exports of frozen shrimps from India were recorded at 95724 tons in the year 1995-96 generating the export value of Rs. 2356.81 crores which in terms of US dollars amounted to $748.19 mn. Shrimps have emerged as major export commodity for Indian fisheries sector where by a significant contribution comes from the inland shrimp production. The exports of shrimp showed an upward growth during the following years but this growth was confined into a narrow range where by the overall export figures were confined to the narrow range, it was only after the period of 2009-10 that the exports experienced a major boost and the exports began to increase manifolds.

In 2015-16 the total frozen shrimp export were 373866 tonnes amounting to a total value of Rs. 20045.50 cr. Or US$3096.68 mn. In terms of the world production of shrimps India currently ranks 2^{nd} only after china. However when compared to china India accounts to only about $1/20^{th}$ of china's total production of shrimps.

Table: 3 5 Years Moving Average For Total Export Quantity

Item	fr. Shrimp	
year	Quantity in ton	5 year Moving average
1995-96	95724	#N/A
1996-97	105427	#N/A
1997-98	101318	#N/A
1998-99	102484	#N/A
1999-00	110275	103045.6
2000-01	111874	106275.6
2001-02	127709	110732
2002-03	134815	117431.4
2003-04	129768	122888.2
2004-05	138085	128450.2
2005-06	145180	135111.4
2006-07	137397	137049
2007-08	136223	137330.6
2008-09	126039	136584.8
2009-10	130553	135078.4
2010-11	151465	136335.4
2011-12	189125	146681
2012-13	228620	165160.4
2013-14	301435	200239.6
2014-15	357505	245630
2015-16	373866	290110.2

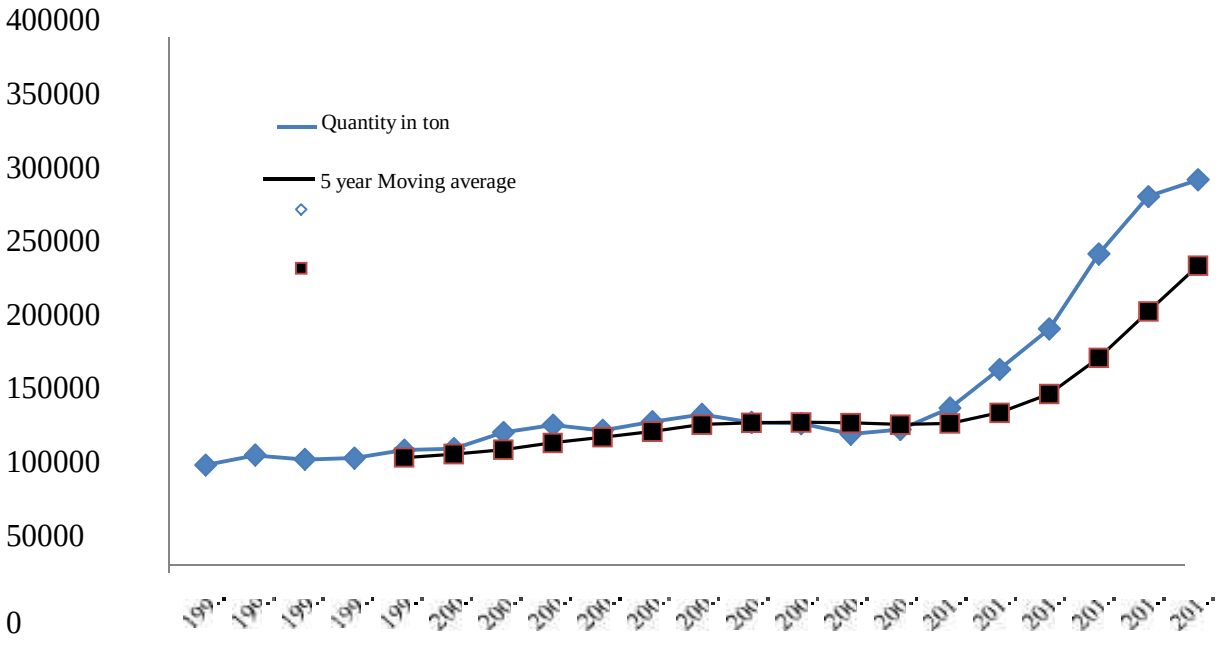


Figure: 3 5 Years Moving Average For Total Export Quantity

5 year moving average of the yearly exports of frozen shrimps from India experienced a stable rate up to the period of 2009-10, after which there was a constant increase in the exports. Advances in farming practices and better management practices in shrimp farming led to growth in the overall productivity of the shrimp farms there by allowing farmers to produce higher quantity of shrimps within the existing culture ponds. Secondly Indian shrimp aquaculture industry experienced a rapid rise in the area under culture due to higher profit expectations which led to a sharp rise in the total shrimp produced in India after 2009-10.

