

Economic Growth, Export and Eximbank Loans: Toda-Yamamoto Causality Test

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ABSTRACT

Following the choices made on January 24, Türkiye has transitioned to an export-oriented economic development model, marking a significant shift in its economic strategy. In subsequent years, the Turkish economy has endeavored to integrate more with the global economy and align with the liberalization mandates of the contemporary era. The implementation of an export-oriented economic growth model necessitated resources to finance the export-driven production strategy, leading to the establishment of Eximbank in 1987 to address this resource requirement. Eximbank, primarily established to finance exports, also indirectly fosters the expansion of the Turkish economy. This study aims to examine the causal link between net exports, which directly influence economic growth, and the financing extended by Eximbank. The study will look at how economic growth, Eximbank loans, and Türkiye's exports are connected by using the Toda-Yamamoto (1995) Causality Test on data from 1999 to 2024, after checking for stability with ADF and PP Unit Root Tests. The study indicates that fluctuations in Eximbank credits may influence exports and economic growth, while economic growth may concurrently affect Eximbank credits and exports. The study's conclusion also presents recommendations pertinent to the research.

Keywords: International Economics, Export, Economic Growth, Eximbank Loans

JEL Classifications: F14, F63, G15

Ekonomik Büyüme, İhracat ve Eximbank Kredileri: Toda-Yamamoto Nedensellik Analizi

ÖZ

24 Ocak kararlarıyla birlikte ekonomik büyüme modelinde köklü değişime giden Türkiye, bu tarihten itibaren büyüme modeli olarak ihracata dayalı bir ekonomik büyüme modelini benimsemiştir. İlerleyen yıllar itibarıyla dünya ekonomine daha fazla entegre olmaya başlayan Türk ekonomisi, çağın gerektirdiği ekonomide liberalleşmeye ayak uydurmaya çalışmıştır. İhracata dayalı bir ekonomik büyüme modelinin benimsenmesi neticesinde ihracata dayalı üretim şeklinin finansmanı için kaynak ihtiyacı doğmuş ve bu kaynak ihtiyacının finansmanı için 1987 yılında Eximbank kurulmuştur. Temel amacı ihracatın finansmanı olan Eximbank, aynı zamanda Türkiye ekonomisinin büyümesine de dolaylı yoldan katkı sağlamaktadır. Bu çalışmada, ekonomik büyümeye direk etkisi bulunan net ihracatla Eximbank tarafından sağlanan krediler arasındaki nedensellik ilişkisi araştırılmak istenmektedir. Ekonomik büyüme, Eximbank kredileri ve Türkiye'nin ihracatı arasındaki nedensel ilişkinin 1999-2024 yıllarını kapsayan veri seti kullanılarak Toda-Yamamoto (1995) Nedensellik Testi ile araştırılacağı çalışmada önce ADF ve PP Birim kök Testleri yapılmıştır. Çalışmanın sonucunda, Eximbank kredilerindeki bir değişimin ihracat ve ekonomik büyümenin nedenseli olabileceği; aynı zamanda ekonomik büyümenin de Eximbank kredilerinin ve ihracatın bir nedenseli olabileceği ortaya konulmuştur. Çalışmanın sonuç kısmında çalışma ile ilgili görüşlere de yer verilmektedir.

Anahtar Kelimeler: Uluslararası İktisat, İhracat, Ekonomik Büyüme, Eximbank Kredileri

JEL Sınıflandırması: F14, F63, G15

1. Introduction

Türkiye, having restructured its long-standing development policy through the January 24 decisions, has forsaken the growth model based on import substitution in favor of an export-oriented growth model. Since the 1980s, Türkiye's economic policymakers have implemented significant measures to liberalize the economy, aiming to elevate the nation to the status of emerging countries and to anchor development in local industry.

