

Estrada, Mario Arturo Ruiz; Samad, Diwa; Ho, Yew Joe

Article

The External Sector Vulnerability Monitoring Index (Λ): The case of Chinese and Asean-5 economies

Contemporary Economics

Provided in Cooperation with:

University of Finance and Management, Warsaw

Suggested Citation: Estrada, Mario Arturo Ruiz; Samad, Diwa; Ho, Yew Joe (2018) : The External Sector Vulnerability Monitoring Index (Λ): The case of Chinese and Asean-5 economies, Contemporary Economics, ISSN 2300-8814, University of Finance and Management in Warsaw, Faculty of Management and Finance, Warsaw, Vol. 12, Iss. 3, pp. 301-314, <https://doi.org/10.5709/ce.1897-9254.279>

This Version is available at:

<https://hdl.handle.net/10419/297503>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

Primary submission: 12.05.2017 | Final acceptance: 26.11.2017

The External Sector Vulnerability Monitoring Index (Λ): The Case of Chinese and Asean-5 Economies

Mario Arturo Ruiz Estrada¹, Diwa Samad¹, Yew Joe Ho²

ABSTRACT

This paper introduces an alternative indicator to evaluate the external sector behavior of a country or region. The objective of this indicator, titled "The External Sector Vulnerability Monitoring Index" (henceforth ESVM) (Λ), is to offer policy-makers and researchers a new analytical tool to study the external sector trends and stages of any country from a global perspective. The ESVM-index (Λ) is not intended to be a forecasting model. It is focused on showing the past and present economic situation in any country's external sector performance. It can provide a general idea of the situation and evolution of the foreign sector performance of any country. Therefore, the application of the ESVM-index (Λ) is based on the characteristics, conditions and historical moments that any country presents in its external sector development. ESVM-index (Λ) acts as a simulator that allows the application of a series of different scenarios and phases of external sector performance of any country. In our case, we apply the external sector vulnerability monitoring index (Λ) on the Chinese and ASEAN-5 economies.

KEY WORDS: Trade liberalization, Openness, International Trade, ASEAN, China

JEL Classification: F15, F41

¹ University of Malaya - Economics, Malaysia; ² Universiti Malaysia Sabah - Labuan Faculty of International Finance, Malaysia

1. Introduction

In the last thirty years, many economists and policy makers have attempted to build alternative indicators to measure the external sector behavior and trends using terms of trade (ToT)¹ or openness index (Oi)². It is important to mention that the abovementioned indicators have significantly contributed to the study of external sectors to date. In the literature, the application of these indicators has been focused on multi-cross-country comparative analysis and forecasting to explain the link between

openness, growth, and income distribution. These indicators include (i) trade dependency ratios; (ii) the rate of growth exports (Balassa, 1985); (iii) the Heritage Foundation Index (Edwards, 1998); (iv) the Sachs and Warner Openness Index (Sachs et al., 1995); (v) Leamer's Openness Index (Barro, 1991); (vi) the Trade Liberalization Index (Lopez, 1990); (vii) Average Coverage of NTB-QR- (Edwards, 1993); (viii) black market premium (Harrison, 1996); (ix) the index of real exchange rate variability; (x) the index of real exchange rate distortion (Dollar, 1992); trade restrictiveness (TRI) under the uses of CGE modeling (Anderson & Neary, 1992; 1994; 1996; 2003; 2007); MTRI or Overall Trade Restrictiveness Index (OTRI) (Anderson & Neary, 2003).

Correspondence concerning this article should be addressed to: **Mario Arturo Ruiz Estrada**, University of Malaya - Economics, KL 53600, KL, Malaysia. T: +60379673728. E-mail: mario Ruiz@um.edu.my

Table 1. Comparison of Terms of Trade, Openness, and ESVM-Index (λ)

Concept	Measures	Function	Advantage	Disadvantage
Terms of Trade -ToT-	X Price/M Price X = Export Index Price M = Import Index Price	To study the relationship between exports price ratio and imports price ratio to find the deteriorating terms of trade among countries	Permits the visualization of the relationship between various international prices in the international market	Difficult to be applied to many countries and goods simultaneously
Openness -Oi-	TV/GDP x 100% TV = X+M	To measure the level of trade liberalization and the orientation of trade policy	Gives a general idea about how open an economy is in its international trade	It is focused to study how open is an economy from the specific trade point of view
The External Sector Vulnerability Monitoring Index (λ)	$\lambda = \epsilon_t / \sigma'$	To measure the level of trade liberalization and investment mobility simultaneously	Observes the trends of the external sector from international trade and finance sector from both perspectives of international trade and finance simultaneously	Difficult to monitoring the FDI mobility in the short term

Source: Adapted from “External Sector Development Index,” by M. A. Ruiz Estrada 2011a, *International Journal of China Studies*, 2(1), 55-70.

Edwards (1997), in a landmark paper titled “Trade Policy, Growth and Income Distribution”, applied trade policy indices such as (i) Deviation from Actual Trade Shares; (ii) Trade Liberalization Index; (iii) Sachs and Warner Openness Index; (iv) QR; (v) deviation of the black market rate; (vi) black market exchange rate premium; (vii) the real exchange distortions and variation; (viii) the coefficient of Gini to prove the link between openness and income distribution. Edwards concluded that there was no evidence linking openness or income per capita increases in inequality.

However, we are interested in presenting a new indicator of analysis that is oriented to monitoring the behavior of the external sector of any country or region with a new perspective. The proposed index in this research is positioned to improve on the limitations of the indicators discussed in the literature review in

this research paper. The ESVM-Index (λ) is a single indicator that uses multidimensional graphs. This new measurement of the external sector vulnerability can show the trend and stages of any country or region external sector. The main aim of ESVM-Index (λ) is to offer policy makers and researchers with a new alternative analytical tool to monitor the behavioral aspect of the external sector of any country from a holistic perspective. At the same time, this new indicator can generate alternative policies to improving the external sector performance of any country or region (Ruiz Estrada, 2011b).

The ESVM-Index (λ) has four objectives. The first objective is to measure the vulnerability of the external sector of any country. The second objective is to evaluate the external sector performance. The third goal is to analyze the relationship between the external sec-

tor leading (ϵ_i) and the GDP marginal rate (σ). The fourth objective is to evaluate the external sector cycle based on the table of possible combinations between (ϵ_i) and (σ). The ESVM-Surface is strongly affiliated with ESVM-Index (λ) results. The difference between these two indices is that in the measurement of ESVM-Index (λ) replaces absolute values by the first partial derivative. These first partial derivatives are the trade volume marginal rate (α'), the foreign direct investment marginal rate (β'), and the GDP marginal rate (σ'). The ESVM-Index (λ) analysis will also introduce a new variable called “the external sector main variable (ϵ_i).” The ϵ_i is equal to the trade volume marginal rate (α') plus the foreign direct investment marginal rate (β') (see Diagram 1).

