

## Measuring The Impact Of The Performance Of Sovereign Wealth Funds On The Economic Sustainability Of Agriculture: Norway, Canada, And Azerbaijan As Case Studies

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### Abstract:

*Rentier countries are afraid of the challenges they face while dealing with financial surpluses (such as Dutch disease, external shocks resulting from low prices or global demand for these resources, structural distortion, and poor distribution between generations). To avoid these problems, many countries have resorted to establishing sovereign wealth funds because it has a major role in helping these countries manage the challenges associated with their heavy dependence on natural resources, by diversifying revenue sources, achieving financial stability, enhancing long-term economic sustainability, achieving intergenerational justice, and accumulating and transferring wealth across generations.*

*The research aims to test the impact of the performance of sovereign wealth funds on the sustainability of the agricultural sector in Norway, Canada and Azerbaijan. It was based on time series data for the period (2008-2020). For the purpose of estimating the model that was built (and using the ARDL methodology) by considering agricultural output as a percentage of GDP as a dependent variable, and each of: the performance of sovereign wealth funds, total domestic investments, spending on research and development, and finally foreign direct investment) as independent variables, and the results proved the validity of the research hypothesis: There is a positive moral relationship between the performance of sovereign wealth funds and the economic sustainability of agriculture.*

### First - Introduction:

Despite the emergence of sovereign wealth funds in the middle of the last century, the concept of sovereign wealth funds did not receive prominent attention from a practical standpoint, whether from the media, economic and political circles, or even from businessmen in most countries of the world, except in recent years, especially after 2007, when writings increased. And research, reports and scientific conferences that aim to provide clarification of the phenomenon of sovereign funds at the level of the global economy. This increasing interest in sovereign funds is due to many factors, including: the increasing growth of the assets collected

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in these funds on the one hand, and the state of imbalance that struck the global financial system after the global financial crisis from The second aspect, in addition to the factor of fear regarding the strategic intentions of these funds' investments in major countries, is that it is one of the mechanisms adopted by countries as a means of saving and achieving stability, as well as a means of transferring the benefits of natural resources and raw materials for the benefit of future generations, allowing them to live in appropriate economic conditions. These funds facilitated macroeconomic management in many countries in light of the growing current account surpluses as a result of a significant increase in incomes by transferring these surpluses to investment funds.

This research is based on the basic hypothesis that the more sovereign wealth funds are highly transparent and have good governance, the more they lead to accelerating the economic sustainability of agriculture. The research aims to measure the extent of the impact of the efficiency of the performance of sovereign wealth funds on the sustainability of the agricultural sector in Norway, Canada and Azerbaijan. The importance of the research lies in the fact that it shed light on one of the basic issues that has attracted the attention of international countries, oil countries and Iraq in particular at the present time as a result of: the rapid developments of this Funds, especially after the global financial crisis, and the increasing interest in them by industrialized countries and the International Monetary Fund.

### **Second - The role and importance of sovereign wealth funds in the economic literature:**

The economic literature indicates a major role for sovereign funds in the macroeconomy by addressing some difficult problems, such as Iraq, which is about to witness a qualitative boom in the level of production in the oil and natural gas sectors, and the accompanying rise in financial returns on a steady basis (which produces the Dutch disease, and also the problem of imbalance in the structure of... The Iraqi economy, corruption and waste of money), which requires efficient economic management of these resources and achieving the highest possible economic benefit, and one of the most important modern mechanisms to achieve this purpose is (creating sovereign wealth funds) and integrating them into the general budget. (Al-Mansouri, 2012) As for the study (Bouflaih, 2010), it highlights the importance and weight of sovereign wealth funds in the financial system and their role in the economies of the oil countries. This study concluded that sovereign wealth funds have high financing capabilities that enable them to finance the economies of the oil countries by raising the level of their financial suitability and providing financial resources. Alternative financing to foreign sources of financing, which leads to getting rid of the problem of debt, while Al-Zouari goes on to clarify the importance and role of sovereign funds through their ability to develop the sustainable Arab agricultural sector by using them as a modern mechanism in reducing the financing deficit of the Arab agricultural sector and increasing the proportion of inter-investment in the agricultural sector. A comparison of the total gross intra-investment investments (Al-Zouari, 2020) While Hasanein sees the establishment and development of sovereign funds as an idea, knowing the types of sovereign funds around the world and reviewing the extent to which the various investment trends of sovereign funds contribute to achieving sustainable development, and finally knowing the principles governing the work of sovereign funds and international efforts in this regard is a natural reaction as a result of the financial surpluses resulting from Natural resources, as is the case in the Gulf states, Russia, and Norway, or from the surplus of the trade balance, as in the case of China and Singapore, and sovereign funds are used as an effective tool to manage these surpluses and preserve the rights of future generations (Hasnain, 2022) While both Nimah and Jassim believe that Iraq is not moving towards sustainable development and there are no serious plans to strengthen the economy and rebuild the infrastructure, so establishing a sovereign fund in Iraq is necessary to