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Makale Gönderim ve Kabul Tarihleri/ Article Submission and Acceptance Dates: 04.06.2025-11.08.2025

Citation/Atf: Özyayturk, İ. (2025). Economic growth, export and eximbank loans: toda-yamamoto causality test. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 57, 317-326. <https://doi.org/10.52642/susbed.1713947>

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Selecting an export-oriented growth strategy has yielded significant benefits and contributions to economic expansion. The rise in demand for exported commodities has resulted in an expansion of the country's production capacity, an increase in national income, and therefore, a rise in employment rates. The rise in export quantities has afforded producers cost benefits through economies of scale, resulting in enhanced savings. The augmentation of savings has resulted in a reduction in capital costs within financial markets. Investors able to secure financing at lower costs have shifted towards technology product investments due to more competitive market circumstances, thereby fostering economic growth. Conversely, the foreign cash generated from exports has fortified the capital structures of firms, allowing those with enhanced capital to pursue additional projects. Often, countries can enhance these advantages further.

To enhance Türkiye's economic well-being, elevate it to the status of developed nations, and augment its per capita income, both official institutions and the private sector provide an extensive array of loans. These loans are available to both people and organizations. The primary objective of these loans is to enhance export levels and thereby stimulate economic growth by offering direct or indirect financial assistance to exports. Loans for this purpose are given both directly to institutions in need (such as Eximbank, leasing, factoring, forfaiting, etc.) and indirectly (including tax refunds, anti-dumping regulations, subsidies, governmental help, etc.).

This study aims to examine the impact of various loans, particularly Eximbank loans, on economic development and exports and to determine their causal relationship with gross domestic product (GDP), a key indicator of exports and economic growth. Eximbank offers short-, medium-, and long-term cash and non-cash loans to exporters, makers of export items, and contractors working internationally. Besides financing programs, Eximbank provides insurance and guarantee programs for exporters and has developed a framework to address all cash and non-monetary requirements of exporters. The study will examine the causal link among the three specified variables. The study addresses a deficiency in the literature about the timeframe and factors it encompasses. The study examines the causative link between the variables utilizing the Toda-Yamamoto (1995) Causality test. This test's benefit over other causality tests is the preservation of information and the retention of the whole number of observations, as it does not use differencing. This test was so favored.

The study has four sections. The introductory part presents the overarching theoretical framework of the investigation. The subsequent part contains the literature review that will underpin the investigation. This section examines research undertaken in prior years. The third component of the paper delineates the analytical methodologies employed in the research. This section presents the values derived from the implemented analytical techniques. The final segment of the investigation is the conclusion section. The conclusion section presents an assessment of the results derived from the analysis. This section provides recommendations for researchers engaged in the study and for individuals involved in the sector.

2. Literature Review

While the role of exports in economic growth is a well-examined subject, the financing mechanisms behind them that facilitate this growth receive less attention. The variety of resources available influences the funding options for exports, which fluctuate over time. This section will present research that examines these problems that have been published in the literature.

Kletzer and Bardhan (1987) conducted a study indicating that an increase in export credit supply correlates with higher export rates, thereby encouraging and promoting exports. The authors conducted a theoretical investigation into the impact of financial markets on international trade. The study employing the Heckscher-Ohlin-Samuelson framework indicates that variations in countries' credit markets lead to differences in export financing, contingent upon their comparative advantages. Ross and Pike (1997) investigated the management of export credit risks in trade credit offers and the impact of this management on exports, utilizing Canadian export data. The study utilizing the survey method concluded that current trade credit models inadequately explain export credit decisions. Abraham and Dewit (2000) investigated the impact of export insurance on export levels. The analysis employed panel data to examine data from official agencies for export insurance alongside data from Germany, Belgium, the United Kingdom, and France. The authors assert that export promotion does not inherently result in trade