The next objective discusses the relationship between ESVM-Index (λ) and (σ), while the last one claims the evaluation of the ESVM-Index cycle based on the table of possible combinations between ESVM-Index (λ) and (σ). Even though the three indicators (ToT, Oi, and ESVM-Index (λ)) have a different focus of analysis, they still share evaluation of the external sector as a mutual objective (see Table 1). The external sector vulnerability monitoring index (ESVM-Index) is an alternative tool for studying the trend of external sector in any country or region. The ESVM-Index (λ) is directly linked to the openness index. The difference between these two indices is that the ESVM-Index (λ) involves the foreign direct investment marginal rate (β') in its analysis, while the openness index does not. This research paper considers (β') as an import item in any country. In the measurement of ESVM-Index, the three primary annual growth rates are the trade volume marginal rate (α'), the foreign direct investment marginal rate (β'), and the GDP marginal rate (σ'). The simultaneous application of these three marginal rates help us visualize the trend of the external sector in any country or region.

2. The External Sector Vulnerability Monitoring Index (λ)

The objective of this indicator, titled as “The External Sector Vulnerability Monitoring Index” (henceforth ESVM) (λ), is to offer policy-makers and researchers a new analytical tool to study the external sector trends and stages of any country from a global perspective. These three fundamental variables are (i) the trade vol-

ume marginal rate (α'); (ii) the foreign direct investment marginal rate (β'); and (iii) the GDP marginal rate (σ').

Two specific growth rates represent the external sector of the ESVM-Index (λ) are the trade volume marginal rate (α') and the foreign direct investment marginal rate (β'). In this part of our research, the trade volume is equal to the sum of exports flows (Ψ) plus imports flow (θ) in billions of US\$ per year. On the investment side, it is represented by the variation of the FDI annual growth rate between two years. The idea to include the foreign direct investment marginal rate (β') and the trade volume marginal rate (α') together into the study of the external sector is to create a more inclusive analysis of the sector. The computation of the ESVM-Index (λ) requires six steps detailed below (see Diagram 1).

Step-1: The Trade Volume Marginal Rate (α')

The trade volume marginal rate (α') is equal to the first derivative between the trade volume of a given year in billions of US\$ ($\Psi + \theta$)_{n+1} and the trade volume of the previous year in billions of US\$ ($\Psi + \theta$)_n.

$$\alpha' = \frac{\partial (\Psi + \theta)_{n+1}}{\partial (\Psi + \theta)_n} \quad (1)$$

Step-2: The Foreign Direct Investment Marginal Rate (β')

The Foreign Direct Investment Marginal Rate (β') is equal to the first derivative between the foreign direct investment volume of a given year in billions of US\$ (β)_{n+1} and the foreign direct investment of previous year in billions of US\$ (β)_n.

$$\beta' = \frac{\partial (\beta)_{n+1}}{\partial (\beta)_n} \quad (2)$$

Step-3: The GDP Marginal Rate (σ')

The GDP marginal rate (σ') is equal to the first derivative between the growth domestic product of a given year in billions of US\$ (σ)_{n+1} and the growth domestic product of the previous year in billions of US\$ (σ)_n.

$$\sigma' = \frac{\partial (\sigma)_{n+1}}{\partial (\sigma)_n} \quad (3)$$

Table 2. Possible combinations between α' and β' to Final ε_i Results

$\Delta FDI/\Delta T$	$+\alpha'$	$-\alpha'$	$\alpha' = 0$
$+\beta'$	$\alpha' + \beta' = \varepsilon_{i+}$ Good	$\blacktriangle(-\alpha') + \blacktriangledown\beta' = \varepsilon_{i-}$ Poor $\blacktriangledown(-\alpha') + \blacktriangle\beta' = \varepsilon_{i+}$ Good	$0 + (\beta') = \varepsilon_{i+}$ Good
$-\beta'$	$\blacktriangle\alpha' + \blacktriangledown(-\beta') = \varepsilon_{i+}$ Good $\blacktriangledown\alpha' + \blacktriangle(-\beta') = \varepsilon_{i-}$ Poor	$\blacktriangle(-\alpha') + \blacktriangledown(-\beta') = \varepsilon_{i-}$ Poor $\blacktriangledown(-\alpha') + \blacktriangle(-\beta') = \varepsilon_{i-}$ Poor	$0 + (-\beta') = \varepsilon_{i-}$ Poor
$\beta' = 0$	$\alpha' + 0 = \varepsilon_{i+}$ Good	$-\alpha' + 0 = \varepsilon_{i-}$ Poor	$0 + 0 = \varepsilon_i = 0$ Null

\blacktriangle = Higher \blacktriangledown = Lower β' = The Foreign Direct Investment Marginal Rate (β')
 σ' = The Trade Volume Marginal Rate (-) = Negative and (+) = Positive
 ε_i = External Sector Main Variable 0 = Zero
Source: Adapted from “External Sector Development Index,” by M. A. Ruiz Estrada 2011a, *International Journal of China Studies*, 2(1), 55-70.

Step-4: The External Sector Main Variable (ε_i)
The external sector main variable (ε_i) is equal to the sum of trade volume annual growth rate (α') and foreign direct investment annual growth rate (β') (see Table 2).

$$\varepsilon_i = \alpha' + \beta'$$

(4)

If any value is located in ε_{i+} then this value can get the category of good performance in the external sector. If any value is located into ε_{i-} then this value can get the category of poor external sector performance. Finally, if $\varepsilon_i = 0$ then this value can get the category of null.

Step-5: The External Sector Vulnerability Monitoring Index (λ)
The External Sector Vulnerability Monitoring Index (λ) is equal to the external sector main variable (ε_i) divided by the GDP annual growth rate (σ')

$$\lambda = \frac{\varepsilon_i}{\sigma'}$$

(5)

The results from the external sector vulnerability monitoring index (λ) is evaluated according to these parameters:

High Vulnerability
If ε_i and σ' are in the range $(+\varepsilon_i/\sigma')$ or $(-\varepsilon_i/-\sigma')$, then the (λ) can be classified into the category of high vulnerability (see Table 3). Within the high vulnerability range, the ε_i and σ' are moving in the different directions. This category may display a strong link between (ε_i) and (σ').

Null Vulnerability
If (ε_i) and (σ') are located into these parameters such as $(0/0)$, $(0/+ \sigma')$, $(0/- \sigma')$, $(-\varepsilon_i/0)$, $(+\varepsilon_i/0)$ then the (λ) can be classified into the category of null vulnerability (see Table 3). The category of null vulnerability can show how (ε_i) is equal to 0 and grow faster than the (σ'). This result will show how the external sector depends on the world trade trend, but it cannot be affected positively or negatively on the (σ').