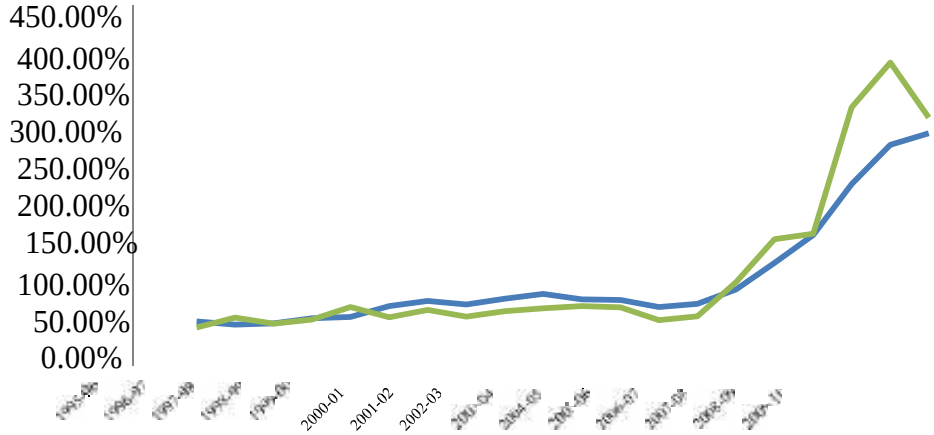
Owing to a very high demand for shrimps around the world, shrimps became a major export commodity where by most of the total shrimps produced are exported. It has been a major foreign exchange revenue generator for the country, and may continue to be so in the following years to come.

Table: 4 Growth Trend In Exports of Frozen Shrimps

Item	**Fr. Shrimp**		
	Quantity in ton	**Value in Crore**	**US$ Million**
1995-96			
1996-97	10.14%	14.64%	1.01%
1997-98	5.84%	33.25%	15.79%
1998-99	7.06%	41.93%	6.76%
1999-00	15.20%	54.67%	13.16%
2000-01	16.87%	90.15%	31.65%
2001-02	33.41%	75.66%	16.42%
2002-03	40.84%	95.53%	27.43%
2003-04	35.56%	70.28%	17.17%
2004-05	44.25%	79.08%	25.42%
2005-06	51.67%	81.24%	29.70%
2006-07	43.53%	91.19%	33.34%
2007-08	42.31%	67.24%	31.07%
2008-09	31.67%	60.38%	12.17%
2009-10	36.38%	77.46%	18.02%
2010-11	58.23%	142.62%	68.65%
2011-12	97.57%	246.88%	132.72%
2012-13	138.83%	311.84%	141.02%
2013-14	214.90%	721.80%	329.16%
2014-15	273.47%	853.33%	395.83%
2015-16	290.57%	750.54%	313.89%

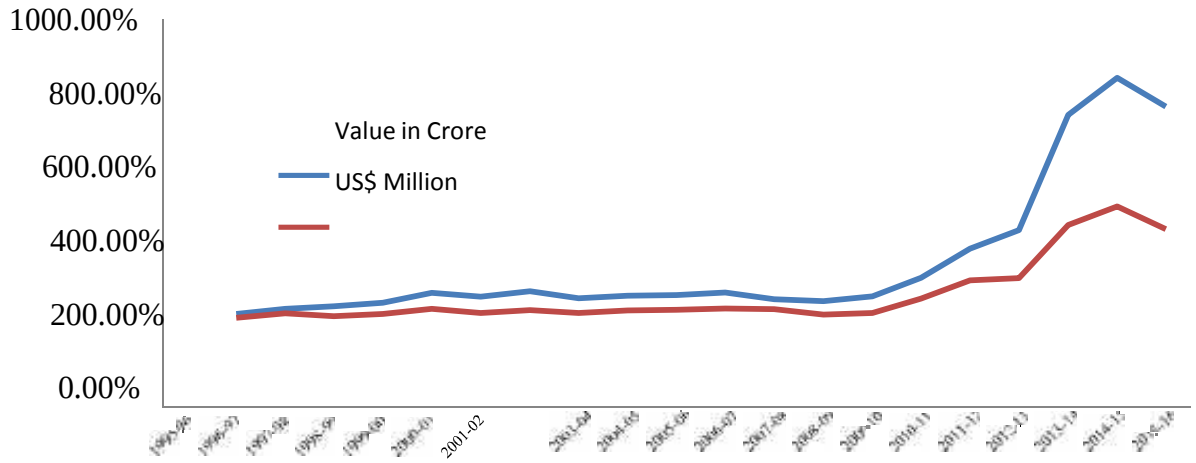
(Calculated considering 1995-95 as base year)

