State Space Model for Evaluating the Causal Impact of Outward-Looking Policy on the Growth Rate in Sri Lanka

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ABSTRACT

The study examines the causal impact of the outward-looking policy in 1978 on the economic growth rate in Sri Lanka. The secondary data is used to estimate the impact of trade liberalization policy from 1970 to 2007. In estimating the impact of the policy, the total period is divided into two sub-period of pre-period as before the implementation of open economic policy during 1970-1977 and post-period as after the implementation of open economic policy during 1978-2007. The study applies the State Space Local Level trend model with the seasonal component. The empirical results suggest that there is a positive impact of the outward-looking policy reforms on the economic growth rate in Sri Lanka. The GDP growth rate has been recording a higher value than the inward-looking policy period.

Keywords

Import Substitution Policy, Outward-Looking Policy, Economic Growth Rate, State Space Local Level Model with Trend, Seasonality

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Introduction

The trade policy is the engine of the economy and the movement towards a free trade policy by reducing tariff and trade restrictions are the key driving forces in most economies of the world to achieve higher economic growth and long-term sustainability (Herath et al., 2013). The inward-looking economic policy was introduced in 1972 in Sri Lanka to encourage import substitution industries and there were a huge government intervention and regulation for the market and import controls and restrictions in that period (Menike, 2016: Balakrishnan, 1980). It has been argued that the import substitution policy was not favorable for the development of industries with exports potential and the targeted objectives were not achieved (Balakisishnan, 1980: Dias, 1991: Athukorala and Jayasuriya, 2004: Blackton, 1983: Embuldeniya, 2010: Menike, 2016: Athukorala, 2010). The period of 1972-1977 were difficult years and weak performance of the private sector firms due to unfavorable investment climate, high export tax policies, trade controls of the government and overvalued exchange rate and the manufacturing sector production dropped to 1.8% with compared to early closed economic policy (Athukorala and Jayasuriya, 2004: Dias, 1991: Blackton, 1983). In the closed economic period, the balance of payment was negative, faced foreign currency issues, and scarcity of necessary food items (Embuldeniya, 2010). Since the strict intervention of the government to the economy, the economic growth rate fell to 2.9% and the unemployment rate exceeds 20% and the public debt had increased sharply (Menike, 2016: Embuldeniya, 2010).

In 1977 a new government was elected and realized the strict intervention and trade restrictions for the economy do not help to achieve the desired targets of the economic development and decided to move toward outward-looking economic strategies of export-oriented growth and open to the international economy to overcome the limitation of inward-looking economic policy and way out from the economic crises (Menike, 2016: Gunarathna, 2007: Dias, 1991). The drastic movement from import substitution industrialization to export-oriented industrialization included reforms in trade liberalization, fine-tuning the tariff rates, reduce the state controls for the transactions, privatize the public sector enterprises, eliminating the dual exchange rate, and replaced by the unified flexible exchange rate, financial deregulation, and another remarkable policy was introduced to attract the foreign investment and private sector capital participation in the economy (Balakrishnan, 1980: Kodikara, 1980: Athukorala and Jayasuriya, 2004: Embuldeniya, 2010: Bandara and Karunaratne, 2013). The government invested in three main macro sectors that stimulate the economic growth, employment creation, and

export-oriented manufacturing industries and established Free Trade Zones, Great Colombo Exchange Commission, Export Development Board, and implemented Accelerated Mahaweli Development Program and Housing and Urban Development Program to enhance the irrigation and agriculture (Balakirishnan, 1980: Dias, 1991: Blackton, 1983: Embuldeniya, 2010: Menike, 2016: Athukorala, 2010). The impressive growth of the economy just after the open economic policy was reflected in the continuous growth of the sectors of manufacturing, trade, agriculture, construction, banking, electricity, transport, and utilities (Balakrishnan, 1980).