stabilize the general budget support first and diversify the Iraqi economy by supporting development projects and building other projects. Secondly, supporting the agricultural sector and strengthening the industrial sector, and thus contributing to the integration of different sectors with forward and backward links, thirdly and finally, because it is not harmful to benefit from the experiences of other countries such as Norway, Qatar, the United Arab Emirates, Singapore, etc., (Naama, Hayder and Jasim, Saad, 2020) Hella believes that sovereign wealth funds can play a major role in addressing environmental problems and be an important source of financing for sustainable development through international climate agreements, and the evaluation of the One Planet Initiative by the Sovereign Wealth Funds Working Group, so there must be strong coordination between the various sovereign funds in the country. The field of green investments (Hella, Engere, 2019) As for Sharma, he explains the importance of sovereign funds and their role in sustainable development by analyzing how to address the structural issues that hinder the flow of sovereign wealth fund capital to long-term sustainable development investments. The study concluded that investments in long-term private market asset classes - such as infrastructure, real estate, and agriculture, venture capital, and private equity - are the most influential strategies for supporting the global economy and thus achieving the Sustainable Development Goals (SDGs). This is because there are unique organizational and structural characteristics of sovereign wealth funds that give them the ability to invest in the most influential asset classes and regions, as investments in these sectors appear to the regions need significant savings and conditions and restrictions that are not available except for sovereign funds that enjoy the size, development, and governance required to manage these investments (Rajiv Sharma, 2017) As for Stella, Angela and Keenan, they set the conditions for governance, transparency and accountability for the success of sovereign wealth funds: in playing a role in the international financial arena as major actors, by welcoming their investments in recipient countries on the one hand, and strengthening the fight against political and financial corruption within the operations of sovereign wealth funds, and enhancing financial sustainability in countries Which owns these funds on the other hand (Stella, Angela and Kenan, 2010) While Julia believes that African sovereign wealth funds have already taken great steps towards achieving the sustainable development goals, and as the scope of African sovereign wealth funds increases, their ability to achieve infrastructure development, increase green investment, and spread environmental, social and governance principles is also increasing, and that there is consensus between SWF practices are consistent with the Sustainable Development Goals adopted by the United Nations (Julia Chen, 2019) Let's go to a small developing island in the Caribbean and see what, and to what extent, Armanno, Alex and Khandokar targeted in a benchmark study of their country's sovereign wealth fund: the impact of the SWF on the economic growth of the island of Trinidad and Tobago (T&T). This study is unique. It is of its kind in the literature on sovereign wealth funds because it is the first study to evaluate the impact of sovereign wealth funds on the economic growth of a small developing country and its methodology is based on simple least squares (OLS) regression for the period between 1960-2017. The study concluded that there is a statistically significant and positive impact of the sovereign wealth fund on the economy of Trinidad and Tobago (T&T). During the study period, the T&T government used its sovereign wealth fund to finance public spending: improving quality of life, improving infrastructure, generating employment, and creating stronger institutional systems for the T&T economy. As a result, the Fund contributed to the rise in GDP per capita in T&T. (Ermanno and Khandokar and Alex, 2022) We end our journey in Tanzania with Tax in his study, which aimed to study the effectiveness of sovereign wealth funds as tools for financial management in general and for managing the huge revenue flows expected from the Tanzanian natural gas sector in particular. The study produced several results, the most important of which is the direct relationship between the efficiency of the performance of sovereign funds and economic growth. That is, the more the sovereign fund is

transparent and has high governance, the more it is able to achieve sustainable development goals (Tax, 2016).

### Third - The concept of sovereign wealth funds:

The phenomenon of establishing sovereign wealth funds is not new, but it is difficult to obtain a comprehensive concept that applies to all sovereign wealth funds in countries of the world. From here we resort to multiple definitions, including the International Monetary Fund's definition that they are funds or investment equipment with a special purpose that the state owns and establishes for economic purposes. Overall, it preserves, employs, or manages assets primarily to achieve macroeconomic goals and financial goals in the medium and long term, through a set of investment strategies, including investment in foreign financial assets. These funds are financed through foreign exchange operations, privatization proceeds, and surpluses. The budget and receipts generated from merchandise exports. These include, in principle, the following: (1) Financial stability funds. (2) Provident funds; (3) Reserve investment companies. (4) Development funds; and (5) pension reserve funds (those without explicit pension obligations), while excluding, among others: (a) government pension funds; (b) Social security funds; (c) Government lending funds. and (d) government-owned banks. (Mark Allen and Jaime Caruana, 2008: p26) While the definition of the Organization for Economic Cooperation and Development came in a relatively different form, considering that sovereign funds are investment vehicles owned by the state and managed directly or indirectly by national governments to achieve various economic goals. These funds are financed from foreign exchange reserves, or exports of natural resources, especially oil and gas. Or the various public revenues of the state or any other income (Wignall, YJuan Yermo, 2008: p4). As for the definition of the Sovereign Wealth Funds Institute, it is an investment entity owned by a government consisting of financial assets of stocks, bonds, and other financial instruments, and those assets are formed from balance of payments surpluses or public budgets, foreign exchange operations, privatization proceeds, revenues from primary commodity exports such as oil and natural gas, or from government transfer payments, or from all of those resources combined. According to this definition, sovereign wealth funds do not include government pension funds, banks, and public economic companies (Guesmia Madjid, 2014: p 16) The US Treasury defines SWFs narrowly as a government investment vehicle financed by foreign exchange assets, which manages those assets separately from the official reserves of the monetary authorities (the central bank and reserve-related functions of the Treasury). The US Treasury's definition is primarily intended to distinguish between sovereign wealth fund investment and official reserves managed by a country's central bank. Because the two primary goals of official foreign reserves are liquidity and security, the investment horizon for these reserves is short. Turco, 2014: p11) Some observers offer a more detailed definition of SWFs. Steven Jin, a currency analyst at Morgan Stanley, expands on the Treasury Department's definition to provide a broader understanding of SWFs and how they differ from official foreign reserve and other government-sponsored funds. According to Jain, there are five main characteristics of SWFs: they are independent sovereign government entities, are exposed to high foreign exchange shocks, have no explicit liabilities (such as a national state pension fund), carry high risks, and have long investment horizons. (Jen, 2007) See also (Seward & others, 2014: p2) While the McKinsey Global Institute, a global research institute in the field of management and economics, believes that sovereign wealth funds are financed by central banks' foreign currency reserves, and their goal is to maximize financial revenues with low risks ( Soleimani et al.: 2018, p. 7) From all of the above, sovereign wealth funds can be defined as a public financial container owned by the state and has the characteristics of independence and sovereignty, to which all financial surpluses in excess of the need of the public treasury are supplied and invested in for distant financial, economic and social goals. The term brings

financial returns to the state and its future generations. The different types of assets owned by the state can be illustrated in the figure below:

