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REVISITING THE EXPORT-LED GROWTH HYPOTHESIS USING ARDL APPROACH: EMPIRICAL EVIDENCE FROM KAZAKHSTAN

The export-led growth (ELG) hypothesis believes that the economy's growth is determined by the growth of the labour force and capital formation and its export growth. According to neo-classical, ELG are essential for both developed and developing countries. It promotes economies of scale, increases labour productivity, availability of quality goods and services, increases employment opportunities, increases economic efficiencies, and increases economic growth. The effect of exports is determined through a neoclassical production function, examining exports' role after controlling the labour force and capital formation. The analysis is based ARDL model on testing for the short-run and long-run effects of independent variables. The long-run coefficient of exports is 0.38, while the short-run coefficient is 0.28 and statistically significant. Therefore, exports impact positively on G.D.P. per capita in both the short-run and long-run. Also, the coefficient of error correction term (E.C.M.) is negative and statistically significant, showing the speed of adjustment towards equilibrium from short-run to long-run. Therefore, Kazakhstan's government should increase exports that can increase the G.D.P. per capita better.

Key words: ARDL, exports, economic growth, Kazakhstan, capital formation.

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ARDL тәсілін қолдана отырып экспорттың өсу гипотезасын қайта қарау: Қазақстанның эмпирикалық дәлелдері

Экспортқа негізделген өсу (ELG) гипотезасы экономиканың өсуі жұмыс күші мен капиталдың өсуімен және оның экспорттық өсуімен анықталады деп санайды. Нео-классикалық көзқарас бойынша ELG дамыған және дамушы елдер үшін өте қажет. Ол ауқымды үнемдеуге ықпал етеді, еңбек өнімділігін, сапалы тауарлар мен қызметтердің қол жетімділігін арттырады, жұмыспен қамту мүмкіндіктерін арттырады, экономикалық тиімділікті арттырады, демек, экономикалық өсімді арттырады. Экспорттың әсері неоклассикалық өндіріс функциясы арқылы анықталады, бұл жұмыс күші мен капиталды қалыптастыруды бақылаудан кейінгі экспорттың рөлін зерттейді. Талдау тәуелсіз айнымалылардың қысқа мерзімді және ұзақ мерзімді әсерін тексеруге негізделген ARDL моделіне негізделген. Экспорттың ұзақ мерзімді коэффициенті 0,38 құрайды, ал қысқа мерзімді коэффициент 0,28 және статистикалық маңызды. Сондықтан экспорт G.D.P.-ге оң әсер етеді. жан басына шаққанда қысқа мерзімді де, ұзақ мерзімді де. Сондай-ақ, қателіктерді түзету коэффициенті (E.C.M.) теріс және статистикалық тұрғыдан маңызды, тепе-теңдікке бейімделу жылдамдығын қысқа мерзімдіден ұзақ мерзімдіге дейін көрсетеді. Сондықтан, Қазақстан үкіметі экспорттың өсуіне назар аударуы керек, бұл G.D.P. жан басына шаққанда оте жақсы.

Түйін сөздер: ARDL, экспорт, экономикалық даму, Қазақстан, капиталды қалыптастыру

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Пересмотр гипотезы роста экспорта с использованием ARDL-подхода: эмпирические доказательства по Казахстану

Гипотеза роста за счет экспорта (ELG) предполагает, что рост экономики определяется ростом рабочей силы и накопления капитала, а также ростом ее экспорта. Согласно неоклассической ELG необходимы как для развитых, так и для развивающихся стран. Это способствует экономии за счет