The annual growth rate of the manufacturing sector during 1977-1988 was notably higher than the close economic period of 1970-1977 and it was recorded only 1.74% manufacturing growth rate during 1970-1977 and it was stunning growth recorded as 4.63% in 1977-1982 and recorded 12.5% growth in 1984-1988 in the total manufacturing sector (Dias, 1991: Athokorala and Jayasuriya, 2004). In the inward-looking policy period 1970-1977, the trade was least recorded as 2.47%, and sudden improvement from 1977-1982 as 7.55% and continuous as 22.9% considerable growth in 1984-1988, as well as the construction, was remarkably enhanced from -2.66% to 11.03% in the open economy (Dias, 1991). As a result of the impressive success rate of eight manufacturing groups like textile and wearing, wood and paper, rubber products, chemical products, and food-based industries mainly tea, the industrial exports to total exports noteworthy increased from 13.4% in 1977 and 48.3% in 1988 (Dias, 1991, Athukorala and Jayasuriya, 2004). Since the outward promoting strategies, the economic growth rate was doubled with compared to the inward-looking policy, and the least 2.9% economic growth rate increased to 5.9% in 1978-1982 (Menike, 2016: Blackton, 1983: Bhalla and Glewwe, 1986: Shastri, 2008).

Therefore, the purpose of this study focus to estimate the causal impact of the open economic policy in 1977 on the economic growth rate of Sri Lanka by applying the State Space Local Level Trend model with the seasonality.

Literature Review

Menike (2016) had studied the impact of the development strategies under the open economic policy on the economy of Sri Lanka by using descriptive analysis and found that the country achieved great growth of the economy than the inward-looking strategies. Bandara and Karunarathna (2013) examined the impact of opening the economy to the global market on the productivity of the export-oriented industries by applying the industry heterogeneity effects through the validation fixed effects model and the empirical results prove that the outward-looking export-oriented policy after 1977 had resulted in total factor productivity growth. Athukorala and Jayasuriya (2004) studied the trade and foreign direct investment reforms in industrial growth in Sri Lanka and suggest that reforms helped to modify the primary products to manufacturing dominate exports. Sultanuzzaman et al (2018) had investigated the short-run and long-run relationship between foreign direct investment, exports, and economic growth in Sri Lanka in 1980-2016 and used Autoregressive Distributed Lag testing. The study suggested that foreign direct investment has a positive and significant relationship with economic growth in both the short run and long run. The study found that in the short run there is a positive significant relationship between exports and economic growth, but exports have a significant negative relationship with economic growth in the long run. Herath et al (2013) examined the impact of trade liberalization on exports and imports and employed multiple regression models to estimate growth rate long term main variables and it suggested different results than other studies. The study showed that the total exports grew at 12.47% during the 1970-1977 closed economic period and 7.39% growth of exports during 1978-2011, and the total imports had grown at 11.7% in closed economic period 7.39% growth rate in imports after the free trade. Hassan and Kamrul (2005) have studied the causal relationship between trade liberalization and economic growth in Bangladesh and the study surveyed that in the long run unidirectional relationship between an open economy and economic growth. Santos-Paulino (2002) had investigated the impact of free trade on the growth of exports in 22 countries and employed dynamic panel data rely on fixed effects, generalized methods of moment estimators, and time-series techniques. The study recorded some interesting results and showed that the impact of free trade on exports differ from country to country, but free

trade is the main cause of export performance. Iftikhar (2012) examined the trade liberalization and economic growth and the results found that trade is a great benefactor for the economic growth of Bangladesh in the long run. Stryker and Pandolfi (1997) have studied the impact of trade openness policy on economic growth and poverty and the results explained that trade openness is very significant to economic growth and the reduction of poverty. Joshi and Little (1996) from their study in India and Ahmed (2000) in Bangladesh study have found that trade opening to the international economy enhances the export production. Sanusi (2008) investigated the openness and growth in Sub-Saharan Africa by applying thirty-six cross country analysis and selected seven time-series sample. The study found that the open economic countries in Sub-Saharan Africa have a propensity for speedy growth than the closed economic countries. Gries and Redlin (2012) examined the causal relationship between trade openness and economic growth for 158 countries during the period of 1970-2009 in both the short-run and long-run and used GMM estimation with the combined of panel cointegration test and panel error correction models. While the study suggests that there is a positive significant causal relationship between openness and trade, in the long run, in contrast, there is a negative relationship in the short run. However, Jenkins (1991) and Greenway and Sapsford (1994) found that that trade liberalization has a weak relationship with export growth.

Therefore, this study examines the causal impact of outward-looking strategies on the economic growth rate in Sri Lanka by using the State Space Local Level Trend model with the seasonal component. Although there were a plethora of studies to find the impact of outward-looking policy on the economic growth rate, there is no study that focuses on State Space Model. Therefore, the findings of this study will significantly contribute to new findings. Since the State Space model is a Bayesian Structural time series model, it is used to estimate the causal impact of an intervention or a new policy change on a time series.