distortions. Beck (2002) examines the relationship between financial development and manufacturing trade. This study utilizes 30 years of panel data from 65 countries spanning 1966 to 1995, concluding that financial development significantly influences both export levels and the trade balance of manufactured goods. Egger and Url (2006) analyze the impact of public export credit guarantees on the volume of international trade. Analysis of disaggregated panel data on Austrian goods exports from 1996 to 2002 reveals that public export credit guarantees significantly enhance international trade volume. Moser, Nestmann, and Wedow (2008) examine the assertion that public export credit guarantees mitigate trade flow friction and consequently enhance exports. This study employs panel data analysis covering the period from 1991 to 2003. The authors demonstrate that public export guarantees exert a statistically and economically significant positive influence on exports. This indicates their effectiveness in promoting exports. Amiti and Weinstein (2009) investigate the relationship between the deterioration of bank health and significant declines in exports in relation to output. The analysis of a dataset encompassing the Japanese financial crises from 1990–2010 indicates that the stability of financial institutions significantly influences firm-level exports in times of crisis.

Bahmani (1993) examines the potential bidirectional causation between export growth and economic growth, as measured by production, in the literature on this relationship. The study shows that there is strong evidence that export growth and production growth influence each other in almost all the countries examined, based on yearly data analysis. Bahmani and Domac (1995) investigate the correlation between economic growth and commerce in their research. The study, employing cointegration and error correction modeling techniques on yearly data from 1923 to 1990, indicated that a long-term link exists between Turkish exports and domestic output. Ramos (2001) examines the Granger causality among exports, imports, and economic development in Portugal from 1865 to 1998. The study does not confirm a unidirectional causation between the examined factors. A reciprocal relationship exists between export-output growth and import-output growth. Hatemi-J (2002) examines the causal link between export growth and economic development in Japan using enhanced Granger causality tests with a bootstrap simulation approach. The projected findings indicate that Granger causality is bidirectional during the period from 1960 to 1999. The established bidirectional causality demonstrates that export expansion is a fundamental component of Japan's economic growth process. Awokuse (2003) looks again at the idea that exports drive economic growth in Canada by studying how changes in exports affect the country's overall economic growth using specific statistical models called vector error correction models (VECM) and the extended vector autoregressive (VAR) method created by Toda and Yamamoto (1995). The analysis reveals a long-run stationary state among the six model variables, with a unidirectional Granger causal flow from real exports to real GDP. Mah (2005) investigates the causal relationship between export expansion and economic development in China, utilizing data from 1979 to 2001. The author, who developed a model permitting varying levels of integration, indicates that they are co-integrated. Examining the results of the error correction model reveals a bidirectional causation between the variables, which confirms previous findings. Özekenci (2024) endeavors to identify the optimal market possibilities for export enterprises within the iron and steel sector in his research. The author, who analyzes the data sets of pertinent countries and the criterion weights using the FUCOM and LOPCOW methods, identifies Canada, the United Arab Emirates (UAE), Germany, Japan, and Malaysia as the most favorable market alternatives for iron and steel export companies, whereas Venezuela, Mexico, Peru, Colombia, and the UK are deemed the least favorable market alternatives.

The principal empirical studies in the literature demonstrating that a rise in economic growth positively influences financial deepening are as follows: Shan and Morris (2002) examined the correlation between financial development and economic growth, employing the Toda & Yamamoto (1995) causality test methodology in their study. Analysis of quarterly data from 19 OECD nations and China revealed insufficient evidence that financial development directly or indirectly propels economic expansion. Al-Yousif (2002) investigated the characteristics and trajectory of the link between financial development and economic growth utilizing time series and panel data from 30 developing nations during the period 1970–1999. The author determined that financial development and economic expansion are mutually causative, indicating bidirectional causation. The essay by Thangevelu and Jiunn (2004) empirically investigates the

dynamic link between financial development and economic growth in Australia, focusing on bank-based and market-based financial systems. The author supports using a time series method with the VAR model to show the dynamic link, concluding that financial intermediaries and financial markets affect economic growth in different ways because they serve different roles in the local economy.

The findings derived from the literature review enhance the study's foundation. The article addresses a deficiency in the literature on the temporal scope, methodological applicability, and data ownership. The next part presents the study's methodology and the outcomes of the conducted analysis.