масштаба, увеличивает производительность труда, доступность качественных товаров и услуг, увеличивает возможности трудоустройства, повышает экономическую эффективность и, следовательно, ускоряет экономический рост. Влияние экспорта определяется через неоклассическую производственную функцию, исследующую роль экспорта после контроля над рабочей силой и накоплением капитала. Анализ основан на модели ARDL на тестировании краткосрочных и долгосрочных эффектов независимых переменных. Долгосрочный коэффициент экспорта составляет 0,38, а краткосрочный коэффициент – 0,28 и является статистически значимым. Таким образом, экспорт положительно влияет на G.D.P. на душу населения как в краткосрочной, так и в долгосрочной перспективе. Кроме того, коэффициент исправления ошибок (E.C.M.) является отрицательным и статистически значимым, показывая скорость корректировки к равновесию от краткосрочного к долгосрочному. Таким образом, правительство Казахстана должно сосредоточиться на увеличении экспорта, что повлечет увеличение ВВП на душу населения.

Ключевые слова: ARDL, экспорт, рост экономики, Казахстан, формирование капитала.

Introduction

Ricardo's comparative advantage theory explains that countries should specialize in producing commodities in which they are efficient and trade those commodities with the rest of the world. By exporting these efficient goods, a country can earn foreign currency to pay for importing those commodities in which country has a disadvantage. This theory has given birth to the export-led growth hypothesis (Zuniga, 2000). The export-led growth (ELG) hypothesis believes that the economy's growth is determined by the growth of the labour force and capital formation and its export growth (Fatemah & Qayyum, 2018).

According to neo-classical, ELG is essential for both developed and developing countries. It promotes economies of scale, increases labour productivity, availability of quality goods and services, increases employment opportunities, increases economic efficiencies, and increases economic growth (Fatemah & Qayyum, 2018; Kruger (1978)). Exports increase the incentives to increase sales in domestic and foreign markets, leading to resource allocation according to comparative advantage and increasing technology development in response to world competition (Bela Balassa, 1978). Likewise, the country's opting for import substitution policies face higher costs due to small national markets.

ELG hypothesis has not been accepted by the academicians but has shaped various countries' development policies (Krueger, 1978). During mid-1970's most of the developing countries opted for export promotion strategies. This is because the inward-oriented policies under the import substitution strategy showed poor growth performance. Developing countries were forced to implement an export-led strategy by making adjustments and stabilization to stimulate growth performance. It was considered exports would enable them to correct external sector imbalances and stimulate growth.

Kazakhstan is the ninth largest country globally and second-largest in the Commonwealth of Independent States (C.I.S.) after Russia and the Largest country in Centre Asia. It has shown tremendous economic growth performance since 2000. The country's exports were 51.777 Million US dollars in 2007 and increased to 67.083 million U.S. dollars in 2018. Therefore, the paper aims to examine the impact of exports on the Kazakhstan economy's economic growth by determining the long-run relationship between variables by employing modern time series econometrics techniques.

The paper's structure is designed as; the following section contains material and methods followed by literature review, results, and discussion. A conclusion finally follows it.

Literature Review

There has been considerable interest among economists in understanding the cause of disparities in growth rates across countries. Usually, two approaches are employed while understanding the cause of differences; the first approach is from the demand perspective, which recognizes the importance of demand factors and exports as a cause of disparities in growth rates across countries. The prominent supporter of this approach is Prebish (1959), Seers (1962) and Myrdal (2017). The second approach is the supply-side perspective, which explains the growth rate differences throw the exogenous model developed by Solow (1956) and Swan (1956) and endogenous growth models developed by Romer (1986); Lucas (1988), and Barro (1989). From the first approach, exports are essential

in determining growth differences across countries. According to Thirlwall (2012), it is evident that exports are critical for financing imports.

Authors use various methodological techniques to verify the hypothesis of ELG. Sultanuzzaman, Hongzhong, Mahamud, Banban, and Sarker (2017) examined the long-run relationship between exports, FDI, and economic growth in Sri-Lanka during 1980-2016. Using ARDL, the authors found a negative and significant relationship between exports and G.D.P. growth in the long run. It is because Sri-Lankan Exports are mainly primarily product-based. Ghazi and Bashier (2015), while applying the same methodology in Jordon during the period 1980-2012, found a positive impact of exports both in the long run and short-run

Bakari and Saaidia (2016) examined the relationship between exports, imports, and G.D.P. of China during 1960-2015. Using the Error Correction Model (E.C.M.), the authors found a positive impact on exports and a negative impact of imports on the G.D.P. of china.