Methodology

This study uses the secondary data published by the Central Bank from 1970 to 2017 in Sri Lanka (Economics and Social Statistics, 2008). The GDP Growth Rate is used as the dependent variable while Trade, Manufacturing, Finance, Transportation, and Communication data are used as the independent variables. State Space applies to evaluate the causal impact of the open economic policy on the economic growth rate. The period of 1970-1977 considers as the pre-period and 1978-2007 considers as the post period of the policy.

According to the State Space Model, consider the Local Level Model with seasonality for the growth rate of Sri Lanka,

$$Y_t = \mu_t + \tau_t + \epsilon_t$$

$$\mu_{t+1} = \mu_t + \delta_t + \eta_{0t}$$

$$\tau_{t+1} = -\sum_{s=0}^{s-2} \tau_{t-s} + \eta_{2t}$$

Y_t is the GDP Growth Rate of Sri Lanka, μ_t is constant, δ_t is the trend, τ_t is the seasonal component, s is 12 months, ϵ_t, η_{0t}, η_{2t} are iid normal errors. Then, consider the time series regression model for the GDP Growth Rate of Sri Lanka,

$$Y_t = \mu_t + \tau_t + \beta X_t + \epsilon_t$$

$$\mu_{t+1} = \mu_t + \delta_t + \eta_{0t}$$

$$\tau_{t+1} = -\sum_{s=0}^{s-2} \tau_{t-s} + \eta_{2t}$$

Y_t is the GDP Growth Rate of Sri Lanka, X_t is the vector containing the Trade, Manufacturing, Finance, Transportation, and Communication, μ_t is constant, δ_t is the trend, τ_t is the seasonal component, s is 12 months, ϵ_t, η_{0t}, η_{2t} are iid normal errors.

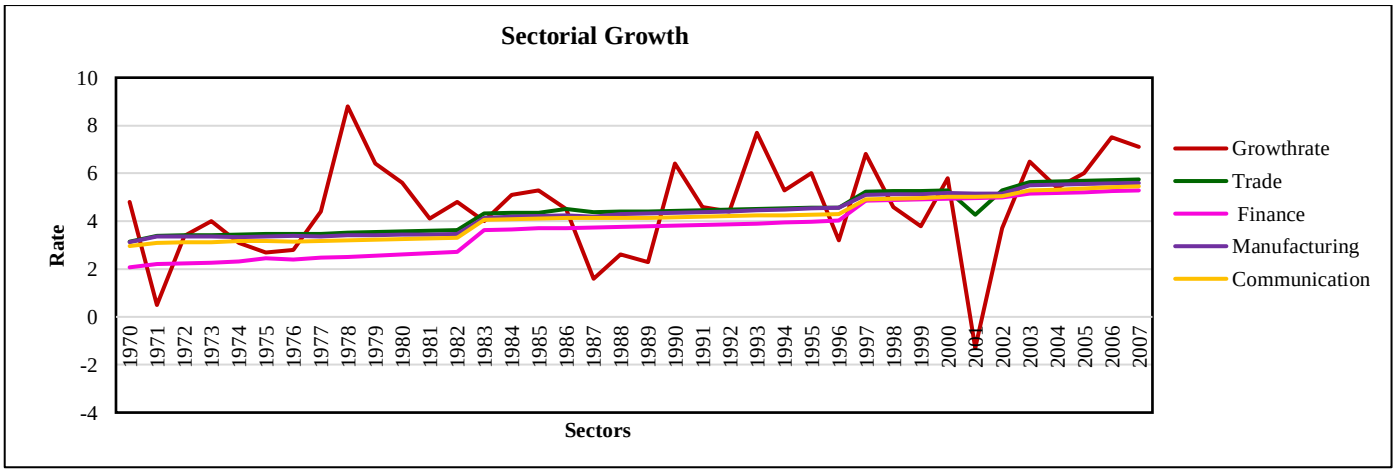
The estimated model and the post-policy data on X_t, forecast of Y_t after the open economic policy implementation. Then compare the forecasts with the actual data to estimate the impact of the outward-looking policy. The difference between the actual data and the forecast is the impact of the policy.