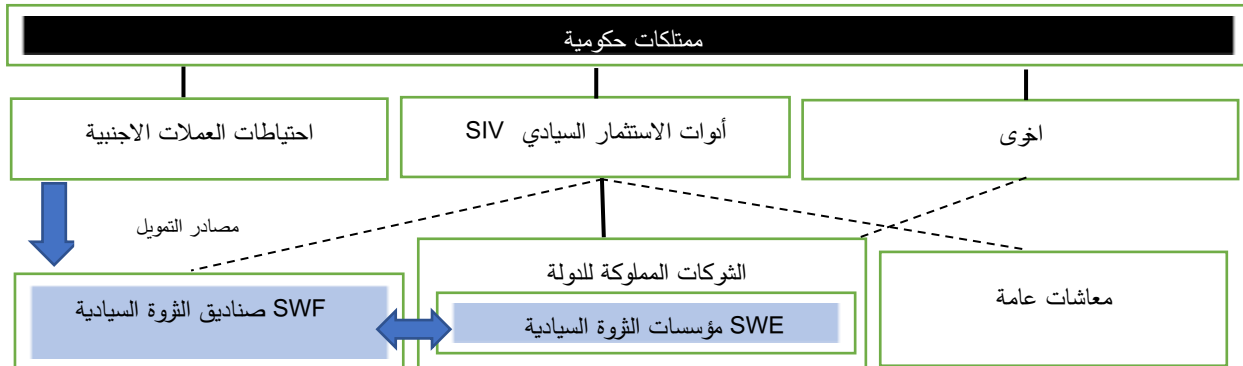


Figure (3-1) Classification of different types of assets owned by the state

Source: Daniil Wagner SOVEREIGN WEALTH FUNDS: INVESTMENT OBJECTIVES AND ASSET ALLOCATION STRATEGIES Journal of Governance and Regulation / Volume 3, Issue 2, 2014, P33.

Fourth: Governance of sovereign wealth funds and indicators to measure their performance  
 Despite the rapid development of the concept and work of sovereign wealth funds in the world, the indicators for measuring the performance of the work of these funds are in their initial stages, and there are two main reasons for this: first, the differences in the objectives of these funds, and second, the ambiguity in much of their work. The research was based on the Linaburg-Maduell index to measure the performance of wealth funds. Sovereign wealth funds, which were developed by Carl Linaburg and Michael Maduell to be a means of measuring the level of transparency of sovereign wealth funds, noting that the classification of sovereign wealth funds according to this index is done every three months, and the closer the sovereign fund's score is to 10, the more transparent the fund is, and the closer the rating score is. From scratch whenever there was a lack of transparency in the fund, the index is an ongoing project by the Sovereign Wealth Fund Institute since its development in 2008 and has since been used around the world by sovereign wealth funds in their official annual reports and statements, as a global benchmark, Invitations are sent to non-transparent funds to show their intentions (Al-Abed, 2016: p. 67). The table below shows the ten basic criteria for the index:

Table No. (4-1) Components of the Linaburg-Maduell index

Se.	Principles of Linaburg-Maduell Transparency Index	point
1	Fund provides history including reason for creation, origins of wealth, and government ownership structure.	1
2	Fund provides up-to-date independently audited annual reports	1
3	Fund provides ownership percentage of company holdings, and geographic locations of holdings	1
4	Fund provides total portfolio market value, returns, and management compensation	1
5	Fund provides guidelines in reference to ethical standards, investment policies, and enforcer of guidelines	1
6	Fund provides clear strategies and objectives	1

7	If applicable, the fund clearly identifies subsidiaries and contact information	1
8	If applicable, the fund identifies external managers	1
9	Fund manages its own web site1	1
10	Fund provides main office location address and contact information such as telephone and fax	1

Source: Piotr Wiśniewski Sovereign Wealth Funds' (SWFs') social media strategies European Conference on social media, ECSM 2023, Vol.10, Issu.1, p356.

**Fifth - Methodology and data:**

**1- Description of the model and its basic variables**

In order to characterize the standard models and identify the independent variables that will be included in these models to be estimated, it was necessary to form the general standard formulas of the model as follows:

$$Y_{1, it} = \beta_0 + \beta_1 X_{1, it} + \beta_2 X_{2, it} + \beta_3 X_{3, it} + \beta_4 X_{4, it} + U_{1, it} \dots \dots \dots (1)$$

i=1, 2, ..... , n; t=1, 2, ..... , T

**Since:**

Y1: represents the dependent variable; Which represents the value of agricultural output, as it was expressed as agricultural output as a percentage of GDP.

X1, it, X2, it, X3, it,

β0: represents the cutting boundary parameter (constant).

β1, β2, β3, β4): They represent the parameters or tendencies of the models (which measure the effect of the independent variables on the dependent variable, respectively (agricultural output as a percentage of GDP).

i: The number of cross-sections, in other words, represents the number of study countries.

t: represents time or period of time.

U1, U2, U3) represent the random error terms for the selected aggregate models for countries, or what are known as random variables or disturbance terms. They include other unmeasured variables as well as those that are not included in the models, and which have an effect on the dependent variable, such as stability. The security, political, economic and financial conditions of the country, etc. Therefore, from the above, the number of observations used in the analysis will depend on the number of cross-sections (N), i.e. the number of countries, and on the number of time series (T), i.e. the number of years of study. Since the cross-sections of countries in this research are (N=3), and their time period is (T=13), the number of observations will be as follows: Observations = N\*T = 3\*13 = 39

As for the method used in the measurement process for what was mentioned above, it is the data collection method, or what is known as the panel model. These models are among the most recently used models in economic studies. It takes into account the effect of change in both time (T) and cross-sectional observations (N). This method also gives better efficiency, increased degrees of freedom, and less multicollinearity between the variables to be measured in the research, in addition to the fact that this method or model has information content. More compared when using time series data methods or models individually. Finally, this was

applied using the ready-made software (Eviews.12), which was recently adopted in econometric analysis.