Dritsakia and Stiakakis (2014) Examined the dynamic causal relationship between exports, G.D.P., and FDI. Using the ARDL/ ECM model, the authors found the bidirectional short-run and the long-run relationship.

Material and Methods

Econometric Modeling

The economic growth of the economy can be represented by using neoclassical Cobb-Douglas production as:

$$Y_t = \beta_0 K_t^{\beta_1} L_t^{\beta_2} \qquad 0 < \beta_1, \beta_2 < 1 \qquad (1)$$

where Y is the aggregate production of the economy at period t. β_0 is the level of technology, also known as total factor productivity (T.F.P.). K_t is the stock of capital of the economy at period t and L_t is the Labour Force of the economy at period t. β_1 , β_2 represents the capital stock and labour force share of income, respectively. The current paper modifies the neoclassical production function by including the exports to the equation (1). The augmented neoclassical production function can be represented in Cobb-Douglas production as:

$$Y_t = \beta_0 K_t^{\beta_1} L_t^{\beta_2} X_t^{\beta_3} \quad 0 < \beta_1, \beta_2, \beta_3 < 1 \quad (2)$$

where X_t are the exports of the economy at period t with its β_3 coefficient share of income. Other variables are the same as discussed in equation (1). The inclusion of exports as a third variable in determining the economy's aggregate production determines the T.F.P. growth (Ghazi & Bashier, 2015). As documented in Ghazi and Bashier (2015), Salvator and Hatcher (1991) provide four reasons for the inclusion of exports as a third factor, (I) incentives associated with exports lead to T.F.P. growth because it leads to lower capital-labor ratio. (II) Exports reduce the foreign exchange constraints and therefore lead to greater access to international markets. (III) It helps in technological transfer between the countries and consequently, technological innovation and lastly (IV). It increases job opportunities and increases labour productivity. However, exports cannot lead to economic growth if the core variables of production (i.e., Labour force and capital) are low. Therefore it becomes essential to examine the impact of exports in relation to the other factors.

Empirical findings of equation (2) can be found by linearizing it by taking logs and expressing it econometrically as given below:

$$Ln(Y_t) = \beta_0 + \beta_1 Ln(K_t) + \\ + \beta_2 Ln(L_t) + \beta_3 Ln(X_t) + u_t \qquad (3)$$

where β_0 represents a constant parameter of the regression line. u_t is the error term representing the influence of other variables other than labour force, capital, and exports of the economy.

Equation (3) is in the form of time series and can be examined by applying the time series econometric technique.

Unit Root Test

Most of the economic variables are trended and, therefore, non-stationary. Using O.L.S. regression can lead to a problem of spurious regression that is both R^2 and values of t statics are high while the variables have no economic relationship and therefore lead to incorrect conclusions. Thus, for actual results, the data series should be stationary. The variables' stationarity is tested using A.D.F. (Augmented Dicky-Fuller Test) and P.P. (Philip-Perron) tests are used. A.D.F. takes into account higher-order correlation by adding the lagged differences of variable and takes the form as:

$$\Delta X_t = \varphi + \gamma t + \beta X_{t-1} + \\ + \sum_{i=1}^{k} \beta_i X_{t-1} + u_t \qquad (4)$$

where X_t is the variable to be estimated, ΔX_t is the first difference ($\Delta X_t = X_t - X_{t-1}$), φ is the constant term, t is the time trend, and u_t is the error term.

The above test is based on the null hypothesis, that the data series is no stationary, i.e., $\beta = 0$, and the alternative hypothesis data series is stationary ($\beta \neq 0$).