3. Methodology and Empirical

This study looked at how Eximbank loans, exports, and economic development are connected by using the Toda-Yamamoto (1995) causality test, with yearly data from 1999 to 2024 for Türkiye. A thorough examination of the literature reveals that the correlation between Eximbank loans and exports has been analyzed alongside several other macroeconomic factors. This section provides information on the variables and the analysis that will underpin the study. Table 1 presents the factors utilized in the investigation.

Table 1. A Brief Synopsis of Criteria

Indicators	Codes	Source
<i>Eximbank Loans</i>	LNEXB	<i>Turkish Eximbank Database</i>
<i>Annual Export of Türkiye</i>	LNEXP	<i>World Bank (WB)</i>
<i>Gross Domestic Product (GDP)</i>	LNGDP	<i>World Bank (WB)</i>

To implement the Toda-Yamamoto (1995) test, it is essential to first create the VAR model and ascertain the necessary lag duration. Table 2 presents the findings for ascertaining the suitable lag duration.

Table 2. Lag Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-26.1393	NA	0.002276	2.428271	2.575527	2.467338
1	42.44223	114.3025*	1.60e-05	-2.536853	-1.947826*	-2.380584*
2	52.36988	14.06416	1.55e-05*	-2.614156*	-1.583359	-2.340686

* indicates lag order selected by the criterion

Table 2 shows that the best lag time for the model is 1 according to the SC, HQ, and LR tests, but it is 2 based on the AIC and FPE tests. According to these findings, the optimal lag time (p) was determined to be 2, taking into account the AIC and FPE values, which are commonly utilized in practice.

After determining the appropriate lag length, we used the LM test to determine if there was an autocorrelation problem within this lag length. Table 3 below presents the results of the autocorrelation test for the model with a lag length established at 2.

Table 3. Autocorrelation LM Test

Lag	LM Stat.	Prob.
1	13.34300	0.1477
2	4.456861	0.8789
3	9.285524	0.4113
4	15.21948	0.0851
5	9.935339	0.3557
6	11.39073	0.2499
7	10.17930	0.3362
8	4.665750	0.8624
9	5.122292	0.8235
10	8.348098	0.4995

The Autocorrelation LM Test posits the following hypotheses:

H_0 : No autocorrelation problem.

H_1 : An autocorrelation problem.

The findings in Table 3 indicate that the null hypothesis H_0 , positing the absence of autocorrelation issues at the specified lag length (p) of 2 and further delays, was accepted.

The subsequent portion of the research elucidates the ADF and PP unit root tests employed to assess the stationarity of the series. Since it calls into question the validity of the causality test between the variables, the series' non-stationarity is advantageous. Consequently, unit root tests were conducted.

3.1. The Extended Dickey-Fuller (ADF) and Phillip-Perron (PP) Unit Root Tests

In time series analysis, to establish econometrically meaningful correlations between series, the examined series must be stable. Typically, we employ unit root tests to determine if the series exhibits a stationary structure. The most often utilized test is the unit root test conducted by Dickey-Fuller (1979), which presupposes that the error term is independently and identically distributed. To deal with the correlation between error components, Dickey and Fuller (1981) created the Extended Dickey-Fuller (ADF) unit root test by adding past values of the dependent variable into the model. The following equations illustrate the proposed models for this test:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad (1)$$

$$\Delta Y_t = \beta_0 + \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad (2)$$

$$\Delta Y_t = \beta_0 + \beta_t + \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad (3)$$

Equation (1) illustrates a structure devoid of a constant term and a trend effect; Equation (2) depicts a structure containing just a constant term; and Equation (3) represents a structure exhibiting both a constant term and a trend effect. The stationarity test is initially conducted at the level value. If the level value fails to achieve stationarity, we compute the first difference of the Y_t series. If the series achieves stationarity at $\Delta Y_t = Y_t - Y_{t-1}$, we denote it as $I(1)$, signifying that the first difference renders the series stationary. The series employs the second difference if the first difference fails to achieve stationarity. The procedure for calculating the differences in the series persists until it reaches a stationary state.