## 2. Statistical tests:

### ➤ Unit root test for model variables

Table (5-1): Unit root test results for model variables in selected foreign countries

<b>Unit Root Test Results Tables: Levin, Lin and Chu Test</b>				
<b>Variable</b>	<b>At Level</b>		<b>At First Difference</b>	
	<b>Individual intercept</b>	<b>Individual intercept and Trend</b>	<b>Individual intercept</b>	<b>Individual intercept and Trend</b>
<b>LNY1 P-value</b>	<b>-1.56362 (0.0590)*</b>	<b>-2.20521 (0.0137)**</b>	<b>-4.22273 (0.0000)***</b>	<b>-3.54284 (0.0002)***</b>
<b>LNX<sub>1</sub> P-value</b>	<b>-2.19787 (0.0140)**</b>	<b>-3.54074 (0.0002)***</b>	<b>-6.42876 (0.0000)***</b>	<b>-5.67228 (0.0000)***</b>
<b>LNX<sub>2</sub> P-value</b>	<b>0.32981 (0.6292)<sup>n.s</sup></b>	<b>-1.18522 (0.1180)<sup>n.s</sup></b>	<b>3.70485 (0.0000)***</b>	<b>-4.03859 (0.0000)***</b>
<b>LNX<sub>3</sub> P-value</b>	<b>-1.31631 (0.0940)*</b>	<b>-4.29735 (0.0000)***</b>	<b>-6.30850 (0.0000)***</b>	<b>-6.19361 (0.0000)***</b>
<b>X<sub>4</sub> P-value</b>	<b>-1.20948 (0.1132)<sup>n.s</sup></b>	<b>-1.47779 (0.0697)*</b>	<b>-7.67716 (0.0000)***</b>	<b>-6.31288 (0.0000)***</b>
level of significance, (**): 5% level of significance, (*): 1% level of significance, %1 : (***) .(n.s): not significant				

Source: Prepared by the researcher based on program data (Eviews.12).

Table (5-1) above shows the unit root test, as the left part of it indicates the results of the test at the At Level level, while the right part indicates the results when taking the first difference At First Differences, as it is noted that the dependent variable and the independent variables are all (With the exception of the first independent variable) they appeared stationary at the level, and this indicates the rejection of the null hypothesis and the acceptance of the alternative hypothesis, which indicates that these variables are stationary at the level, meaning that they do not have or do not contain a unit root; This is because the calculated (t) values are less than the tabulated (t) values at a significance level (5%). As for the first independent variable (performance of sovereign funds), only it appeared non-stationary at the level, and this indicates acceptance of the null hypothesis, which indicates that this variable has or contains a unit root. To know the type and nature of the time series for variables in the selected developed countries, it is possible to represent them graphically in terms of time, through Figure (5-1) below, as follows:

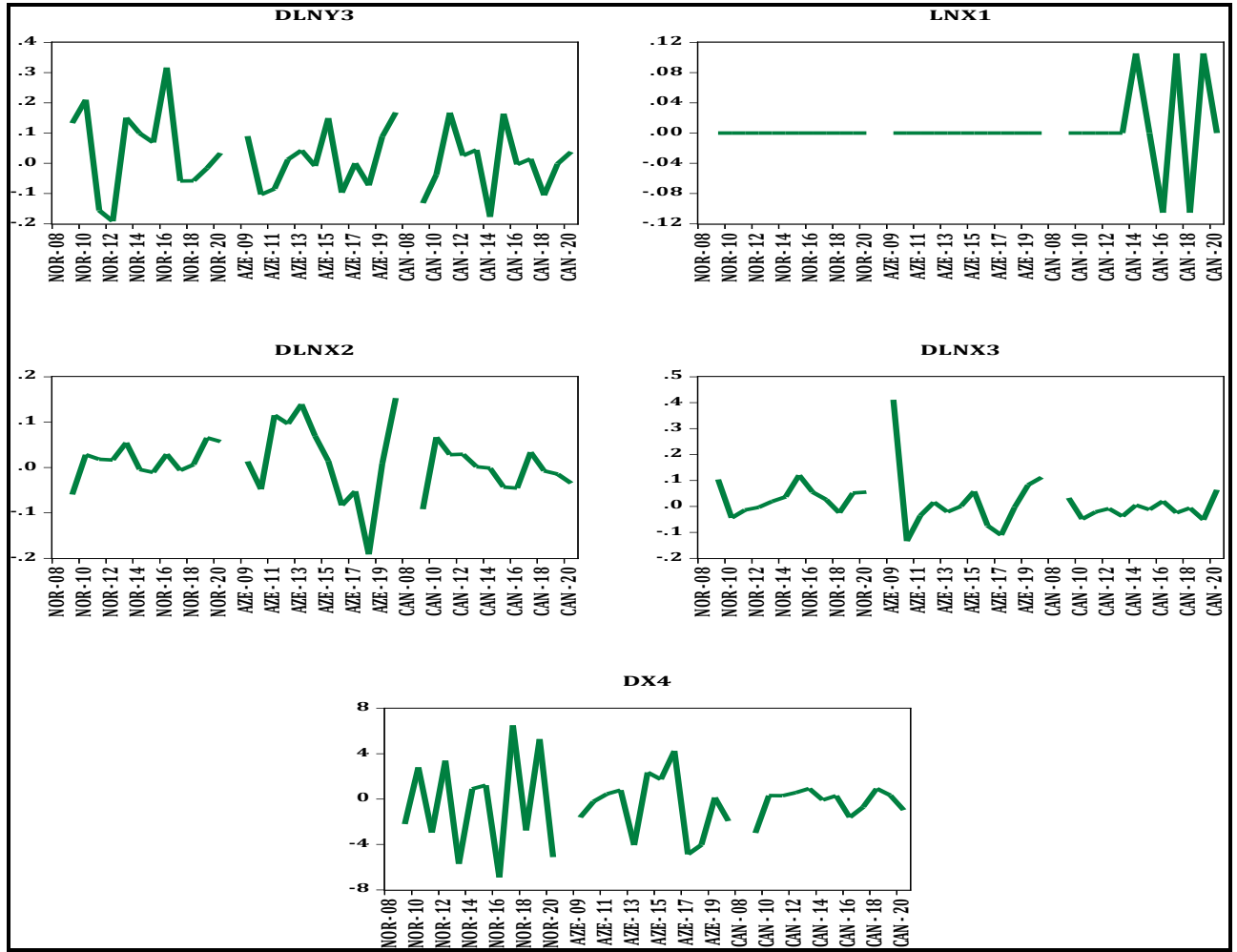


Figure (3-1): Trends in model variables data in selected presenting countries for the period (2008-2020)

Source: Prepared by the researcher based on program data (Eviews.12).