The A.D.F. test is based on the assumption that error terms are normally distributed and have homoskedicity (i.e., constant variance). P.P. test developed by Phillips and Perron (1988) is a non-parametric test. The test is based on a regression equation, which is AR (1) process, and is based on less restrictive assumptions related to the error terms:

$$\Delta X_t = \varphi + \gamma t + \beta X_{t-1} \quad (5)$$

Co-integration Test

A Co-integration test is utilized to check whether there exists a long-run relationship between variables is not. After variables became stationary at the difference, the next step is to check Co-integration among the variables. We apply the ARDL bounds testing approach to examine the co-integration for the long-run relationship between G.D.P., exports, labour force, and capital of the Kazakhstan economy. The ARDL test of co-integration used in our model takes the form as:

$$\Delta GDP_t = \alpha_{01} + \gamma_{11}K_{t-1} + \gamma_{21}L_{t-1} + \\ + \gamma_{31}X_{t-1} + \gamma_{41}GDP_{t-1} + \sum_{i=1}^{k}\beta_{1i}K_{t-i} + \\ + \sum_{i=1}^{k}\beta_{2i}L_{t-i} + \sum_{i=1}^{k}\beta_{3i}X_{t-i} + \\ + \sum_{i=1}^{k}\beta_{4i}GDP_{t-i} + + u_{1t} \quad (6)$$

The null hypothesis of the above test is that there is no co-integration against the alternative hypothesis of there is co-integration, i.e.,

$$H_0: \gamma_{11} = \gamma_{21} = \gamma_{31}$$

$$H_1: \gamma_{11} \neq \gamma_{21} \neq \gamma_{31}$$

Determining Long-run and Short-run Relationship

If the variables are co-integrated, then we can express the relationship between G.D.P. and other factors as:

$$GDP_t = \alpha_{01} + \sum_{i=1}^{k}\gamma_{11}K_{t-i} + \\ + \sum_{i=1}^{k}\gamma_{21}L_{t-i} + \sum_{i=1}^{k}\gamma_{31}X_{t-i} + \\ + \sum_{i=1}^{k}\gamma_{41}GDP_{t-i} + u_{1t} \quad (7)$$

Dynamic error correction model (DECM) can arise from bounds test of ARDL co-integration to incorporate short-run dynamics with long with equilibrium. DECM is expressed as:

$$\Delta GDP_t = \alpha_{01} + \sum_{i=1}^{k}\beta_{1i}\Delta K_{t-i} + \\ + \sum_{i=1}^{k}\beta_{2i}\Delta L_{t-i} + \sum_{i=1}^{k}\beta_{3i}\Delta X_{t-i} + \\ + \sum_{i=1}^{k}\beta_{4i}G\Delta DP_{t-i} + \\ + ECM_{t-i} + u_{1t} \quad (8)$$

Where E.C.M. is the error correction term. Its coefficient should be negative and statistically significant. It shows the speed at which the variable is returning to its long-run equilibrium path.

For this paper, firstly, we studied descriptive statistics and correlation analysis. Secondly, we examined the stationary of data through A.D.F. and Philips and Perron test. Before testing co-integration, we checked for necessary lags through the V.A.R. model to determine its optimum lag. Fourthly we run the ARDL model to study for long-run co-integration among variables. In the fifth step, we examined the long-run and short-run relationships. Lastly, we test serial correlation, heteroscadacity, and stability of the model.

Results and Discussions

Descriptive Statistics and Correlation Analysis

Table 1 shows the descriptive statistics of Gross Domestic Product (G.D.P.), capital formation (K), Labour Force (L), and Exports (X) of the Kazakhstan economy from 2000-2018. Also, the table shows the correlation among variables of the study. It can be seen that there is a positive correlation between variables.