Figure: 4 Growth Trend In Exports Of Frozen Shrimps
Trend Of Exports : Quantity, Value In $



The above chart shows an overall trend in the export performance pattern of frozen shrimp exports from India in terms of percentage growth in terms of the quantity exported and the value generated in US$. The base for calculation was considered to be 1995-96. On an absolute measure the exported quantity of frozen shrimps increased by 290% in these 20 years. The export value rose by 750.54% in terms of Rupees and 313.89% in terms of US4$. The trend experienced both ways movement in terms of both the quantity and value, over this period of 20 years however the general trend was found to be increasing.

Figure: 5 Growth trend in export value of frozen shrimps marine exports value

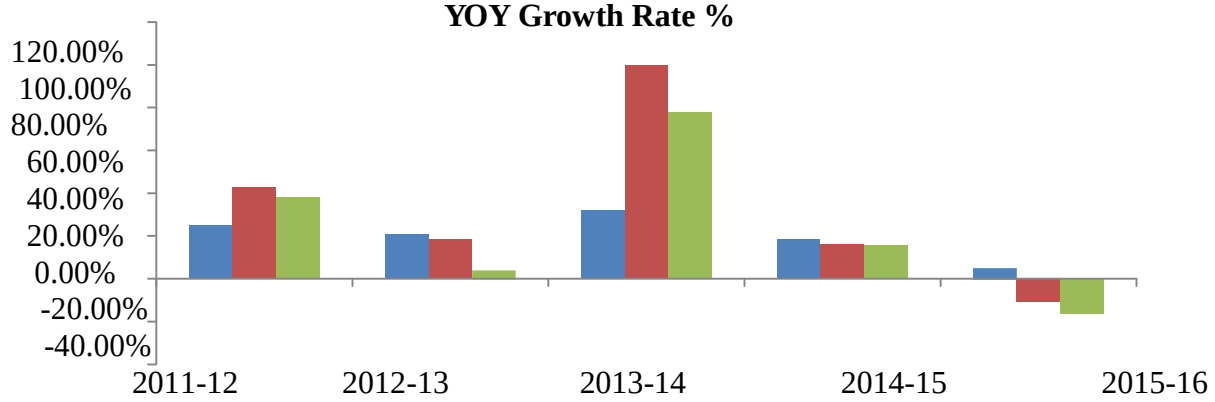


Above is the chart comparing the growth trend of export values in terms of rupee and US$, shows the pattern and uniform gap between these two trend lines until the period of 2011-12 after which the gap between these two trend line widens. At this point export value in terms of US$ experienced a suppressed growth, where in the exchange rates or changes in the export policy regime might have contributed to such scenario.

Table: 5 Year On Year Growth In Exports of Frozen Shrimps

YoY growth	Quantity in	Value in	US$
2011-12	24.86%	42.97%	37.99%
2012-13	20.88%	18.73%	3.56%
2013-14	31.85%	99.54%	78.06%
2014-15	18.60%	16.00%	15.54%
2015-16	4.58%	-10.78%	-16.53%

Figure: 6 Year On Year Growth In Exports of Frozen Shrimps



On comparing the last 5 years export performance on year on year basis, 2013-14 showed highest YoY growth rate where in the total exported quantity increased by 31.85% as compared to 2012-13. During the same period the value of exports grew by 99.54% in terms of Rupee and 78.06% in terms of US$.