➤ **Testing the cointegration relationship between the study variables:**

Table (5-2): Co-integration test results in selected foreign countries

Pedroni Residual Cointegration Test				
Series: LNX1LNX2LNX3X4				
Alternative hypothesis: common AR coeffs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.805364	(0.7897) <sup>n.s</sup>	-0.805364	(0.7897) <sup>n.s</sup>
Panel rho-Statistic	0.761000	(0.7767) <sup>n.s</sup>	0.761000	(0.7767) <sup>n.s</sup>
Panel PP-Statistic	-1.305805	(0.0958) <sup>n.s</sup>	-1.305805	(0.0958) <sup>n.s</sup>
Panel ADF-Statistic	-1.132647	(0.1287) <sup>n.s</sup>	-1.132647	(0.1287) <sup>n.s</sup>



Alternative hypothesis: individual AR coefs. (between-dimension)		
	<u>Statistic</u>	<u>Prob.</u>
Group rho-Statistic	1.155357	(0.8760) <sup>n.s</sup>
Group PP-Statistic	-1.195722	(0.1159) <sup>n.s</sup>
Group ADF-Statistic	-1.000811	(0.1585) <sup>n.s</sup>
(*): 1% level of significance, (**): 5% level of significance, (***): 10% level of significance, (n.s): not significant.		

Source: Prepared by the researcher based on program data (Eviews.12).

Table (5-2) shows the cointegration relationships between the dependent variable represented by (agricultural output as a percentage of GDP) and the independent variables represented by (performance of sovereign funds, total domestic investments, spending on research and development and foreign direct investment), as it is noted from Through the results of the table above, all seven tests confirm that there is no cointegration between the study variables at a significance level greater than (5%). This indicates that there is no long-term relationship between the study variables in the selected foreign countries for the period (2008-2020).

➤ **Estimation of standard models:**

The estimation will be made according to three models (aggregate regression model, fixed effects model, and random effects model), and then a comparison will be made between them in order to choose the appropriate and best model for the study, as follows:

**A - Estimating the pooled regression model (PRM):**

Table (5-3) below shows the results of estimating the aggregate regression model for the model variables in selected foreign countries. Assuming that the model effects are general or shared, the following results were obtained:

Table (5-3): Results of estimating the aggregate regression model for model variables in selected foreign countries for the period (2008-2020)

<b>Pooled Regression Model (PRM)</b>				
<b>Method: Panel Least Squares</b>				
<b>Dependent Variable: LNY1</b>				
<b>Sample: 2008 2020</b>				
<b>Periods included: 13</b>				
<b>Cross-sections included: 3</b>				
<b>Total panel (balanced) observations: 39</b>				
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
LNX1	0.652574	0.214132	3.047529	(0.0046)***
LNX2	0.169867	0.100595	1.688619	(0.1010) <sup>n.s</sup>
LNX3	0.774516	0.363085	2.133158	(0.0407)**
X4	-0.014057	0.003057	-4.598310	(0.0001)***
C	-0.984561	0.527481	-1.866535	(0.0712)*
<b>R-squared</b>	<b>0.974311</b>		<b>F-statistic</b>	<b>202.2770</b>
<b>Adjusted R-squared</b>	<b>0.969494</b>		<b>Prob. (F-statistic)</b>	<b>0.000000</b>
level of significance, (**): 5% level of significance, (*): 1% level of significance, %1 : (***) (n.s): not significant				

Source: Prepared by the researcher based on program data (Eviews.12).

Table (5-3) above shows the results of estimating the aggregate regression model, as it is noted that there is a significant effect of the performance of sovereign funds, spending on research and development, and foreign direct investment on the dependent variable, which is agricultural output as a percentage of gross domestic product, at a significance level of less than (1%), (5%), respectively. While no significant effect appeared for total domestic investments, as for the explanatory power of the model, it reached (97%), which is a very strong percentage. In general, the model as a whole was significant, as the calculated (F) value reached about (202.277), with a significance level less than (1). %).

**B- Estimating the fixed effects model (FEM):**

Table (5-4) below shows the results of estimating the fixed effects model for the model variables in selected foreign countries. Assuming that the model effects are fixed, the following results were obtained:

Table (5-4): Results of estimating the fixed effects model for model variables in selected foreign countries for the period (2008-2020)

<b>Fixed Effect Model (FEM)</b>				
<b>Method: Panel EGLS (Cross-section SUR)</b> <b>Dependent Variable: LNY1</b> <b>Sample: 2008 2020</b> <b>Periods included: 13</b> <b>Cross-sections included: 3</b> <b>Total panel (balanced) observations: 39</b>				
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
LNX1	0.597589	0.216326	2.762442	(0.0094)***
LNX2	0.169670	0.104023	1.631077	(0.1127) <sup>n.s</sup>
LNX3	0.681633	0.362227	1.881784	(0.0690)*
X4	-0.013163	0.004048	-3.252171	(0.0027)***
C	-0.874346	0.596543	-1.465689	(0.1525) <sup>n.s</sup>
<b>R-squared</b>	<b>0.945631</b>	<b>F-statistic</b>		<b>214.6065</b>
<b>Adjusted R-squared</b>	<b>0.923158</b>	<b>Prob. (F-statistic)</b>		<b>0.000000</b>
<b>level of significance, (**): 5% level of significance, (*): 1% level of %1 :(***)</b> <b>.significance, (n.s): not significant</b>				

Source: Prepared by the researcher based on program data (Eviews.12).

Table (5-4) above shows the results of estimating the fixed effects model for variables in the model in selected foreign countries. It is noted that there is a significant effect for the performance of sovereign funds, spending on research and development, and foreign direct investment on the adopted variable, agricultural output as a percentage of the gross domestic product and at the level of Significant less than (1%, 5%, 10%), respectively. While no significant effect appeared for total domestic investments, as for the explanatory power of the model, it reached (94%), which is a very strong percentage. In general, the model as a whole was significant, as the calculated (F) value reached about (214.601), with a significance level less than (1). %).