Lower Vulnerability
If (ε_i) and (σ') are in the following range $(-\varepsilon_i/\sigma')$ or $(+\varepsilon_i/-\sigma')$ then the (λ) can be classified into the category

Table 3. ESVM-Index (λ) Cycles Level Table

σ' / ϵ_i	$+\sigma'$	$-\sigma'$	$\sigma'=0$
$+\epsilon_i$	Level-1.1 Higher Vulnerability $+\epsilon_i / +\sigma'$	Level-1.2 Lower Vulnerability $+\epsilon_i / -\sigma'$	Level-1.3 Null $+\epsilon_i / 0$
$-\epsilon_i$	Level-2.1 Lower Vulnerability $-\epsilon_i / +\sigma'$	Level-2.2 Higher Vulnerability $-\epsilon_i / -\sigma'$	Level-2.3 Null $-\epsilon_i / 0$
$\epsilon_i=0$	Level-3.1 Null $0 / +\sigma'$	Level-3.2 Null $0 / -\sigma'$	Level-3.3 Null $0 / 0$

Variables: \blacktriangle = High \blacktriangledown = Low σ' = GDP annual growth rate

ϵ_i = External Sector Main Variable (-) = Negative and (+) = Positive 0 = Zero

Source: Adapted from "External Sector Development Index," by M. A. Ruiz Estrada 2011a, *International Journal of China Studies*, 2(1), 55-70.

of lower vulnerability (see Table 3). The category of lower vulnerability can show how (ϵ_i) growth is lower or higher than the (σ'). This result will clearly show that the external sector is not the main key factor to affect the (σ') of any country.

Step-6: The External Sector Vulnerability Monitoring Surface (λ -Surface)

The construction of the external sector vulnerability monitoring surface (λ -Surface) is using the (λ) results and the mega-surface coordinate space (see Expression 6 below). The (λ) is a three-by-three matrix that contains the individual results of all nine variables (taken from Table 3). However, the nine variables are plotted onto a three-by-three array with the vertical value on the (λ) (see Figure 1). The intent is to produce a surface for a quick pictorial representation of the overall propensities for any one country external sector behavior. The main idea here is to use the results of nine variables in the (λ) to build a symmetric surface. When the λ -surface-coordinate-system (η) has strictly the same number of rows as the

number of columns, then the ESVM-Index rates can always be perfectly symmetric.

$$\eta = \begin{pmatrix} \lambda_1 & \lambda_2 & \lambda_3 \\ \lambda_4 & \lambda_5 & \lambda_6 \\ \lambda_7 & \lambda_8 & \lambda_9 \end{pmatrix} \quad (6)$$

The final analysis of the λ -Surface depends on any changes that the surface can experience in a fixed period. The evaluation of the λ -Surface is classified in two distinct levels of vulnerability (see Table 3): (i) Level 1: High vulnerability: ($+\lambda$); Level 2: Low vulnerability: ($-\lambda$).

3. The External Sector Vulnerability Monitoring Index (λ)

The ESVM-Index (λ) analyzed the ASEAN-5's (Indonesia, Malaysia, Philippines, Singapore, Thailand) and China's external sector performance and vulnerability between 2005 and 2015. The reason for applying the ESVM-Index (λ) is to observe the performance and vulnerability of the external sector of any country or