2015-16 experienced a reversal in trend where the quantity exported managed to grow only by 4.58% as compared to 2014-15. The export value of frozen shrimps for that same period observed a negative growth rate of -10.78% in terms of rupee and -16.53% in terms of US$.

During this period Indian shrimp industry experiences many challenges including risk of diseases and reduction in the prices, which resulted in decline of export performance of frozen shrimps from India.

Forecasting - Quantity in Ton

In order to estimate the future trend, forecasting models were applied to the data. The forecasting process adopted the best fit model of forecasting for each of the variables and generated the output. Following are the results obtained for each variable.

Data variable: Quantity in ton
Number of observations = 21
Time indices: YEAR ENDING Length of seasonality = 2

Forecast Summary

Forecast model selected: ARIMA(0,2,0)x(2,0,2)2
Number of forecasts generated: 12
Number of periods withheld for validation: 0

Figure: 7 Time Sequence Plot For Quantity In Ton Time Sequence Plot for Quantity in ton
ARIMA(0,2,0)x(2,0,2)2

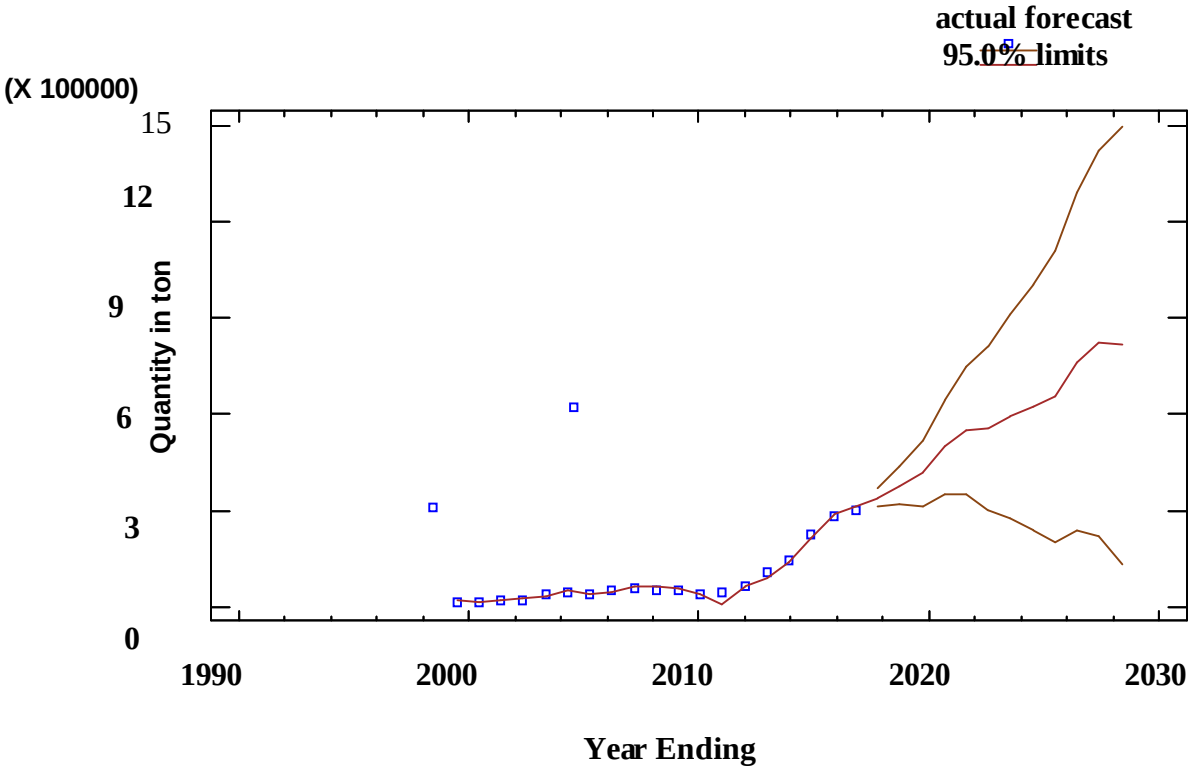


Table: 6 Forecast Table For Quantity In Ton
Model: ARIMA(0,2,0)X(2,0,2)2

Period	Data	Forecast	Residual	Period	Forecast	Lower 95.0% Limit	Upper 95.0% Limit
1996.0	95724.0						
1997.0	105427.						
1998.0	101318.	107093.	-5774.55				
1999.0	102484.	101861.	622.815				
2000.0	110275.	108555.	1719.82				
2001.0	111874.	115881.	-4006.66				
2002.0	127709.	119649.	8059.5				
2003.0	134815.	139599.	-4783.77				
2004.0	129768.	128178.	1589.9	2017.0	409871.	383953.	435788.