**C- Estimating the random effects model (REM):**

Table (5-5) below shows the results of estimating the random effects model for the model variables in selected foreign countries. Assuming that the model effects are constant, the following results were obtained:

Table (5-5): Random effects model estimation results for model variables in selected foreign countries for the period (2008-2020)

<b>Random Effect Model (REM)</b>				
<b>Method: Panel EGLS (Cross-section SUR)</b>				
<b>Dependent Variable: LNY1</b>				
<b>Sample: 2008 2020</b>				
<b>Periods included: 13</b>				
<b>Cross-sections included: 3</b>				
<b>Total panel (balanced) observations: 39</b>				
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
LNX1	-0.144653	0.894453	-0.161723	(0.8725) <sup>n.s</sup>
LNX2	0.465400	0.287202	1.620465	(0.1144) <sup>n.s</sup>
LNX3	-0.547385	0.094820	-5.772891	(0.0000) <sup>***</sup>
X4	-0.026575	0.012006	-2.213599	(0.0337) <sup>**</sup>
C	-0.247647	2.199385	-0.112598	(0.9110) <sup>n.s</sup>
<b>R-squared</b>	<b>0.512172</b>	<b>F-statistic</b>		<b>8.924176</b>
<b>Adjusted R-squared</b>	<b>0.454781</b>	<b>Prob. (F-statistic)</b>		<b>0.000049</b>
<b>level of significance, (**): 5% level of significance, (*): 1% level of significance, %1 : (***) ,(n.s): not significant</b>				

Source: Prepared by the researcher based on program data (Eviews.12).

Table (5-5) above shows the results of estimating the random effects model for the model variables in selected foreign countries. It is noted that there is a significant effect of spending on research and development only on the dependent variable, which is agricultural output as a percentage of the gross domestic product, and at a significance level of less than (1%) While no significant effect appeared for the rest of the independent variables, as for the explanatory power of the model, it reached (51%), which is a weak percentage. In general, the model as a whole was significant, as the calculated (F) value reached about (8.924), with a significance level of less than (1%)

➤ **Comparison between the three estimated panel models:**

In order to compare between the three models above or determine the most appropriate model, we will conduct diagnostic statistical tests, as follows:

A - Fisher's restricted test (F-Test) in order to differentiate between the aggregated regression model and the fixed effects model. Table (5-6) below shows the statistical results of this test as follows:

Table (5-6): Fisher's test results for the comparison between the pooled regression model (PRM) and the random effects model (FEM) for the model in selected foreign countries.

<b>Redundant Fixed Effects Tests</b>			
<b>Equation: Untitled</b>			
<b>Test cross-section fixed effects</b>			
<b>Effects Test</b>	<b>Statistic</b>	<b>d.f.</b>	<b>Prob.</b>
<b>Cross-section F</b>	<b>29.015275</b>	<b>(2,32)</b>	<b>(0.0000)<sup>***</sup></b>
<b>level of significance, (**): 5% level of significance, (*): 1% level of significance, %1 : (***) ,(n.s): not significant</b>			

Source: Prepared by the researcher based on program data (Eviews.12).

It is clear from Table (3-7) above that the statistical value of the test reached (29.015) with a significance level of less than (1%). This indicates acceptance of the null hypothesis, which states that the fixed effects model is the appropriate and appropriate model to estimate the model in foreign countries. Selected for the period (2008-2020) compared to the pooled regression model.

**B - Hausman Test in order to compare between the fixed effects model and the random effects model.**

Table (5-7) below shows the statistical results of this test as follows:

Table (5-7): Hausman test results for the comparison between the random effects model (FEM) and the random effects model (REM) for the model in selected foreign countries.

Correlated Random Effects – Hausman-Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	13.236559	4	(0.0023)***
level of significance, (**): 5% level of significance, (*): 1% level of %1 :(***) .significance, (n.s): not significant			

Source: Prepared by the researcher based on program data (Eviews.12).

It is clear from Table (3.8) above that the statistical value of the test reached (13.237) with a significance level of less than (1%), and this indicates acceptance of the null hypothesis, which states that the fixed effects model is the appropriate and appropriate model to estimate the model in selected foreign countries for the period (2008-2020) compared to the random effects model.

Therefore, we infer from the above that the best model for estimation is the fixed effects model. Before going to analyze the results of this model, we must apply the fifth step, which is related to conducting diagnostic tests in order to ensure its accuracy and efficiency in describing the model’s data in selected foreign countries.

➤ **Diagnostic tests of the estimated model:**

**A- Testing the normal distribution of the model residuals:**

It is clear from Figure (5-2) below that the statistical value of the Jarque and Berra test reached (0.552) with a level of significance greater than (5%). Therefore, we accept the null hypothesis, which indicates that the residuals generated from the first estimated model follow a normal distribution with a mean equal to zero. With a standard deviation of (0.099).

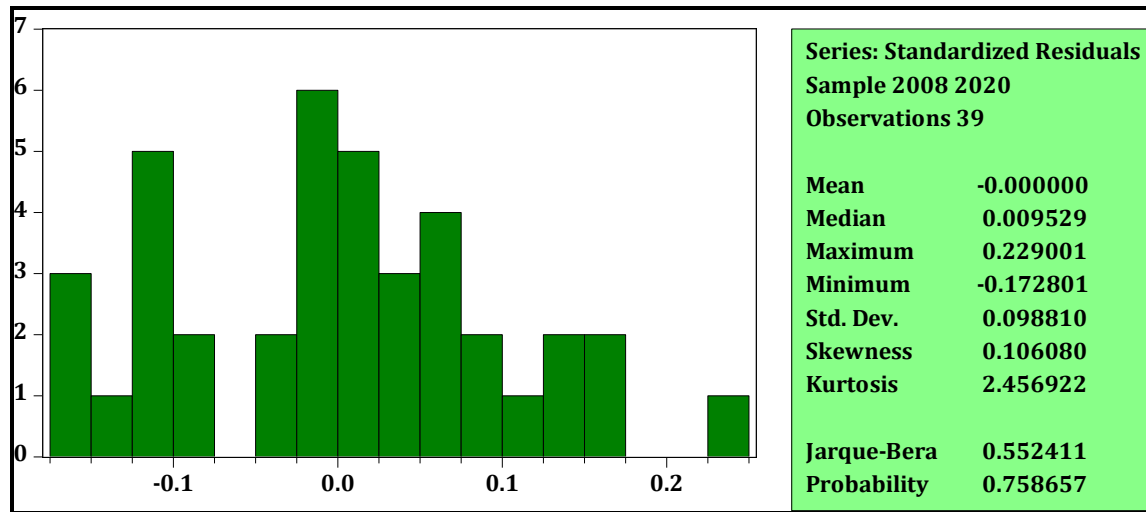


Figure (5-2): Testing the normal distribution of the estimated model residuals in selected foreign countries

Source: Prepared by the researcher based on program data (Eviews.12).