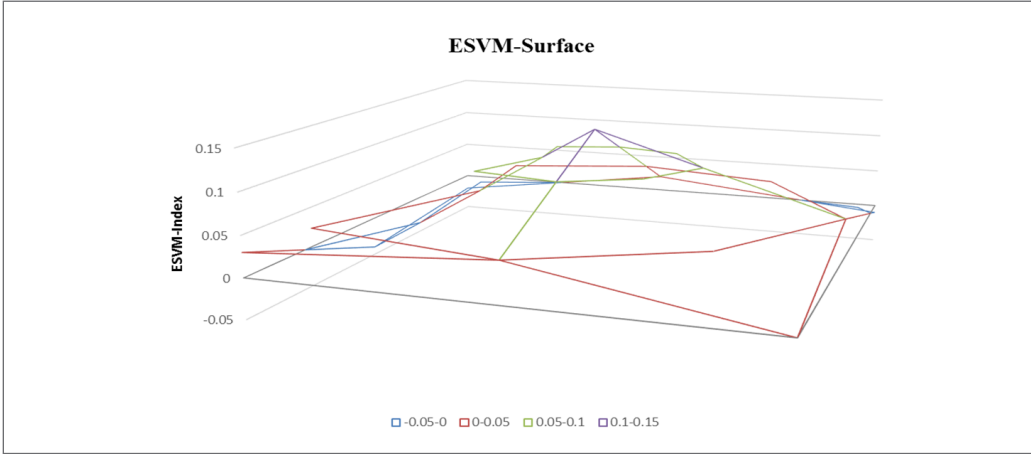


Figure 1. λ -Surface

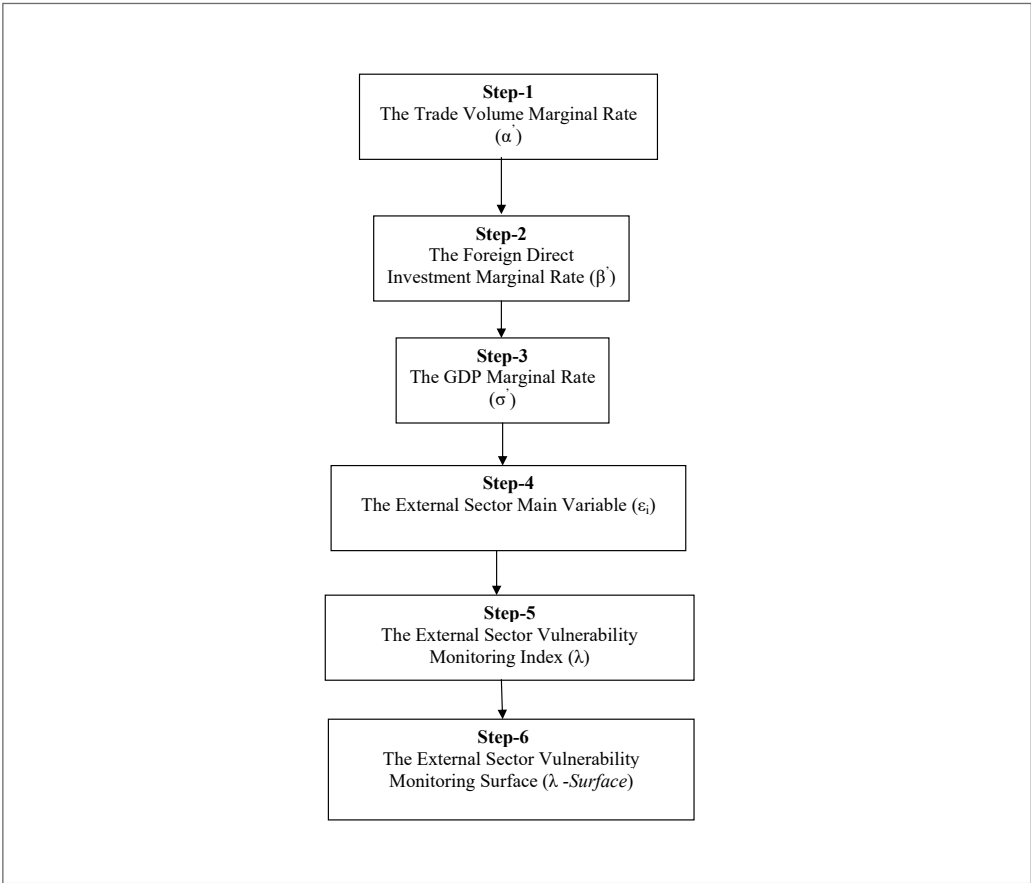


Diagram 1. Procedure to Measure the Si-Index

region. The objective in applying ESVM-Index (λ) is to see the effect of trade and investment growth on the (σ). The reason to incorporate (β) together with (α) is to analyze how both variables can be affected by possible broad international trade or financial crisis. Specifically, the ESVM-Index (λ) is applied to the ASEAN-5 members as well as China to observe the effect of the 2008 financial crisis. The main reason for using ASEAN-5 (five members or five original members) and China is because of missing or inconsistent data from other ASEAN members such as Vietnam, Cambodia, Myanmar, Brunei, and Laos.

The application of the ESVM-Index (λ) to the selected countries in this study shows that the countries most affected by the 2008 financial crisis were the Philippines $\lambda_{2008} = -0.08$ (See Table 8), Singapore $\lambda_{2008} = -0.18$ (See Table 5), Thailand $\lambda_{2008} = -0.16$ (See Table 7), Malaysia $\lambda_{2008} = 0.10$ (See Table 6), Indonesia $\lambda_{2008} = -0.18$ (See Table 4) and China $\lambda_{2008} = 0.00$ (See Table 9).

In the case of China (2008), it was affected by the financial crisis but not at the same level as ASEAN-5 members. The results show high dependency of ASEAN-5 members to the external sector. The results also point to China's vulnerability to global fiscal crisis and business cycles. In the period of 2005-2015, we can show that the foreign sector of ASEAN-5 members and China illustrated an acceptable external sector performance, but two ASEAN-5 members displayed irregularities in their external sector behavior between 2008 and 2015. These countries are the Philippines (low participation of the external sector in world trade) and Singapore (high exposure of the foreign sector in world trade). From a comparative stance, China's external sector outperformed ASEAN-5 members between 2005-2015.

Next, we discuss how (ϵ) and (σ) are correlated. Our analysis in China ($r^2 = 0.78$), Malaysia ($r^2 = 0.57$) and Indonesia ($r^2 = 0.52$) indicated there exists a strong correlation between (ϵ) and (σ), while Singapore ($r^2 = 0.95$), Thailand ($r^2 = 0.83$) and Philippines ($r^2 = 0.89$) displayed a higher correlation. Correlation results show that China and ASEAN-5 economies are highly dependent on external sector performance on (α) and (β) together. Singapore's external sector is classified as a high vulnerable category, mainly due to a higher trade volume and FDI from the U.S.

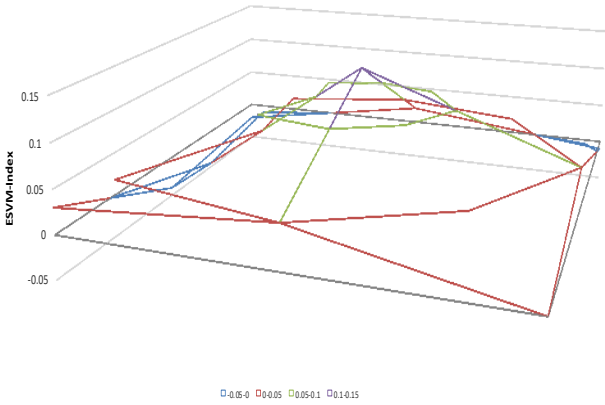
An analysis of Malaysia (less correlation) indicated normal vulnerability, mainly due to different proportions of growth between (α) and (β). The analysis of the Philippines and Thailand showed low correlation between (ϵ) and (σ), which points to the low vulnerability of their external sectors, where (α) and (β) are slow and small compared to Singapore, China, Malaysia, and Indonesia.

Considering ASEAN-5 and China, ESVM-Index (λ) cycles between 2005 and 2015 (10 years) indicate the following results: Thailand showed the poorest performance in Level-1.1 (4 years), Level-2.1 (5 years) and Level-2.2. (1 year) according to Table 7. Among ASEAN-5 members, the ESVM-Index cycles showed that Indonesia had the worst outcome in Level-1.1 (6 years) and Level-2.1 (4 years) (See Table 4). On the other hand, Singapore showed fair behavior in its ESVM-Index (λ) cycle; Singapore had Level-1.1 (3 years), Level-2.2 (1 year), and Level-2.1 (6 years) (See Table 5), and Malaysia featured Level-1.1 (3 years), Level-2.1 (6 years) and Level-2.2. (1 year) (See Table 6). In the case of China, it was located in Level-1.1 (6 years) and Level-2.2 (4 years). The reason why China shows different results in the ESVM-Index (λ) cycles is due to high dependency on international markets, especially with the U.S. (See Table 9). In the case of the Philippines, which was located in Level-1.1 (4 years) and Level-2.2 (6 years) (See Table 8), their unique position was due to low participation of its external sector in the world economy. It has few export products with high value to international markets.

4. Concluding Remarks

This research paper has presented the External Sector Vulnerability Monitoring Index (λ). It is focused on diagnosing the external sector vulnerabilities of any country. With the application of the ESVM-Index (λ) to the study of trade liberalization and openness, it is possible to observe that (α) and (β) need to be joined into a single variable to explore the external sector of any country or region. The single variable is called the external sector leading variable (ϵ). Thus, the ESVM-Index (λ) can be used as an alternative index to study trade liberalization cycles. In our opinion, the ESVM-Index (λ) may be considered as a complementary analytical tool together with terms of trade (ToT) and the