Table1 – Descriptive Statistics and Correlation Analysis

	LNGDP	LNK	LNL	LNX
Mean	25.61382	24.19939	15.95046	24.85951
Median	25.65034	24.34934	15.96375	24.90547
Maximum	26.04171	24.76981	16.04087	25.04053
Minimum	24.92573	23.01097	15.85077	24.50363
Std. Dev.	0.343982	0.544580	0.070747	0.152700
Skewness	-0.560199	-0.812926	-0.165022	-1.255902
Kurtosis	2.116466	2.386856	1.454420	3.588341
Jarque-Bera	1.611774	2.390313	1.977384	5.268783
Probability	0.446691	0.302657	0.372063	0.071763
Sum	486.6625	459.7884	303.0587	472.3308
Sum Sq. Dev.	2.129820	5.338208	0.090092	0.419713
Observations	19	19	19	19
Correlation Analysis				
LNGDP	1.000000			
LNK	0.984155	1.000000		
LNL	0.972228	0.933521	1.000000	
LNX	0.862871	0.888753	0.742104	1.000000

Unit Root Test

For checking the stationary of Gross Domestic Product (G.D.P.), Gross Capital Formation (K), Labour Force (L), and Export (X), we use A.D.F. (Augmented Dickey-Fuller) and P.P. (Phillips Perron) unit root tests through A.I.C. (Akaike Information Criterion) with both intercept and trend. Non-stationary variables can lead to spurious regression (Hill, Griffiths & Judge, 2001).

ARDL model suggests suggested that all variables should be stationary in I(0) and I(1) or I(1) or I(2) for running the model. So after unit root tests, we observe all variables, LNGDP in I(1), LN.K. in I(1), LN.L. in I(2), and LN.X. in I(1) are stationary at 10, 5, and 1 % significant level. A degree of mixing orders leads us to employ the ARDL bounds test of co-integration for determining the long-run relationship among the variables during the period 2001-2018 in the case of Kazakhstan. The next step is to check the bound test of co-integration.

Lag Length Criteria

Table 3 provides the optimum lag length criteria. The appropriate lag length is one of the important criteria for choosing the ARDL model. We use L.R., F.P.E., A.I.C., SC, H.Q., Log Y criteria for determining the optimum lag length of the model. We use maximum appropriate lag 2 for deciding the co-integration relationship among variables.

Table 2 – Unit Root Test

Variable	Augmented Dickey-Fuller Test		Phillips-Perron Test	
	t-Statistic	Prob	Adj. t-Stat	Prob
LNGDP	-1.605331	0.7444	-2.832207	0.2048
#D(LNGDP)	-4.263001	0.0202**	-2.648440	0.2662
LNK	-1.253813	0.8642	-1.836672	0.6443
D(LNK)	-3.527357	0.0728*	-3.309700	0.0981*
LNL	-1.507924	0.7856	-1.265656	0.8633
D(LNL)	-1.725539	0.6946	-1.600945	0.7491
D(LNL,2)	-4.559313	0.0121**	-4.723379	0.0091***
LNX	-1.937695	0.5940	-1.916868	0.6045
D(LNX)	-3.368878	0.0891*	-3.436586	0.0796*

Null Hypothesis: Variable has a unit root
Exogenous: Constant, Linear Trend
, **, * denotes significance at 10, 5, and 1 % significance level respectively. #, D denotes the difference of a variable*

Table 3 – Lag length criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	47.52540	NA*	0.000353	-5.120635	-4.924585	-5.101147
1	49.11969	2.250768	0.000332*	-5.190552*	-4.945489*	-5.166192*
2	49.15778	0.049298	0.000377	-5.077386	-4.783311	-5.048155

ARDL Bound level Test of Co-integration

Table 4 provides the results ARDL bound test of co-integration to examine the long-run relationship among variables. We have used A.I.C. to determine the lag order for ARDL estimation. With a model based on intercept and no trend, the test results show that F-statistics is 17.78 and is higher than both lower limit I(0) and upper limit I(1) in 10, 5, 2.5, 1 % significant level. Therefore test results suggest that there is a long-run co-integration association between the variables of interest. The test gives the lags for the model to check the short-run and long-run relationship. The next step is checking the long-run relationship.