Results and Discussion

The study focuses on the GDP growth rate as the dependent variable and Trade, manufacturing, Finance, and Transportation and Communication areas as the independent variables. Figure 1 illustrates the variations of the dependent and independent variables over time.

Figure 1

The GDP Growth Rate, Trade, Manufacturing, Finance, Transportation and Communication



Source: Central Bank of Sri Lanka 2008

Figure 1 shows the GDP Growth Rate, Trade, Manufacturing, Finance, Transportation, and Communication from 1970 to 2007 and it changes over time. The growth rate varies from minus growth to 8% growth. At first, there was a huge decline in the growth rate from 1970 to 1977. Because in 1972 the government declared a closed economy. Then after 1978, there was an improvement in the growing economy with the open economic policy introduced in 1978. After that, it varies with the time and in 2001 there was minus growth that was affected by the civil war in the country, global economic slowdown, and the security issues (CB of Sri Lanka, 2008). The trade increased slowly during the import substitution policy period and there was a rapid improvement after the open economic policy. Then there was a random walk and trade hugely decreased in 2001 and again there was an enhancement. The manufacturing, finance, transportation, and communication were slowly increasing during the inward-looking policy period of 1970-1977 and there was a stable improvement from 1978 to 1982 and there was a stunning enhancement after 1982.

Estimate the Causal Impact

The State Space Local Level model with trend and with the seasonal component applies to estimate the causal impact of outward-looking policy reforms on the economic growth rate of Sri Lanka. The model is used to forecast the economic growth rate after the policy implementation from 1978 to 2007. Then the forecast is compared with the actual data to estimate the impact. The difference between the forecast and the actual data is the casual impact of the export-oriented policy on the GDP growth rate.

Table 1

The Estimation of the Causal Impact of the Open Economic Policy in State Space Local Level Trend Model with a Seasonal Component

	Average	Cumulative
Actual	4.8	139.8
rediction (s.d.)	4 (0.79)	115 (22.80)
95% CI	[2.6, 5.6]	[74.0, 161.8]
Absolute effect (s.d.)	0.86 (0.79)	24.87 (22.80)
95% CI	[-0.76, 2.3]	[-22.03, 65.8]
Relative effect (s.d.)	22% (20%)	22% (20%)
95% CI	[-19%, 57%]	[-19%, 57%]
Posterior tail-area probability p:	0.123	
Posterior prob. of a causal effect:	88%	

The actual average after the change is 4.8. The prediction is 4. So the impact is 0.86. On average the value of the growth rate increases 0.86 units and the confidence intervals are -0.76 and 2.3. It is not significant. The Relative effect is 22%, the growth rate increases by 22%, and the confidence

intervals are -19% and 57%. It gives you the Posterior tail area probability of 0.123. It is around 12%. That explains the probability that is smaller than 0 is 12% and the probability that is bigger than 0 is 88%. It is significant at the 88% level. Positive impact with an 88% probability. The cumulative is the adopt all the effect. The actual cumulative value is 139.8 and the prediction is 115. Then the difference is the impact absolute effect is 24.87.

Figure 2

The Causal Impact of the Open Economic Policy with State-Space Local Level Trend Model with Seasonal component

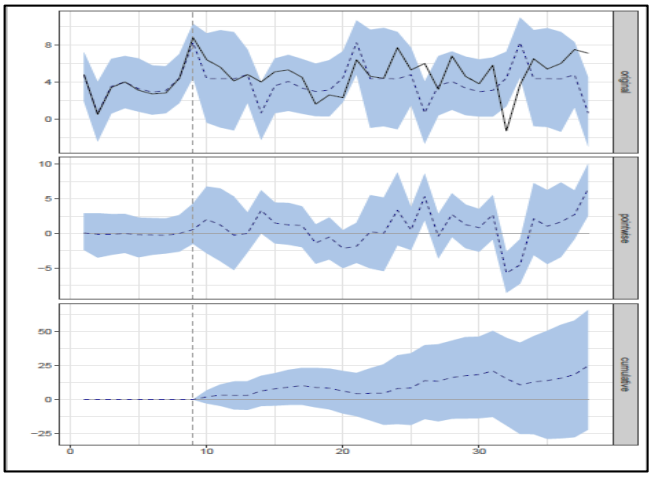


Figure 2 explains the three graphs. First, the original graph explains the actual data (original data) and forecast. The black line explains the original data and the dotted line (light blue line) explains the forecast. Sometimes actual data goes with the forecast but sometimes there some variations. Ex. 2001 there was a huge difference. A pointwise graph explains the difference between actual data and forecast. It is the impact (effect) of the policy. The cumulative graph explains the adoption of all the effects. It would be different to adapt over time. It goes up which means a positive effect of open economic policy on the growth rate.