#### B- Testing the problem of autocorrelation between the residuals:

It is clear from Table (5-8) below that the statistical value of the Code Frey and Pagan test reached (0.893) with a level of significance greater than (5%). Therefore, we accept the null hypothesis, which indicates that the estimated model is free of the problem of autocorrelation between the residuals.

Table (5-8): Testing the problem of autocorrelation between the residuals of the estimated model in selected foreign countries

Serial Correlation LM Test: Breusch-Pagan LM			
Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	0.614247	3	(0.8932) <sup>n.s</sup>
– (n.s) indicates non-significant.			

Source: Prepared by the researcher based on program data (Eviews.12).

#### T- Testing the problem of non-constancy of variance:

It is clear from Table (5-9) below that the statistical value of the Brioche, Pagan and Codefrey test reached (1.611) with a level of significance greater than (5%). Therefore, we accept the null hypothesis which indicates that the estimated model enjoys consistency of variance.

Table (5-9): Testing the problem of non-stationarity of variance for the estimated model in selected foreign countries

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.611141	Prob. F(4,34)	(0.1940) <sup>n.s</sup>
Obs*R-squared	6.214382	Prob. Chi-Square(4)	(0.1837) <sup>n.s</sup>

**– (n.s) indicates non-significant.**

Source: Prepared by the researcher based on program data (Eviews.12).

**D- Multicollinearity test between independent variables:**

Table (5-10) shows the variance inflation factor test in order to detect the problem of multicollinearity among the independent variables. It is noted that all central inflation factors were less than (10), which means that the estimated model is free of the problem of multicollinearity among its independent variables.

Table (5-10): Multicollinearity test between the independent variables of the estimated model in selected foreign countries

<b>Variance Inflation Factors (VIF)</b>			
<b>Variable</b>	<b>Coefficient Variance</b>	<b>Un centered VIF</b>	<b>Centered VIF</b>
<b>LNX1</b>	<b>0.607391</b>	<b>3757.232</b>	<b>1.306637</b>
<b>LNX2</b>	<b>0.081613</b>	<b>987.2917</b>	<b>1.493795</b>
<b>LNX3</b>	<b>0.001975</b>	<b>2.497432</b>	<b>2.452933</b>
<b>X4</b>	<b>0.000161</b>	<b>3.968882</b>	<b>1.744597</b>
<b>C</b>	<b>2.949434</b>	<b>3505.479</b>	<b>NA</b>

Source: Prepared by the researcher based on program data (Eviews.12).

**C- Testing the quality of the estimated model’s predictions:**

Based on the above, the estimated standard model, which represents the relationship between the independent variables and the dependent variable in selected foreign countries for the period (2008-2020), was significantly significant, and its explanatory power exceeded (94%), and it does not suffer from any problem of The problems facing standard models, and therefore this relationship is best represented, and this can be seen through the graph (5-3) below, which shows the great convergence between the actual values and the predicted values of agricultural output as a percentage of the GDP, and as in the figure below. :

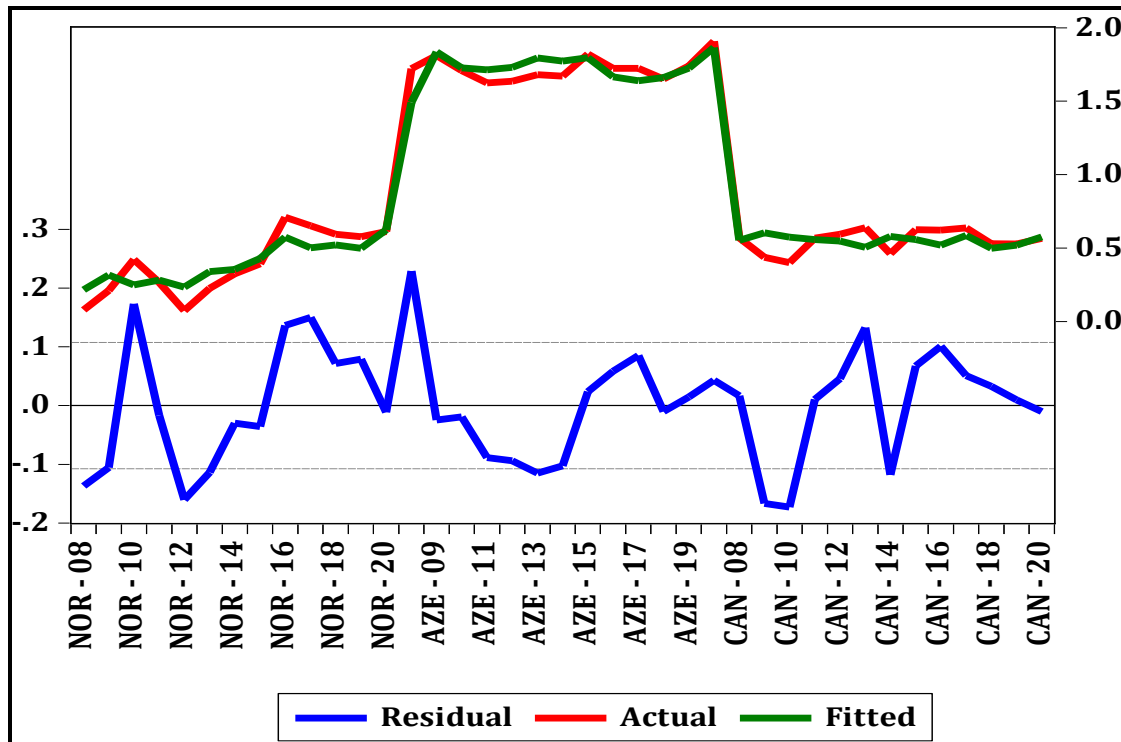


Figure (5-3): Actual and predicted values of agricultural output as a percentage of GDP in selected foreign countries

Source: Prepared by the researcher based on program data (Eviews.12).