Table 4 – ARDL Bound level Test of Co-integration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
F-statistic	17.78	10%	2.37	3.2
		5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Long Run Estimates: ARDL approach

The long-run coefficients are shown in Table 5. The coefficient of exports is positive, with a value of 0.38, and is significant at a 5 % level of significance. If 100% increases in exports, it leads to a 38% increase in G.D.P. per capita income. The results indicate that exports are an essential factor for Kazakhstan's economy. Findings advise that policymakers must consider the exports as a benchmark of the economy. The other variables of the study are the labour force and gross capital formation. Both variables are significant at 1 and 5 % level of significance. A 100% increase in labour force leads to a rise in 137% increase in G.D.P. per capita while a 100% increase in gross capital formation leads to an 18% increase in G.D.P. per capita of Kazakhstan's economy. Therefore both variables are growth-enhancing factors of growth of the economy. The government of Kazakhstan must keep an eye on these factors for the economy's long-run economic growth.

Table 5 – Long Run Estimates: ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-26.90909	7.350694	-3.660755	0.0026
Ln (L)	1.376185	0.409757	3.358537	0.0047
Ln (X)	0.387052	0.146346	2.644784	0.0192
Ln (K)	0.181907	0.076967	2.363434	0.0331

Short-Run Estimates: E.C.M. approach

Table 6 shows the short-run estimates. The results show that the coefficient of d(Ln.X. (-1)) 0.28 and is significant at 5%. If the current year FDI increases by 100%, G.D.P. per capita rises by 28%. Therefore exports have a positive spill-over impact both in the long run and in the short run. It shows that exports are a crucial determinant of G.D.P. per capita of Kazakhstan. That other variables labor force has a positive coefficient but is insignificant. Capital formation is having a positive coefficient and is statistically significant.

The coefficient of error correction term (E.C.M.) is negative and statistically significant. It confirms the long-run relationship between variables. The coefficient of E.C.M. (-1) shows the speed of adjustment towards equilibrium. The coefficient of E.C.M. (-1) is -0.52, indicating an adjustment is corrected by 52% from short run to long run every year.

Table 6 – Short Run Estimates: E.C.M.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNL(-1))	1.083827	0.690376	1.569908	0.1404
D(LNX(-1))	0.282879	0.120563	2.346310	0.0355**
D(LNK(-1))	0.240737	0.058782	4.095392	0.0013*
ECM(-1)	-0.523160	0.270944	-1.930877	0.0756***

Sensitivity estimates

Table 7 shows the diagnostic test of the model. The serial correlation of the model is examined through the Breusch-Godfrey Serial Correlation L.M. Test. The results of the L.M. test based on F-statistics confirm no serial correlation in the model. Likewise, the heteroskedasticity of the model is checked by using Breusch-Pagan-Godfrey and ARCH tests. Both tests confirm the absence of heteroskedasticity.

Table 7 – Diagnostic tests

	F-Statistic	Probability
Breusch-Godfrey Serial Correlation L.M. Test	2.886326	0.1675
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.696909	0.6996
Heteroskedasticity Test: ARCH	2.392896	0.1459

Source: Authors own calculation

Stability estimates

For verifying the stability of the model, we have used CUSUM and CUSUM Square Tests. The E.C.M. model proves that the model is stable through both CUSUM and CUSUM Square Tests, as shown in Figure 1 and Figure 2, respectively. Each blue line plots should not lie outside critical values (i.e., should not cross red lines).