Table 2

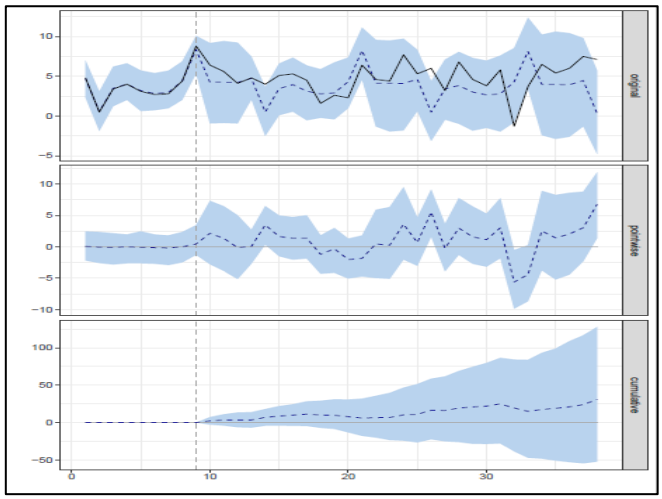
The Estimation of Causal Impact of the Open Economic Policy in State Space Local Level Trend Seasonality Model with Time Series Regression

	Average	Cumulative
Actual	4.8	139.8
Prediction (s.d.)	3.8 (1.5)	109.0 (42.1)
95% CI	[0.41, 6.6]	[11.98, 192.1]
Absolute effect (s.d.)	1.1 (1.5)	30.8 (42.1)
95% CI	[-1.8, 4.4]	[-52.3, 127.8]
Relative effect (s.d.)	28% (39%)	28% (39%)
95% CI	[-48%, 117%]	[-48%, 117%]
Posterior tail-area probability p:	0.148	
Posterior prob. of a causal effect:	85%	

The regression model also explains somewhat similar results with the previous model but there are some differences. The actual average after the change is 4.8. The prediction is 3.8. So the impact is 1.1. On average the value of the growth rate increases 1.1 units and the confidence intervals are -1.8 and 4.4. It is not significant. The Relative effect is 28%, the growth rate increases by 28%, and the confidence intervals are -48% and 117%. It gives the Posterior tail area probability as 0.148. It is around 14.8%. That means the probability that is smaller than 0 is 14.8% and the probability that is bigger than 0 is 85.2%. It is significant at the 85% level. Positive impact with 85% probability. The cumulative is the adopt all the effect. The actual cumulative value is 139.8 and the prediction is 109. Then the difference is the impact absolute effect is 30.8

Figure 3

The Causal Impact of the Open Economic Policy in State Space Local Level Trend Seasonality Model with Time Series Regression



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original data and the dotted line (light blue line) explains the forecast. Sometimes actual data goes with the forecast but sometimes there some variations. Ex. 2001 there was a huge difference. A pointwise graph explains the difference between actual data and forecast. It is the impact (effect) of the policy, Cumulative graph explains the adopt all the effects. It would be different to adapt to overtime. It goes up which means a positive effect of the open economic policy on the economic growth rate.

Conclusion

The trade liberalization policy was introduced in 1978 due to unsatisfactory economic results of the import substitution policy in Sri Lanka during 1972-1977. The study explains the causal impact of the trade liberalization policy on the economic growth rate in Sri Lanka by the State Spacetime series model. The study shows interesting results and suggests on average with the regression time series model, the growth rate increases by 1.1 units and on the relative effect, the growth rate increases by 28% due to trade liberalization policy. The estimated cumulative effect is 30.8 units. According to Figures 2 and 3, the cumulative effect goes up and there is a positive impact from the open economic policy on the GDP growth rate in Sri Lanka. Therefore, the study suggests that there are positive favorable results from the trade liberalization policy reforms on the economic growth rate in Sri Lanka. The government moves to the liberalization of trade restrictions, diversify the export-oriented industries, and encouraging manufacturing sectors based on more country-based resources, will be more effective to generate sustainable economic growth.

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