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exports	95	107	122	146	125	167	213	211	205	199	205
Export Growth	0.00	0.13	0.14	0.20	-0.14	0.34	0.28	-0.01	-0.03	-0.03	0.03
Imports	86	87	101	136	104	145	199	213	211	202	210
Import Growth	0.00	0.01	0.16	0.35	-0.24	0.39	0.37	0.07	-0.01	-0.04	0.04
Total Trade	181	194	223	282	229	312	412	424	416	401	415
ΔT	0.00	0.07	0.15	0.26	-0.19	0.36	0.32	0.03	-0.02	-0.04	0.03
FDI	-5,271,257,208	2,188,448,467	-2,253,330,000	-3,418,723,399	-2,628,247,483	-11,106,333,135	-11,528,394,762	-13,716,225,988	-12,170,055,179	-15,502,233,989	#####
ΔFDI	0.00	-1.42	-2.03	0.52	-0.23	3.23	0.04	0.19	-0.11	0.27	0.10
ΔGDP	0	5.5	6.3	6	4.6	6.2	6.2	6	5.6	5	5.10
EI	0.00	-1.34	-1.88	0.78	-0.42	3.59	0.36	0.22	-0.13	0.24	0.13
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESVM-INDEX	0.00	-0.24	-0.30	0.13	-0.09	0.58	0.06	-0.04	-0.02	0.05	0.03
EI Performance	0	Poor	Poor	Good	Poor	Good	Good	Good	Poor	Good	Good
ESVM-Vulnerability	0	Lower	Lower	Higher	Lower	Higher	Higher	Higher	Lower	Higher	Higher
ESVM-LEVEL	0	L-2.1	L-2.1	L-1.1	L-2.1	L-1.1	L-1.1	L-1.1	L-2.1	L-1.1	L-1.1
T = ΔTRADE/ΔGDP	0.00	0.01	0.02	0.04	-0.04	0.06	0.05	0.00	0.00	-0.01	0.01
FDI = ΔFDI/ΔGDP	0.00	-0.26	-0.32	0.09	-0.05	0.52	0.01	0.03	-0.02	0.05	0.02
ESVM-index TEST	0.00	-0.24	-0.30	0.13	-0.09	0.58	0.06	0.04	-0.02	0.05	0.03

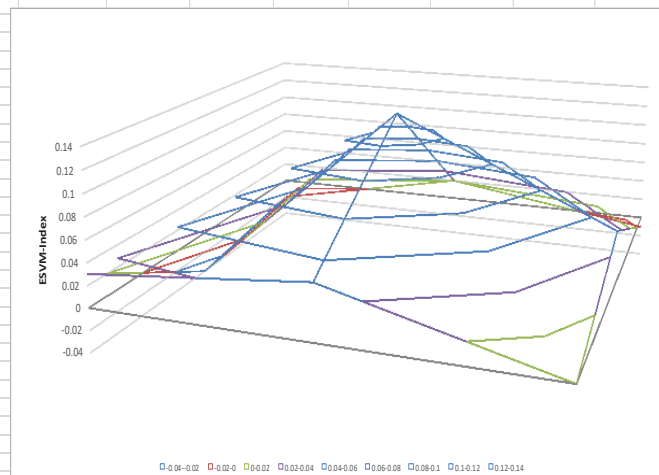


Source: World Development Indicators, World Bank
<http://data.worldbank.org/indicator/BX.GSR.GNFS.CD?page=2>
<http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>
<http://data.worldbank.org/indicator/BN.KLT.DINV.CD>
<http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

Table 4. Application of the trade terms, openness index and ESVM-index in Indonesia
Figure 2. ESVM-Surface of Indonesia (2006-2014)

Source: Adapted from “Annual report GDP Growth (Annual %)” by The World Bank (2015a). Retrieved from <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>; “Annual report Exports of Goods and Services (BoP Current Prices)” by The World Bank (2015b). Retrieved from <http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; “Annual report Imports of Goods and Services (BoP Current Prices)” by The World Bank (2016a). Retrieved from <https://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; “Foreign direct investment, net (BoP, current US\$)” by The World Bank (2016b). Retrieved from <http://data.worldbank.org/indicator/BN.KLT.DINV.CD>

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exports	286	340	386	443	369	471	554	567	579	578	590
Export Growth	0.00	0.19	0.14	0.15	-0.17	0.28	0.18	0.02	0.02	0.00	0.02
Imports	86	296	331	402	324	409	482	501	509	502	510
Import Growth	0.00	2.44	0.12	0.21	-0.19	0.26	0.18	0.04	0.02	-0.01	0.02
Total Trade	372	636	717	845	693	880	1,036	1,068	1,088	1,080	1,100
Trade Growth	0.00	0.71	0.13	0.18	-0.18	0.27	0.18	0.03	0.02	-0.01	0.02
FDI	-6,502,052,545	-18,285,978,015	-10,836,097,100	-5,395,159,595	2,417,713,597	-21,698,437,242	-23,511,978,991	-41,512,193,196	-35,979,301,526	-26,863,107,218	#####
FDI Growth	0.00	1.81	-0.41	-0.50	-1.45	-9.97	0.08	0.77	-0.13	-0.25	-0.90
GDP Growth	0	8.9	9.1	1.8	-0.6	15.2	6.2	3.4	4.4	2.9	3.10
ESI	0.00	2.52	-0.28	-0.32	-1.63	-9.70	0.26	0.80	-0.11	-0.26	-0.88
ESI	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESVM-INDEX	0.00	0.28	-0.03	-0.18	2.71	-0.64	0.04	0.23	-0.03	-0.09	-0.28
EI Performance	0	Good	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Poor
ESVM-Vulnerability	0	Higher	Lower	Lower	Higher	Lower	Higher	Higher	Lower	Lower	Lower
ESVM-LEVEL	0	L-1.1	L-2.1	L-2.1	L-2.2	L-2.1	L-1.1	L-1.1	L-2.1	L-2.1	L-2.1
T = $\Delta \text{TRADE} / \Delta \text{GDP}$	0.00	0.08	0.01	0.10	0.30	0.02	0.03	0.01	0.00	0.00	0.01
FDI = $\Delta \text{FDI} / \Delta \text{GDP}$	0.00	0.20	-0.04	-0.28	2.41	-0.66	0.01	0.23	-0.03	-0.09	-0.29
ESVM-Index TEST	0.00	0.28	-0.03	-0.18	2.71	-0.64	0.04	0.23	-0.03	-0.09	-0.28

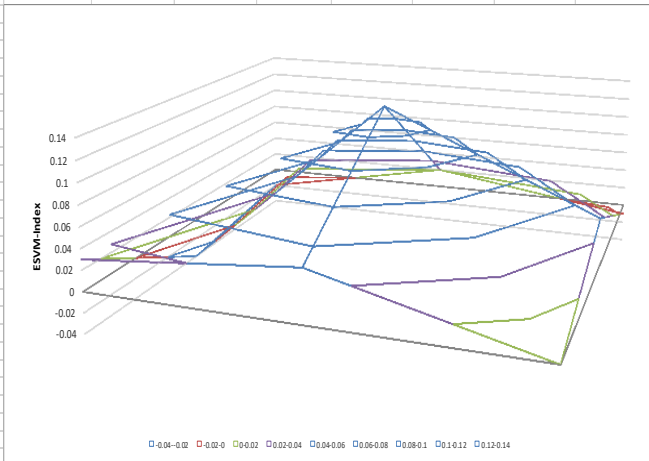


Source: World Development Indicators, World Bank

<http://data.worldbank.org/indicator/BX.GSR.GNFS.CD?page=2><http://data.worldbank.org/indicator/BM.GSR.GNFS.CD><http://data.worldbank.org/indicator/BN.KLT.DINV.CD><http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>**Table 5.** Application of the trade terms, openness index and ESVM-index in Singapore**Figure 3.** ESVM-Surface of Singapore (2006-2014)