2005.0	138085.	132412.	5673.02	2018.0	446554.	388600.	504507.
2006.0	145180.	151885.	-6704.71	2019.0	482661.	386478.	578845.
2007.0	137397.	149647.	-12250.4	2020.0	558685.	418712.	698659.
2008.0	136223.	142746.	-6522.73	2021.0	608395.	420290.	796499.
2009.0	126039.	127332.	-1292.6	2022.0	614664.	374306.	855022.
2010.0	130553.	95124.0	35429.0	2023.0	649747.	351855.	947639.
2011.0	151465.	147889.	3576.29	2024.0	676376.	316273.	1.03648E6
2012.0	189125.	175609.	13515.7	2025.0	708391.	282470.	1.13431E6
2013.0	228620.	223673.	4947.19	2026.0	808955.	313772.	1.30414E6
2014.0	301435.	289822.	11612.6	2027.0	864287.	297503.	1.43107E6
2015.0	357505.	359522.	-2017.21	2028.0	858203.	217427.	1.49898E6
2016.0	373866.	384533.	-10667.2				

The above table shows the forecasted values for Quantity in ton for the period of 12 years (2017 - 2028).

During the period where actual data is available, it also displays the predicted values from the fitted model and the residuals (data-forecast). For time periods beyond the end of the series, it shows 95.0% prediction limits for the forecasts. These limits show where the true data value at a selected future time is likely to be with 95.0% confidence, assuming the fitted model is appropriate for the data. ARIMA model was applied to the data for forecasting, the trend series in quantity. The model shows an upward movement during the forecasted period.

Forecasting - Value in Crore
Data variable: Value in Crore
Number of observations = 21
Time indices: YEAR ENDING Length of seasonality = 2

Forecast Summary
Forecast model selected: ARIMA(0,1,1)x(0,0,0)2
Number of forecasts generated: 12
Number of periods withheld for validation: 0

