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Forecasting Export and Import of Herbs and Herbal Products in Malaysia

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Abstract: Herbal industry in Malaysia has been identified as a potential sector in new key economic areas (NKEA) since Tenth Malaysian Plan (2011 - 2015). The export and import of herbs and herbal products experienced an increasing trend nevertheless the production of herbs in Malaysia shows fluctuating trend. This situation indicated that the need to examine the future demand of herbs and herbal products is important to help the players of the herbal industry in planning their business strategy. The export and import for herbs and herbal products need to be forecasted to understand the future situation. The common forecasting technique used in agricultural commodities such as palm oil, rubber, cocoa and logs are Input-output model, multiple regression model, ARIMA model and composite model. This study applied ARIMA model since it shows an acceptable, reliable and realistic forecasting result with a good performance. The projections are made for five years since ARIMA show more accurate forecasts rather than a complex forecasting model for a two to five years projection. The data used are the export and import data on herbs and herbal product in Malaysia that is available from 2001 to 2016. The results are diagnosed using statistical software. The result of the study is useful for the players in the industry and for the policy implementation.

Keywords: herbal industry; forecasting; export; import

I. INTRODUCTION

The herbal industry is a fast growing industry worldwide. The Global Industry Analysts Inc. based in USA projected the herbal market to reach USD115 billion by the year 2020 [2]. The growth is supported by the changing mind set and awareness movement initiated around the globe on alternative health care and disease prevention. Herbal industry in Malaysia has been identified as a potential sector in new key economic

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areas (NKEA) since Tenth Malaysian Plan (2011 – 2015). The industry contributed to the Malaysian economic growth and plays a significant role in providing job opportunities [4].

Fig. 1 illustrated contribution of import and export for herbal industry in Malaysia from 2001 until 2016. The export value of herbal market increased from USD 2.1 billion in 2001 to USD 6.4 billion before decreased to USD 5.4 billion in 2009 and then increased again for seven years ahead to reach USD 9.1 billion in 2016.

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Whereas the import value of herbal Malaysia drastically increased from USD 2.6 billion in 2001 to USD 11.4 billion in 2015. However, in 2016 there is a 6.1% reduction in import value to USD 10.7 billion. In a nutshell, the export and import value of Malaysian herbs and herbal products experienced a threefold increases from 2001 to 2016. The trend of export and import shows trade deficit widened since 2011 onwards.

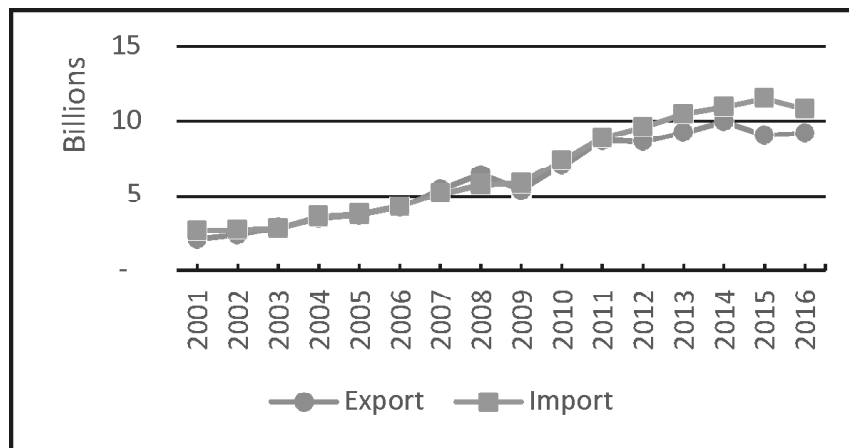


Figure 1: Export and Import of Malaysian Herbs and Herbal Products, 2001-2016

The export and import of herbs and herbal products experienced an increasing trend nevertheless the production of herbs in Malaysia shows fluctuating trend. This situation indicated the need to examine the future demand of herbs and herbal products. The forecasting period will be intermediate term period which consists of five years forecasting period suitable for research and development, plant location and product planning.

II. LITERATURE REVIEW

ARIMA is the usual method used in agricultural commodities forecasting such as palm oil, rubber, cocoa and logs besides Input-output model, multiple regression model and composite model. In a study conducted by [6] entitled forecasting production of fossil fuel sources, ARIMA model is chosen for natural gas forecasting since it gave better results than regression analysis and the results of the forecast are also more realistic. ARIMA model was also found to be more representative. Box-Jenkins procedure is concerned with fitting a mixed ARIMA model to a given set of data to produce forecasts. This model is well documented, in particular, by Box and Jenkins (1996) and O'Donovan (1983) [3]. This research employed Box-Jenkins

time series forecasting approach to forecast the export and import of herbs and herbal products. In this study, ARIMA and Box-Jenkins terms will be interchangeably used.