Source: Adapted from "Annual report GDP Growth (Annual %)" by The World Bank (2015a). Retrieved from <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>; "Annual report Exports of Goods and Services (BoP Current Prices)" by The World Bank (2015b). Retrieved from <http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; "Annual report Imports of Goods and Services (BoP Current Prices)" by The World Bank (2016a). Retrieved from <https://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; "Foreign direct investment, net (BoP, current US\$)" by The World Bank (2016b). Retrieved from <http://data.worldbank.org/indicator/BN.KLT.DINV.CD>

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exports	161	183	206	230	186	231	265	266	259	250	238
Export Growth	0.00	0.14	0.13	0.12	-0.19	0.24	0.15	0.00	-0.03	-0.03	-0.05
Imports	131	147	167	179	145	189	217	229	231	240	223
Import Growth	0.00	0.12	0.14	0.07	-0.19	0.30	0.15	0.06	0.01	0.04	-0.07
Total Trade	292	330	373	409	331	420	482	495	490	490	461
Trade Growth	0.00	0.13	0.13	0.10	-0.19	0.27	0.15	0.03	-0.01	0.00	-0.06
FDI	-953,682,960	-53,139,541	2,744,191,223	7,827,500,376	6,626,128,852	4,464,001,483	2,989,026,889	7,147,825,588	1,416,056,518	6,626,128,852	#####
FDI Growth	0.00	-0.95	-52.64	1.85	-0.15	-0.33	-0.33	1.39	-0.80	3.68	-0.33
GDP Growth	5.3	5.6	6.3	4.8	-1.5	7.4	5.3	5.5	4.7	6	5.00
ESi	0.00	-0.82	-52.51	1.95	-0.34	-0.06	-0.18	1.42	-0.81	3.68	-0.39
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESVM-INDEX	0.00	-0.15	-8.34	0.41	0.23	-0.01	-0.03	0.26	-0.17	0.61	-0.08
Ei Performance	0	Poor	Poor	Good	Poor	Poor	Poor	Good	Poor	Good	Poor
ESVM-Vulnerability	0	Lower	Lower	Higher	Higher	Lower	Lower	Higher	Lower	Higher	Lower
ESVM-LEVEL	0	L-2.1	L-2.1	L-1.1	L-2.2	L-2.1	L-2.1	L-1.1	L-2.1	L-1.1	L-2.1
T = ΔTRADE/ΔGDP	0.00	0.02	0.02	0.02	0.13	0.04	0.03	0.00	0.00	0.00	-0.01
FDI = ΔFDI/ΔGDP	0.00	-0.17	-8.36	0.39	0.10	-0.04	-0.06	0.25	-0.17	0.61	-0.07
ESVM-Index TEST	0.00	-0.15	-8.34	0.41	0.23	-0.01	-0.03	0.26	-0.17	0.61	-0.08

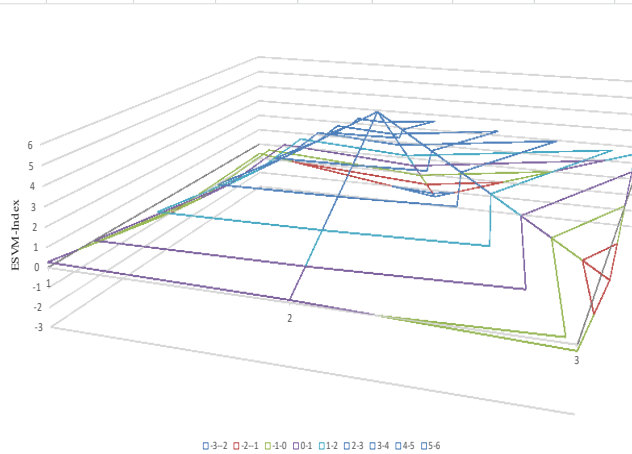


Source: World Development Indicators, World Bank
<http://data.worldbank.org/indicator/BX.GSR.GNFS.CD?page=2>
<http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>
<http://data.worldbank.org/indicator/BN.KLT.DINV.CD>
<http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

Table 6. Application of the trade terms, openness index and ESVM-index in Malaysia
Figure 4. ESVM-Surface of Malaysia (2006-2014)

Source: Adapted from “Annual report GDP Growth (Annual %)” by The World Bank (2015a). Retrieved from <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>; “Annual report Exports of Goods and Services (BoP Current Prices)” by The World Bank (2015b). Retrieved from <http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; “Annual report Imports of Goods and Services (BoP Current Prices)” by The World Bank (2016a). Retrieved from <https://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; “Foreign direct investment, net (BoP, current US\$)” by The World Bank (2016b). Retrieved from <http://data.worldbank.org/indicator/BN.KLT.DINV.CD>

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exports	129	153	181	208	181	226	260	275	284	280	268
Export Growth	0.00	0.19	0.18	0.15	-0.13	0.25	0.15	0.06	0.03	-0.01	-0.04
Imports	133	147	163	204	155	207	254	272	274	253	248
Import Growth	0.00	0.11	0.11	0.25	-0.24	0.34	0.23	0.07	0.01	-0.08	-0.02
Total Trade	262	300	344	412	336	433	514	547	558	533	516
Trade Growth	0.00	0.15	0.15	0.20	-0.18	0.29	0.19	0.06	0.02	-0.04	-0.03
FDI	-7,554,132,823	-8,480,341,310	-8,312,493,362	-4,445,056,066	-683,125,957	-4,487,865,221	4,729,978,070	1,327,896,204	-1,901,956,499	-4,973,347,772	#####
FDI Growth	0.00	0.12	-0.02	-0.47	-0.85	5.57	-2.05	-0.72	-2.43	1.61	-0.40
GDP Growth	4.2	5	5.4	1.7	-0.7	7.5	0.8	7.3	2.8	0.9	1.10
ESI	0.00	0.27	0.13	-0.27	-1.03	5.86	-1.87	-0.66	-2.41	1.57	-0.43
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESVM-INDEX	0.00	0.05	0.02	-0.16	1.47	0.78	-2.33	-0.09	-0.86	1.74	-0.39
E Performance	0	Good	Good	Poor	Poor	Good	Poor	Poor	Poor	Good	Poor
ESVM-Vulnerability	0	Higher	Higher	Lower	Higher	Higher	Lower	Lower	Lower	Higher	Lower
ESVM-LEVEL	0	L1.1	L1.1	L2.1	L2.2	L1.1	L2.1	L2.1	L2.1	L1.1	L2.1
T = ATRADE/GDP	0.00	0.03	0.03	0.12	0.26	0.04	0.23	0.01	0.01	-0.05	-0.03
FDI = AFDI/GDP	0.00	0.02	0.00	-0.27	1.21	0.74	-2.57	-0.10	-0.87	1.79	-0.36
ESVM-index TEST	0.00	0.05	0.02	-0.16	1.47	0.78	-2.33	-0.09	-0.86	1.74	-0.39