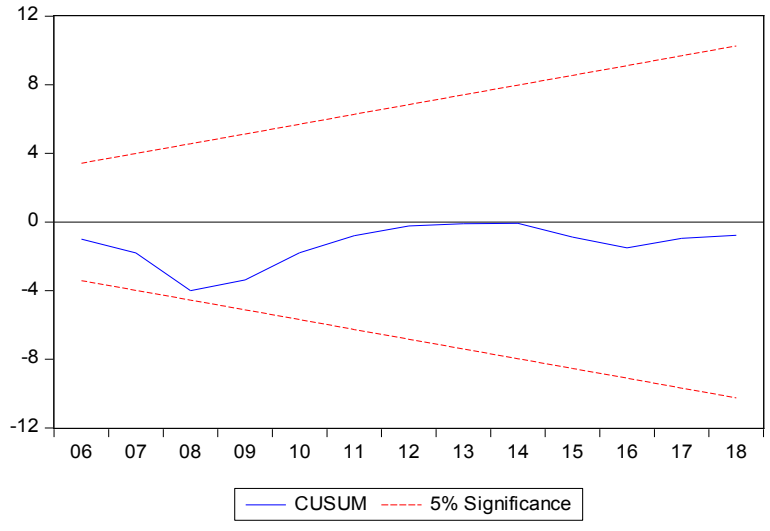

Figure 1 – CUSUM stability test

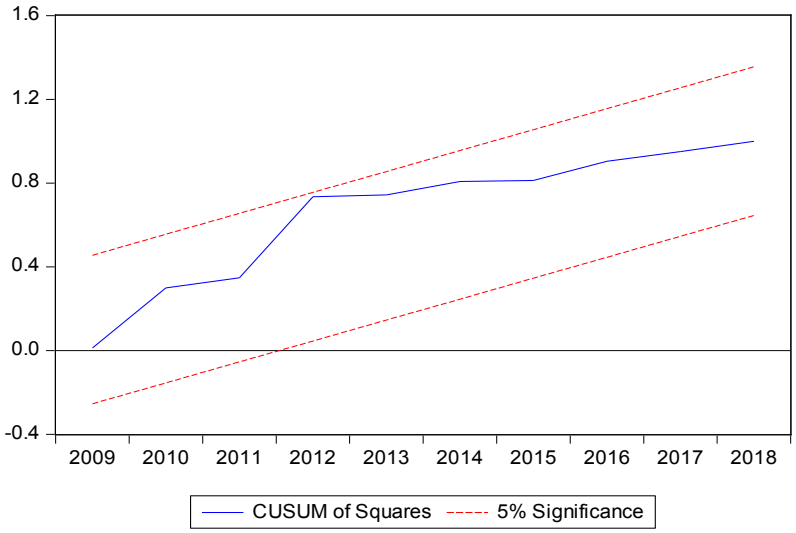

Figure 2 – CUSUM Square stability test

Conclusion

The paper attempted to find the impact of exports on the economic growth of Kazakhstan. The effect of exports is determined through a neoclassical production function, that is, examining exports' role after controlling the impact of the labour force and capital formation. The analysis is based ARDL model on testing for the short-run and long-run effects of independent variables. Unit root test confirms that variables are stationary at different orders. The Bound test of co-integration confirms the long-run relationship between G.D.P. per capita, exports, labour force, and Kazakhstan's capital formation during 2000-2018. The long-run impact of coefficients is determined through ARDL.

In contrast, short-run coefficients are examined through the E.C.M. Long-run coefficient of exports is 0.38, while the short-run coefficient is 0.28 and statistically significant. Therefore exports impacts positively impact G.D.P. per capita in both short-run as well as in long-run. Also coefficient of error correction term (E.C.M.) is negative and statistically significant, showing the speed of adjustment towards equilibrium from short-run to long-run. Therefore, the government of Kazakhstan should focus on increasing exports. The government should also focus on increasing the capital formation and labor force of the economy as these variables positively and significantly impact the G.D.P. per capita of Kazakhstan's economy. Our research is limited in variables as well as in time-series data. Researchers may add more variables like government consumption, inflation, FDI to capture the influence of other variables on G.D.P. per capita. Also, increase the length of time series and checking multidirectional analysis can be a separate research area.

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