Figure: 8 Time Sequence Plot For Value In Crore

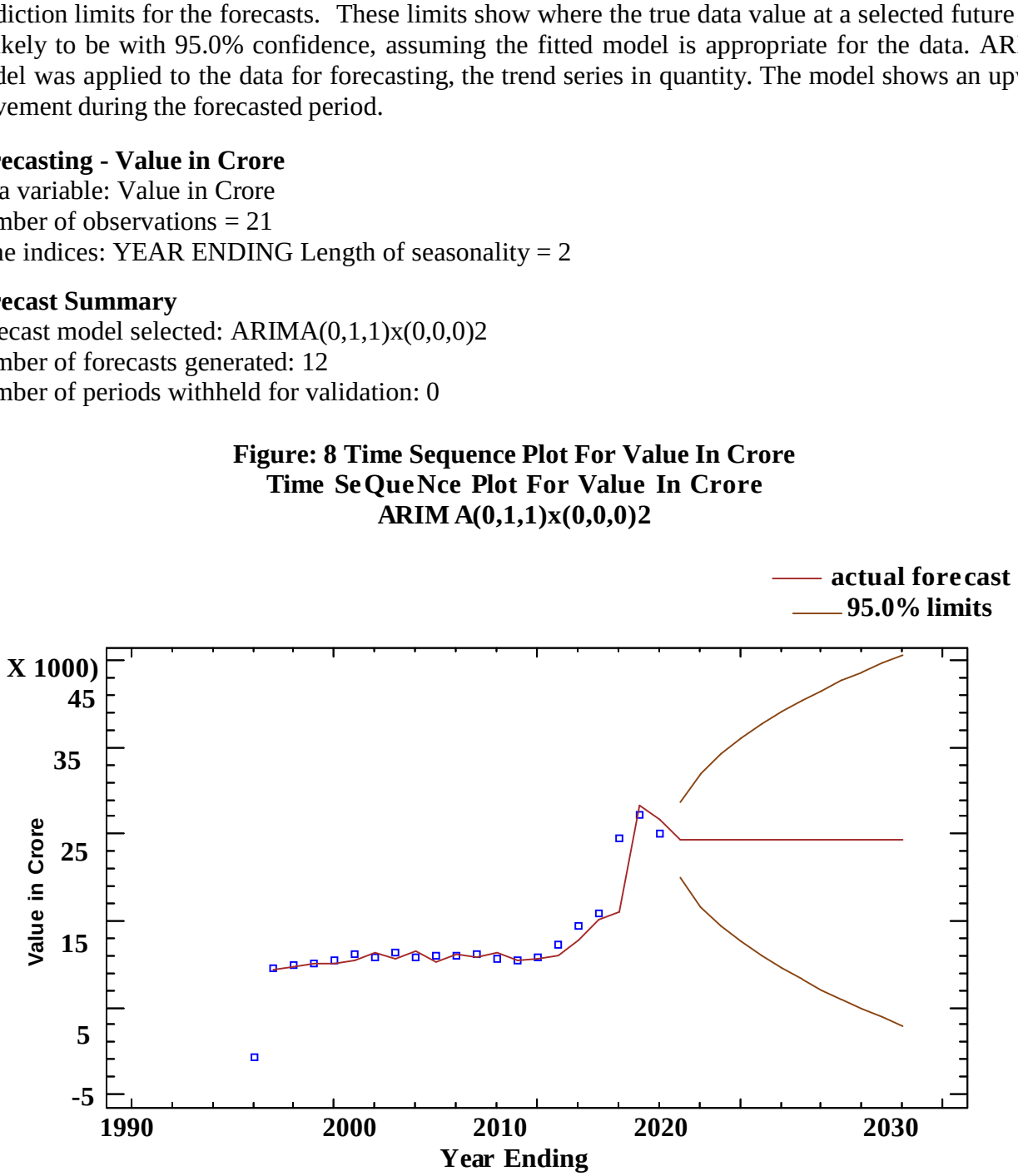


Table: 7 Forecast Table For Value In Crore
Model: ARIMA(0,1,1)X(0,0,0)2

Period	Data	Forecast	Residual	Period	Forecast	Lower 95.0% Limit	Upper 95.0% Limit
1996.0	2356.81						
1997.0	2701.76	2399.95	301.806				
1998.0	3140.56	2838.93	301.627				
1999.0	3344.91	3277.65	67.2584				
2000.0	3645.22	3375.48	269.741				
2001.0	4481.51	3767.82	713.691				
2002.0	4139.92	4805.89	-665.968				
2003.0	4608.31	3837.23	771.077				
2004.0	4013.07	4958.77	-945.7	2017.0	19181.3	14333.5	24029.1
2005.0	4220.67	3583.24	637.427	2018.0	19181.3	10624.5	27738.1
2006.0	4271.51	4510.39	-238.875	2019.0	19181.3	8093.61	30269.0
2007.0	4506.08	4162.94	343.141	2020.0	19181.3	6041.48	32321.1
2008.0	3941.62	4662.04	-720.42	2021.0	19181.3	4269.12	34093.5
2009.0	3779.8	3614.18	165.616	2022.0	19181.3	2686.11	35676.5
2010.0	4182.35	3855.07	327.276	2023.0	19181.3	1242.26	37120.4
2011.0	5718.13	4331.1	1387.03	2024.0	19181.3	-93.7446	38456.4
2012.0	8175.26	6348.55	1826.71	2025.0	19181.3	-1342.96	39705.6
2013.0	9706.36	9005.51	700.845	2026.0	19181.3	-2520.39	40883.0
2014.0	19368.3	10024.9	9343.4	2027.0	19181.3	-3637.15	41999.8
2015.0	22468.1	23614.9	-1146.82	2028.0	19181.3	-4701.74	43064.4
2016.0	20045.5	21946.9	-1901.38				

This table shows the forecasted values for Value in Crore for the period of 12 years (2017 - 2028).

During the period where actual data is available, it also displays the predicted values from the fitted model and the residuals (data-forecast). For time periods beyond the end of the series, it shows 95.0% prediction limits for the forecasts. These limits show where the true data value at a selected future time is likely to be with 95.0% confidence, assuming the fitted model is appropriate for the data. ARIMA model was applied to the data for forecasting, the trend series in quantity. The model shows fixed and parallel movement during the forecasted period.