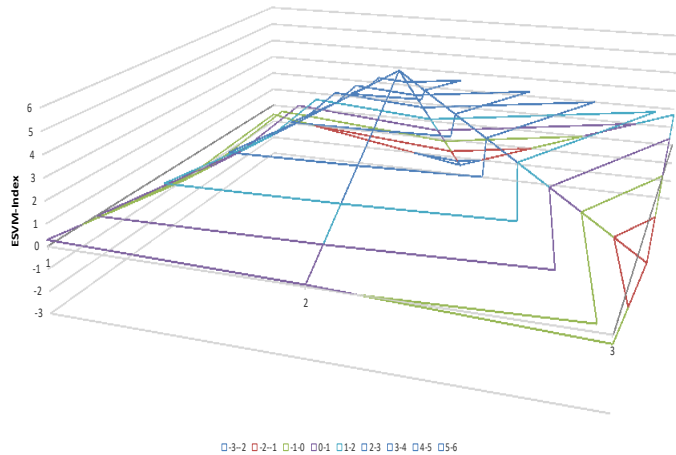


Source: World Development Indicators, World Bank

<http://data.worldbank.org/indicator/BX.GSR.GNFS.CD?page=2><http://data.worldbank.org/indicator/BM.GSR.GNFS.CD><http://data.worldbank.org/indicator/BN.KLT.DINV.CD><http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>**Table 7.** Application of the trade terms, openness index and ESVM-index in Thailand**Figure 5.** ESVM-Surface of Thailand (2006-2014)

Source: Adapted from "Annual report GDP Growth (Annual %)" by The World Bank (2015a). Retrieved from <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>; "Annual report Exports of Goods and Services (BoP Current Prices)" by The World Bank (2015b). Retrieved from <http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; "Annual report Imports of Goods and Services (BoP Current Prices)" by The World Bank (2016a). Retrieved from <https://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; "Foreign direct investment, net (BoP, current US\$)" by The World Bank (2016b). Retrieved from <http://data.worldbank.org/indicator/BN.KLT.DINV.CD>

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exports	34	42	46	48	43	55	57	67	68	73	70
Export Growth	0.00	0.24	0.10	0.04	-0.10	0.28	0.04	0.18	0.01	0.07	-0.04
Imports	44	49	54	64	52	66	71	80	78	84	91
Import Growth	0.00	0.11	0.10	0.19	-0.19	0.27	0.08	0.13	-0.03	0.08	0.08
Total Trade	78	91	100	112	95	121	128	147	146	157	161
Trade Growth	0.00	0.17	0.10	0.12	-0.15	0.27	0.06	0.15	-0.01	0.08	0.03
FDI	-7,554,132,823	-8,480,341,310	-8,312,493,362	-4,445,056,066	-683,125,957	-4,487,865,221	4,729,978,070	1,327,896,204	-1,901,956,499	-4,973,347,772	#####
FDI Growth	0.00	0.12	-0.02	-0.47	-0.85	5.57	-2.05	-0.72	-2.43	1.61	-0.40
GDP Growth	4.8	5.2	6.6	4.2	1.1	7.6	3.7	6.7	7.1	6.1	6.50
ESI	0.00	0.29	0.08	-0.35	-1.00	5.84	-2.00	-0.57	-2.44	1.69	-0.37
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESVM-INDEX	0.00	0.06	0.01	-0.08	-0.91	0.77	-0.54	-0.09	-0.34	0.28	-0.06
B Performance	0	Good	Good	Poor	Poor	Good	Poor	Poor	Poor	Good	Poor
ESVM-Vulnerability	0	Higher	Higher	Lower	Lower	Higher	Lower	Lower	Lower	Higher	Lower
ESVM-LEVEL	0	L1.1	L1.1	L2.1	L2.1	L1.1	L2.1	L2.1	L2.2	L1.1	L2.1
T = ΔTRADEΔGDP	0.00	0.03	0.01	0.03	-0.14	0.04	0.02	0.02	0.00	0.01	0.00
FDI = ΔFDIΔGDP	0.00	0.02	0.00	-0.11	-0.77	0.73	-0.56	-0.11	-0.34	0.26	-0.06
ESVM-Index TEST	0.00	0.06	0.01	-0.08	-0.91	0.77	-0.54	-0.09	-0.34	0.28	-0.06

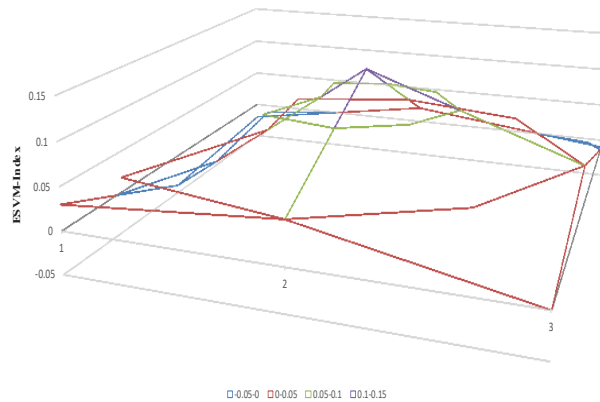


Source: World Development Indicators, World Bank
<http://data.worldbank.org/indicator/BX.GSR.GNFS.CD?page=2>
<http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>
<http://data.worldbank.org/indicator/BN.KLT.DINV.CD>
<http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

Table 8. Application of the trade terms, openness index and ESVM-index in Philippines
Figure 6. ESVM-Surface of Philippines (2006-2014)

Source: Adapted from “Annual report GDP Growth (Annual %)” by The World Bank (2015a). Retrieved from <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>; “Annual report Exports of Goods and Services (BoP Current Prices)” by The World Bank (2015b). Retrieved from <http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; “Annual report Imports of Goods and Services (BoP Current Prices)” by The World Bank (2016a). Retrieved from <https://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; “Foreign direct investment, net (BoP, current US\$)” by The World Bank (2016b). Retrieved from <http://data.worldbank.org/indicator/BN.KLT.DINV.CD>