III. RESEARCH METHODOLOGY

Secondary time series data of export and import of herbs and herbal products from 2001 to 2016 was collected from trade map website [5] was used in this study. There are four basic steps to be followed in the Box-Jenkins approach for forecasting. These steps are identification, estimation, diagnostic checking and forecasting.

(A) Identification

Identification stage determines the appropriate ARIMA model. The first step is to define the stationarity of the data series. The data used in this study is annual data so there is no consideration for seasonal effects. Data stationarity can be checked by plotting data on a graph against time. Further analysis of the series is performed on the basis of either correlogram technique or auto correlation function (ACF) and unit root test. Non-stationary in the series is indicated by an autocorrelation plot with very slow decay. Box and Jenkins recommended differencing non-stationary series one or more times (d) to achieve data stationarity. The next step is to identify the order of the AR (p) and MA (q) values. The appropriate p and q for the data series then could be identified from the series of correlogram or ACF and partial auto correlation function PACF.

(B) Estimation

After the appropriate p and q values are identified, the parameters of the autoregressive and moving average terms included in the model are estimated. This process is to determine the right specification. This calculation can be done by simple least squares method (LS). For a good model, the coefficients should be of high statistical quality, should not be highly correlated and statistically independent random noise. This problem can be tested using Box-Pierce Q-statistic (Q-stat).

(C) Diagnostic Checking

The best model is the model with smallest root mean square error (RMSE), mean absolute error (MAE) and mean absolute percentage error (MAPE) values. In this study MAPE is used to examine the accuracy of forecasted value. Reference [1] identified that, small MAPE which is less than 10% is considered highly accurate, 10-20% is good, 20-50% is reasonable and more than 50% is inaccurate.

(D) Forecasting

The selected model is used in ex-post forecasting to forecast and the forecasts value is then compared to the actual value to see the accuracy of the model.

IV. DATA ANALYSIS

The correlogram functions for both export and import indicate a decline at higher lags proved the stationarity of the time series data. Therefore the order of intergration for both models is zero, I (0) and only the Auto Regressive and Moving Average (ARMA) (p,q) is implemented. Fig. 2 and 3 indicate that, the ACF and PACF spikes at lag 1 which are statistically different from 0 at approximate 95% confidence limits.

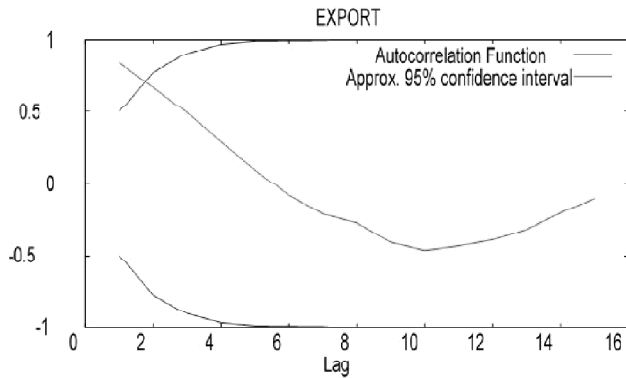


Figure 2: Correlograms of export

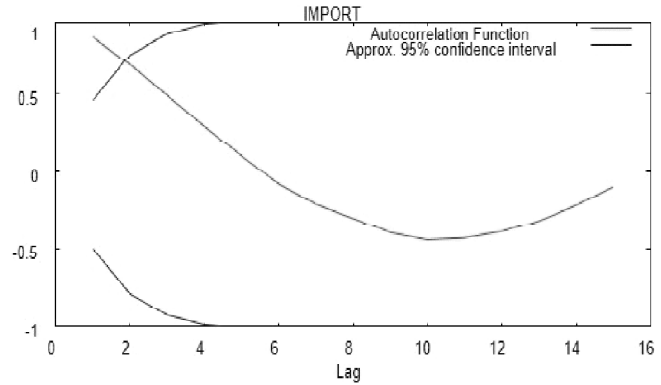


Figure 3 : Correlograms of import

Table 1 shows the Q-stat results for the estimated ARIMA model with AR (1) and MA (1) for both export and import model. Both models show insignificant Q-stat so the hypothesis of white noise errors is rejected which indicates the residuals estimated are purely random and has no white noise. The relatively small Akaike information criteria (AIC) and Schwarz's information criteria (SIC) also indicates the appropriate values for p and q for production model is ARMA (1,1).