Forecasting - US$ Million
Data variable: US$ Million
Number of observations = 21
Time indices: YEAR ENDING Length of seasonality = 2

Forecast Summary
Forecast model selected: ARIMA(2,2,2)x(0,0,0)2
Number of forecasts generated: 12
Number of periods withheld for validation: 0

Figure: 9 Time sequence plot for value in USD Million

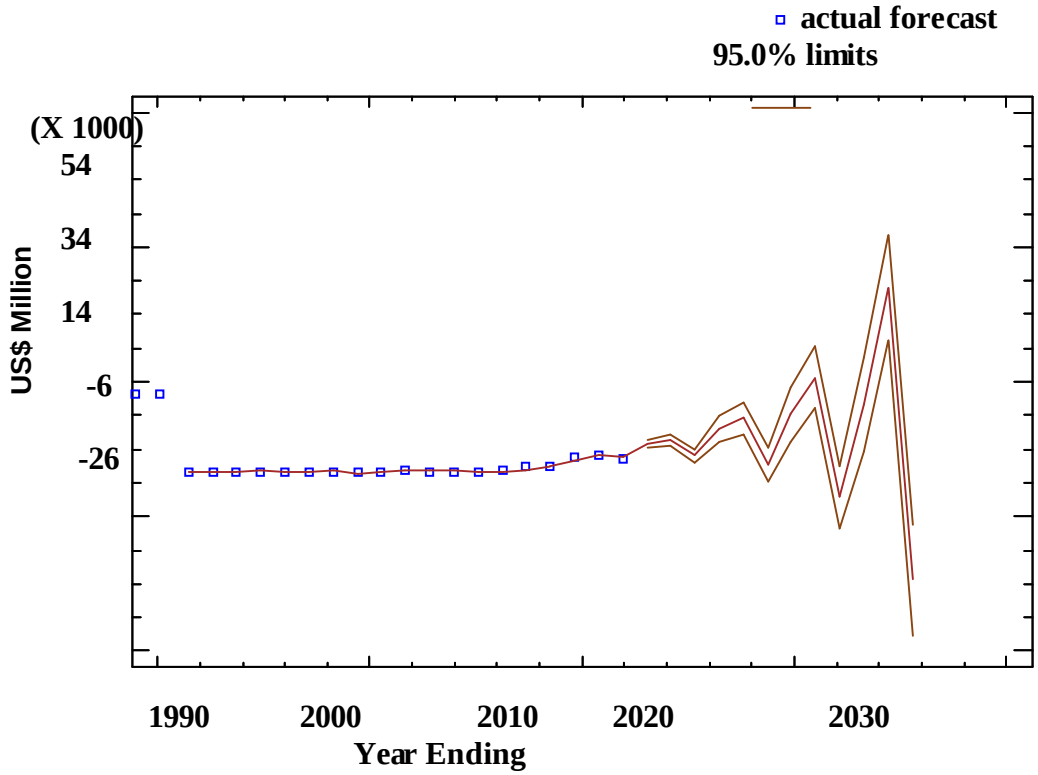


Table: 8 Forecast Table for US$ Million

Model: ARIMA(2,2,2)x(0,0,0)2

Period	Data	Forecast	Residual	Period	Forecast	Lower 95.0% Limit	Upper 95.0% Limit
1996.0	748.19						
1997.0	755.74						
1998.0	866.36	850.998	15.3617				
1999.0	798.75	884.058	-85.3076				
2000.0	846.62	762.436	84.1841				
2001.0	985.0	1023.56	-38.5604				
2002.0	871.03	862.903	8.12667				
2003.0	953.44	872.572	80.8681				
2004.0	876.64	1266.26	-389.616	2017.0	5410.93	4770.68	6051.18
2005.0	938.41	652.677	285.733	2018.0	6070.9	5205.3	6936.51
2006.0	970.43	874.099	96.3306	2019.0	3481.29	2383.87	4578.71
2007.0	997.64	1004.41	-6.77106	2020.0	7770.92	5631.7	9910.13
2008.0	980.62	1151.67	-171.049	2021.0	9590.49	7011.39	12169.6
2009.0	839.28	1001.03	-161.751	2022.0	2065.24	-703.095	4833.57
2010.0	883.03	786.725	96.3047	2023.0	10226.0	5835.58	14616.5
2011.0	1261.81	822.425	439.385	2024.0	16220.7	11187.4	21253.9
2012.0	1741.2	1024.34	716.86	2025.0	-3269.9	-8324.95	1785.15