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Exports	770	973	1,256	1,494	1,260	1,648	1,991	2,188	2,363	2,450	2,189
Export Growth	0.00	0.26	0.29	0.19	-0.16	0.31	0.21	0.10	0.08	0.04	-0.11
Imports	646	765	947	1,145	1,040	1,425	1,809	1,956	2,127	2,223	2,135
Import Growth	0.00	0.18	0.24	0.21	-0.09	0.37	0.27	0.08	0.09	0.05	-0.04
Total Trade	1,416	1,738	2,203	2,639	2,300	3,073	3,800	4,144	4,490	4,673	4,324
Trade Growth	0.00	0.23	0.27	0.20	-0.13	0.34	0.24	0.09	0.08	0.04	-0.07
FDI	-90,379,127,564	-100,150,000,000	-139,095,000,000	-114,792,000,000	-87,167,067,370	-185,750,000,000	-231,652,000,000	-176,250,000,000	-184,972,000,000	-170,000,000,000	#####
FDI Growth	0.00	0.11	0.39	-0.17	-0.24	1.13	0.25	-0.24	0.05	-0.08	0.05
GDP Growth	11.4	12.7	14.2	9.6	9.2	10.6	9.5	7.8	7.7	7.3	6.90
ESI	0.00	0.34	0.66	0.02	-0.37	1.47	0.48	-0.15	0.13	-0.04	-0.03
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESVM-INDEX	0.00	0.03	0.05	0.00	-0.04	0.14	0.05	-0.02	0.02	-0.01	0.00
E Performance	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Weak	Weak	Acceptable	Acceptable
ESVM-Vulnerability	0	Higher	Higher	Higher	Lower	Higher	Higher	Lower	Higher	Lower	Lower
ESVM-LEVEL	0	L1.1	L1.1	L1.1	L2.1	L1.1	L1.1	L2.1	L1.1	L2.1	L2.1
T = ΔTRADE/GDP	0.00	0.02	0.02	0.02	-0.01	0.03	0.02	0.01	0.01	0.01	-0.01
FDI = ΔFDI/GDP	0.00	0.01	0.03	-0.02	-0.03	0.11	0.03	-0.03	0.01	-0.01	0.01
ESVM-Index TEST	0.00	0.03	0.05	0.00	-0.04	0.14	0.05	-0.02	0.02	-0.01	0.00



Source: World Development Indicators, World Bank
<http://data.worldbank.org/indicator/BX.GSR.GNFS.CD?page=2>
<http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>
<http://data.worldbank.org/indicator/BN.KLT.DINV.CD>
<http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

Table 9. Application of the trade terms, openness index and ESVM-index in China

Figure 7. ESVM-Surface of China (2006-2014)

Source: Adapted from “Annual report GDP Growth (Annual %)” by The World Bank (2015a). Retrieved from <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>; “Annual report Exports of Goods and Services (BoP Current Prices)” by The World Bank (2015b). Retrieved from <http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; “Annual report Imports of Goods and Services (BoP Current Prices)” by The World Bank (2016a). Retrieved from <https://data.worldbank.org/indicator/BM.GSR.GNFS.CD>; “Foreign direct investment, net (BoP, current US\$)” by The World Bank (2016b). Retrieved from <http://data.worldbank.org/indicator/BN.KLT.DINV.CD>

openness index (Oi). Additionally, the ESVM-Index (λ) offers a new type of graph to observe the index ESVM-Surface (λ -Surface). The ESVM-Index (λ) provides an opportunity for policy makers and researchers on international trade issues to observe and analyze the trends and stages of the external sector in any country from a new perspective.

References

- Anderson, J. & Neary, J. P. (1992). Trade reform with quotas, partial rent retention, and tariffs. *Econometrica: Journal of the Econometric Society*, 60(1), 57-76. <https://doi.org/10.2307/2951676>
- Anderson, J., & Neary, P. (1994). Measuring the restrictiveness of trade policy. *The World Bank Economic Review*, 8(2), 151-169. <https://doi.org/10.1093/wber/8.2.151>
- Anderson, J., & Neary, P. (1996). A new approach to evaluating trade policy. *The Review of Economic Studies*, 63(1), 107-125. <https://doi.org/10.2307/2298117>
- Anderson, J., & Neary, P. (2003). The Mercantilist index of trade policy. *International Economic Review*, 44(2), 627-649. <https://doi.org/10.1111/1468-2354.t01-1-00083>
- Anderson, J., & Neary, P. (2007). Welfare versus market access: the implications of tariff structure for tariff reform. *Journal of International Economics*, 71(1), 187-205. <https://doi.org/10.1016/j.jinteco.2006.02.004>
- Balassa, B. (1985). Exports, policy choices, and economic growth in developing countries after the 1973 oil shock. *Journal of development economics*, 18(1), 23-35. [https://doi.org/10.1016/0304-3878\(85\)90004-5](https://doi.org/10.1016/0304-3878(85)90004-5)
- Barro, R. (1991). Economic growth in a cross section of countries. *The Quarterly Journal of Economics*, 106(2), 407-443. <https://doi.org/10.2307/2937943>
- Dollar, D. (1992). Outward-oriented developing economies really do grow more rapidly: evidence from 95 LDCs, 1976-1985. *Economic development and cultural change*, 40(3), 523-544. <https://www.jstor.org/stable/1154574>
- Edwards, S. (1993). Openness, trade liberalization, and growth in developing countries. *Journal of Economic Literature*, 31(3), 1358-1393. <https://www.jstor.org/stable/2728244>
- Edwards, S. (1997). Trade policy, growth, and income distribution. *The American Economic Review*, 87(2), 205-210. <https://www.jstor.org/stable/2950881>
- Edwards, S. (1998). Openness, productivity and growth: what do we really know? *The economic Journal*, 108(447), 383-398. <https://doi.org/10.1111/1468-0297.00293>
- Harrison, A. (1996). Openness and growth: A time-series, cross-country analysis for developing countries. *Journal of Development Economics*, 48(2), 419-447. [https://doi.org/10.1016/0304-3878\(95\)00042-9](https://doi.org/10.1016/0304-3878(95)00042-9)
- Lopez, R. (1991). Economic growth, capital accumulation and trade policy in LDCs. *Trade Policy Division, Country Economics Department, WPS 625*. Retrieved from <http://documents.worldbank.org/curated/en/256911468766773672/pdf/multi0page.pdf>
- Ruiz Estrada, M. A. (2011a). External Sector Development Index. *International Journal of China Studies*, 2(1), 55-70. Available at <https://ssrn.com/abstract=2572041>
- Ruiz Estrada, M. A. (2011b). Policy Modeling: Definition, Classification, and Evaluation. *Journal of Policy Modelling* 33(4), 523-536. <https://doi.org/10.1016/j.jpolmod.2011.02.003>
- Sachs, J. D., Warner, A., Åslund, A., & Fischer, S. (1995). Economic Reforms and the Process of Global Integration. *Brookings papers on economic activity*, 1995(1), 1-118. <https://doi.org/10.2307/2534573>
- The World Bank. (2015a). Annual report GDP Growth (Annual %). Retrieved from <http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>
- The World Bank. (2015b). Annual report Exports of Goods and Services (BoP Current Prices). Retrieved from <http://data.worldbank.org/indicator/BM.GSR.GNFS.CD>
- The World Bank. (2016a). Annual report Imports of Goods and Services (BoP Current Prices). Retrieved from <https://data.worldbank.org/indicator/BM.GSR.GNFS.CD>
- The World Bank. (2016b). Foreign direct investment, net (BoP, current US\$). Retrieved from <http://data.worldbank.org/indicator/BN.KLT.DINV.CD>

Endnotes

¹ $ToT = IP_x / IP_m \times 100\%$

² $O_i = X + M / GDP \times 100\%$