Table 1
Estimated ARIMA model

	Parameter	Estimates	Std Error	T-Stat	R ²
Export	AR (1)	0.97316	4.50E-02	21.64	
	MA (1)	-0.3547	2.71E-01	-1.307	
	Constant	1.55E+05	2.58E+05	0.5992	
	AIC :	27.831	SIC :	27.976	0.88
Import	AR (1)	0.98383	2.96E-02	33.2	
	MA (1)	-6.17E-01	0.2357	-2.617	
	Constant	1.04E+05	1.94E+05	0.5379	
	AIC :	27.234	SIC :	27.379	0.96

The model was then used to do ex-post forecasting. The forecast period is five years ahead as identified earlier that the forecast will be intermediate forecast. Fig. 4 and 5 show the actual and forecasted values of export and import together with the range of expected error. The forecasted value displays decreasing rate in export and import.

Both export and import trend shows a decreasing trend for five forecasting years. MAPE for 2015 and 2016 indicates that the forecasted value for export and import are highly accurate with 9.8% and 2.7% error respectively evidenced that, these models are acceptable.

V. CONCLUSION AND DISCUSSION

Malaysian herbal industries experienced an increasing trend of export and import for the previous 16 years showed the increasing demand of herbs and herbal products.

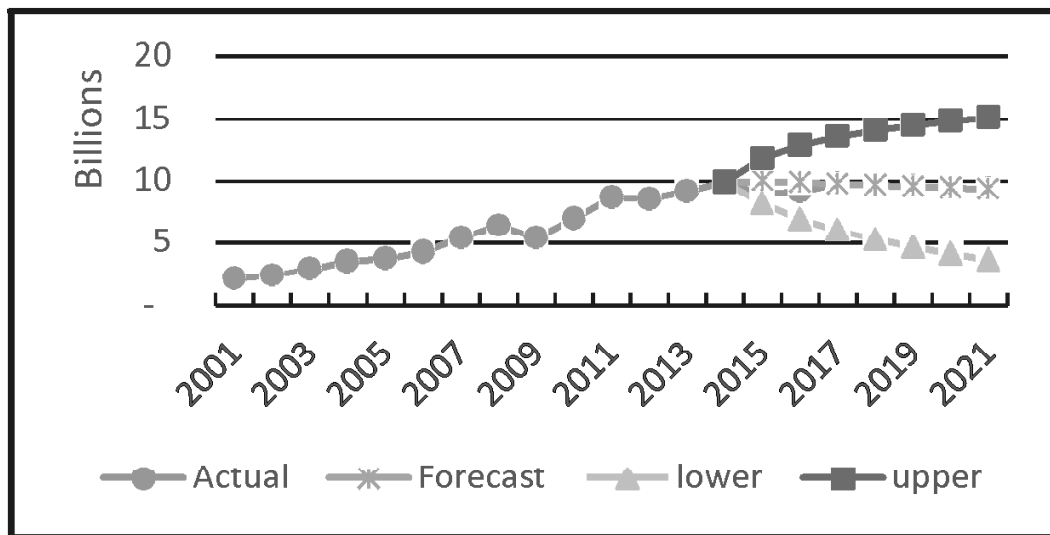


Figure 4: Actual and forecasted value of export

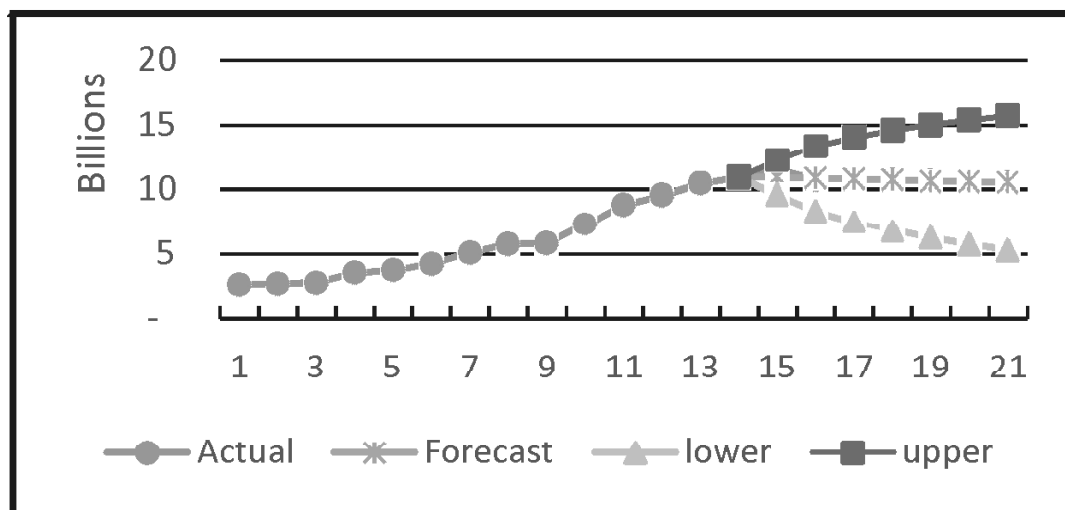


Figure 5: Actual and forecasted value of import

Nevertheless, the widened trade deficit since 2011 onwards indicated that, the Malaysian herbal industry is not capable to cater the domestic market demand. The efforts of Malaysian government through various initiatives to develop the herbal industry since 1990 such as in Vision 2020, Science & Technology Policy 2003, Biotechnology Policy 2004 and many more indicated that the herbal industry has a huge potential. The result of this study which projected the Malaysian export