2013.0	1803.26	1894.21	-90.9535	2026.0	11832.7	4188.33	19477.2
2014.0	3210.94	2687.46	523.481	2027.0	30892.9	22206.0	39579.8
2015.0	3709.76	3739.96	-30.2007	2028.0	-16777.2	-25737.6	-7816.84
2016.0	3096.68	3262.56	-165.878				

This table shows the forecasted values for US$ Million for the period of 12 years (2017 - 2028)

During the period where actual data is available, it also displays the predicted values from the fitted model and the residuals (data-forecast). For time periods beyond the end of the series, it shows 95.0% prediction limits for the forecasts. These limits show where the true data value at a selected future time is likely to be with 95.0% confidence, assuming the fitted model is appropriate for the data. ARIMA model was applied to the data for forecasting, the trend series in quantity. The model shows high volatility during the forecasted period and estimating a decline in the total value.

Conclusion

With the introduction of Vannamei species of shrimp in Indian aquaculture industry, the productivity and the overall production of shrimps experienced a major boost. With the increase in production, shrimp now became a major export commodity for Indian marine export and a major source of earning foreign exchange revenue for the country.

The trend analysis of the exports of frozen shrimps from India shows a positive trend in terms of quantity exported as well as the value in terms of rupee and US dollars. Exports of frozen shrimps recorded a significant increase in these 20 years. A major shift in the pattern of growth was observed after 2009-10 where in due to a significant increase in the production of shrimps in country, the exports experienced a sharp growth. With an ever increasing demand for shrimps in the world market, there lies a huge potential for the shrimp industry in India, which needs to be addressed, in order to continue this growth pattern in marine exports.

ARIMA model was used to forecast the 12 years export performance of shrimps from India. This forecast was in terms of the total quantity exported in tons, the total value of exports in Indian Rupees and the total value of exports in Terms of US dollars. The ARIMA model forecasted a significant and consistent increase in the total exported quantity from India during this period. In terms of the export value in Indian rupees, the forecast remained flat and constant. While the US dollar export forecast showed a downward trend.

Shrimps form a major portion of the overall exports of the country. With the advancement of scientific farming methods and technology, the shrimp aquaculture industry holds high potential for growth in India in future. However the aquaculture industry is exposed to several risks both operational and economic which creates pressure on the production of such species. Moreover due to tighter custom policies and quality check procedures from the importing countries, Indian marine exports would have to find a solution for a sustainable growth of exports in future.

Bibliography

Publications

1. Koli, P. A. (2012). Economics of fisheries in India. Jaipur: Shruti Publications.
2. Singh, R. K. (2013). Economics of aquaculture. Place of publication not identified: Daya Publishing House.

Websites

1. About aquaculture. (n.d.). Retrieved March 01, 2018.
2. Aquaculture industry in India. (n.d.).
3. Country profile. (2005, June 01). Retrieved February 26, 2018.
4. Indian aquaculture shrimp production crosses 5 lakh tonnes. (2017, May 14). Retrieved February 26, 2018.
5. Kumar, V. S. (2016, January 21). Aquaculture industry estimates 10-15% growth in production. Retrieved February 26, 2018, from https://www.thehindubusinessline.com/economy/agri-business/aquaculture-industry-estimates-1015-growth-in-production/article8135838.ece.
6. Rani, P., Immanuel, S., Ananthan, P. S., Ojha, S. N., Kumar, N. R., & Krishnan, M. (n.d.). Export performance of Indian ornamental fish - an analysis of growth, destination and diversity.
7. Ravi, R. (2018, January 27). Indian seafood exports to touch Rs 40,000 cr. Retrieved February 26, 2018, from http://www.financialexpress.com/economy/indian-seafood-exports-to-touch-rs-40000-cr/1032896/.
8. T. (2017, May 14). India's aquaculture exports can double in 4 years: Min - Times of India. RetrievedFebruary 26, 2018, from https://timesofindia.indiatimes.com/city/mangaluru/indias-aquaculture-exports-can-double-in-4-years-min/articleshow/58673694.cms.
9. Time Series Analysis. (n.d.). Retrieved February 26, 2018,
10. What is Time Series analysis? (n.d.). Retrieved February 26, 2018.