➤ **Economic analysis and interpretation of the results of the best and most appropriate model:**

Since the comparison tests between the three models have confirmed that the best and appropriate model for estimating the model in selected developed countries for the period (2008-2020) is the fixed effects model, we will analyze and interpret its results shown in Table (4.5) above, as follows:

I. There is a positive, significant relationship between the performance of sovereign funds and agricultural output as a percentage of GDP, at a significance level less than (1%), meaning that increasing the performance of sovereign funds by (1%) will lead to an increase in agricultural output by (0.598%).

II. There is no significant relationship between total domestic investments and agricultural output as a percentage of GDP.

III. There is a positive, significant relationship between spending on research and development and agricultural output as a percentage of GDP, at a significance level less than (10%), meaning that increasing spending on research and development by (1%) will lead to an increase in agricultural output by (0.682%).

IV. There is a significant inverse relationship between foreign direct investment and agricultural output as a percentage of GDP, at a significance level less than (1%), meaning that increasing foreign direct investment by (1%) will lead to a decrease in agricultural output by (0.013%).

V. The constant or segment has an insignificant adverse effect on agricultural output at a significance level greater than (5%).

### **Conclusions and suggestions:**

#### **Conclusions:**

1. There is a positive, significant relationship between the performance of sovereign funds and agricultural output as a percentage of GDP, at a significance level less than (1%), meaning that increasing the performance of sovereign funds by (1%) will lead to an increase in agricultural output by (0.598%) in The three countries, and this proves the validity of the study's assumption that there is a positive moral relationship between the performance of sovereign funds and the sustainability of the agricultural sector, represented by agricultural output as a percentage of the gross domestic product.
2. The agricultural sector in the three countries does not benefit from the increase in total domestic investments.
3. There is a positive, significant relationship between spending on research and development and agricultural output as a percentage of GDP, at a significance level less than (10%), meaning that increasing spending on research and development by (1%) will lead to an increase in agricultural output by (0.682%) In selected foreign countries, it is consistent with economic theory.
4. There is a significant inverse relationship between foreign direct investment and agricultural output as a percentage of GDP, at a significance level less than (1%), meaning that increasing foreign direct investment by (1%) will lead to a decrease in agricultural output by (0.013%). In selected foreign countries.
5. Comparison tests between the three models confirmed that the fixed effects model is the best and appropriate model to estimate the model in the selected foreign countries for the period (2008-2020).

#### **suggestions:**

1. Canadian sovereign funds need to improve further in their performance to obtain full marks, similar to Norway and Azerbaijan, and both Norway and Azerbaijan must maintain the performance of their sovereign funds.
2. The three countries need to increase their spending on research and development, especially Azerbaijan, because it has a positive moral impact on agricultural sustainability.
3. The need for both Canada and Azerbaijan to direct foreign investments towards agricultural projects.
4. It is necessary for Norway to help rentier developing countries transfer their experience in managing sovereign funds.

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## Appendices

Appendix No. (1): Annual data for study variables in selected foreign countries for the period (2008-2020)

Countries	Years	Agricultural output as a percentage of GDP	Performance of SWFs	Total domestic investment as a percentage of GDP	R&D spending (% of GDP)	Foreign direct investment, net inflows (% of GDP)
Countries	Years	Y	X1	X2	X3	X4
NOR	2008	1.082553	10	25.78315	1.55448	4.426208
NOR	2009	1.236089	10	24.2957	1.72472	2.225859
NOR	2010	1.524785	10	24.98869	1.64999	5.018944
NOR	2011	1.304837	10	25.44598	1.62712	2.053676
NOR	2012	1.077275	10	25.87203	1.62087	5.440562
NOR	2013	1.253036	10	27.32762	1.65238	-0.26018
NOR	2014	1.383431	10	27.20999	1.71506	0.646204
NOR	2015	1.48183	10	26.91884	1.93526	1.873994
NOR	2016	2.033899	10	27.72642	2.0446	-5.03255
NOR	2017	1.918779	10	27.55283	2.09919	1.468743
NOR	2018	1.811199	10	27.72684	2.04781	-1.28796
NOR	2019	1.782461	10	29.61144	2.15605	3.995134
NOR	2020	1.843929	10	31.35212	2.27804	-1.11597
AZE	2008	5.595806	10	18.69363	0.16554	8.161104
AZE	2009	6.121933	10	18.94864	0.24976	6.547465
AZE	2010	5.521253	10	18.05958	0.21848	6.337255
AZE	2011	5.07565	10	20.26785	0.21084	6.800503
AZE	2012	5.13977	10	22.31672	0.21427	7.596522
AZE	2013	5.366264	10	25.65794	0.20969	3.532116
AZE	2014	5.319407	10	27.51004	0.20978	5.888466
AZE	2015	6.177455	10	27.91357	0.22232	7.626067

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AZE	2016	5.604946	10	25.68134	0.20637	11.88281
AZE	2017	5.607369	10	24.37893	0.18468	7.016695
AZE	2018	5.212506	10	20.12948	0.18416	2.977975
AZE	2019	5.695258	10	20.30778	0.20013	3.121831
AZE	2020	6.738947	10	23.66595	0.2239	1.187904
CAN	2008	1.768274	9	24.0725	1.85578	4.515137
CAN	2009	1.549893	9	21.95949	1.91742	1.524131
CAN	2010	1.493236	9	23.482	1.82528	1.837256
CAN	2011	1.765664	9	24.15145	1.78714	2.137833
CAN	2012	1.811346	9	24.86754	1.77232	2.700169
CAN	2013	1.894232	9	24.90768	1.7054	3.629804
CAN	2014	1.586548	10	24.87071	1.71417	3.553903
CAN	2015	1.869836	10	23.82159	1.69324	3.853895
CAN	2016	1.862226	9	22.76112	1.72873	2.23835
CAN	2017	1.889995	10	23.55047	1.6858	1.537521
CAN	2018	1.699892	9	23.37731	1.67578	2.469357
CAN	2019	1.697079	10	23.04242	1.59123	2.806767
CAN	2020	1.762322	10	22.25692	1.69638	1.844172

**Sources:**

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