and import of herbs and herbal products to experience a negative growth by 3% for the five years ahead since 2017 to 2021 might be a positive sign to the Malaysian herbal industry. The negative growth might be an indicator that Malaysian herbal industry are narrowing the gap by developing the local herbal industry. The projected decreasing value of export and import exhibited narrowing trade deficit (Fig. 6). The shortcoming of this study is the limited data on herbs production. A study on the production of Malaysian herbs and herbal products and herbs plantation should be conducted to be able to assess the capability and future sustainability of Malaysian herbal industry.

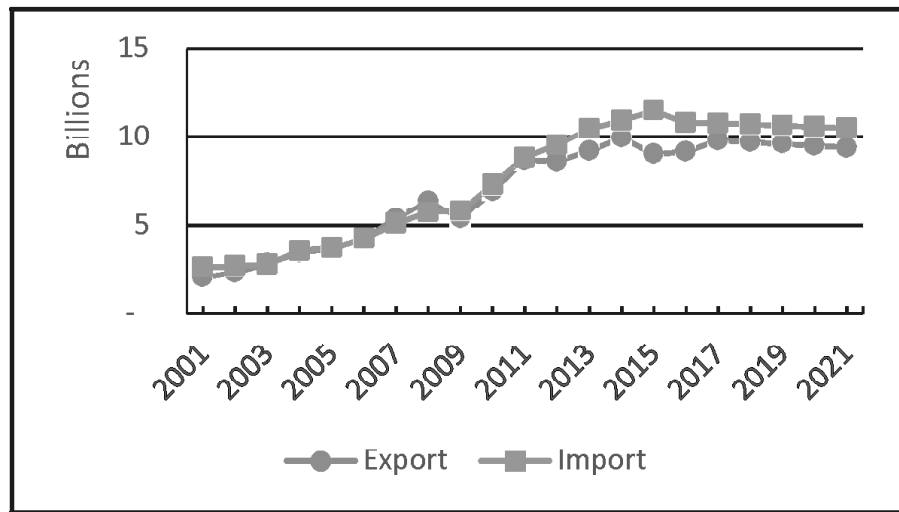


Figure 6: Export and Import of Malaysian Herbs and Herbal Products, 2001-2021

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REFERENCES

- Dharmaratne, GS. (1995). Forecasting tourist arrivals in Barbados. *Annals of Tourism Research*. 22 (4), (pp. 804-818).
<http://www.strategyr.com/MarketResearch/Infographics/Images/MCP-1081/1081.jpg>
- Mad Nasir, S. and Fatimah, M. A. (1993). Forecasting of crude palm oil and rubber prices: comparative techniques. In *Malaysian agricultural commodity forecasting and policy modeling*, ed. Fatimah, M.A., Mad Nasir, S. and Mohd. Shahwahid, H.O. (pp23-34). Kuala Lumpur: Universiti Pertanian Malaysia.
- Saari, A & Noraini, O. (2015). Malaysia herbal industry: profile of SMES. *Journal of Scientific Research and Development*. 2 (14), (pp. 74-78).
- Trade statistics for international business development 2001 – 2016. <http://www.trademap.org/Index.aspx>
- Volkan, S. E., Sertac A. and Berkin U. (2006). Forecasting production of fossil fuel sources in Turkey using a comparative regression and ARIMA model. *Energy Policy*, 34 (2006), (pp.3836 -3846).