Usually, researchers use two hypotheses to investigate the existence of a unit root:

$H_0: \alpha = 0$ ($\theta = 1$) Series is Not stationary

$H_1: \alpha < 0$ ($\theta < 1$) Series is stationary

The Phillips-Perron (PP) test possesses more adaptable assumptions about error terms. In the PP test, error terms are presumed to exhibit weak dependence and heterogeneity. In contrast to the ADF test, to mitigate the issue of autocorrelation, the lags of the dependent variables are excluded from the equations as explanatory factors. The t-statistic for the coefficient α_1 is adjusted using the Newey-West (1987) estimation. The image below illustrates models without constants, with constants, and with constants and trends, respectively.

$$\Delta X_t = \alpha_1 X_{t-1} + \varepsilon_t \quad (4)$$

$$\Delta X_t = \alpha_0 + \alpha_1 X_{t-1} + \varepsilon_t \quad (5)$$

$$\Delta X_t = \alpha_0 + \alpha_1 X_{t-1} + \alpha_2 Trend + \varepsilon_t \quad (6)$$

To check if the series is stationary in the ADF and PP unit root tests, we compare the t-statistics for the coefficient α_1 with the critical values from MacKinnon (1996).

The theoretical framework indicates that the stationarity of the series is assessed in Table 4, with the results presented therein.

Table 4. ADF and PP Unit Root Test Results

Variables	ADF			PP		
	t-stat.	Prob.	Critical Value	t-stat	Prob.	Critical Value
LNEXB	-0.39330	0.8960	-2.98622	-0.47682	0.8802	-2.98622
Δ LNEXB	-3.94084	0.0063***	-2.99187	-3.94084	0.0063	-2.99187
LNEXP	-2.15487	0.2265	-2.98622	-2.15487	0.2265	-2.98622
Δ LNEXP	-3.57348	0.0145**	-2.99187	-3.57348	0.0145	-2.99187
LNGDP	-1.08074	0.707	-2.98622	-1.12399	0.6898	-2.98622
Δ LNGDP	-3.66479	0.0118**	-2.99187	-3.66479	0.0118	-2.99187

Note: The critical value represents the 5% significance level.

3.2. Toda-Yamamoto (1995) Causality Test

As the technique of investigation, the Toda-Yamamoto causality analysis was selected as the method of choice. Toda-Yamamoto (1995) demonstrated that this test possesses an asymptotic chi-square (χ^2) distribution with k degrees of freedom. This is the case regardless of whether the relevant series is stationary, stationary around the trend, or co-integrated. One of the most important features of the method that Toda and Yamamoto introduced is that it removes the need for possibly misleading pre-tests used to find unit root and cointegration properties. In this way, the use of the appropriate procedure helps reduce the likelihood of making an erroneous determination regarding the degree of integration of the series. On the other hand, because it is applied to the level values of the series, it also prevents the information loss that occurs as a result of taking differences.

The Toda-Yamamoto method estimates the VAR ($k+d_{\max}$) model as follows, in accordance with the above definition:

$$y_t = \delta_1 + \sum_{i=1}^{k+d_{\max}} \alpha_{1i} y_{t-i} + \sum_{j=1}^{k+d_{\max}} \beta_{1j} x_{t-j} + \varepsilon_{1t} \quad (7)$$

$$x_t = \delta_2 + \sum_{i=1}^{k+d_{\max}} \alpha_{2i} x_{t-i} + \sum_{j=1}^{k+d_{\max}} \beta_{2j} y_{t-j} + \varepsilon_{2t} \quad (8)$$

In equations 7 and 8, k denotes the suitable lag length, whereas d_{\max} represents the maximum degree of variable integration inside the system. Furthermore, it is presumed that the error terms ε_{1t} and ε_{2t} possess a mean of zero and a constant covariance matrix. Toda-Yamamoto, an advanced Granger causality study, is a bifurcated methodology: The first phase constructs a VAR model, yielding outcomes contingent upon the lag duration. Unit root tests using the AIC and SIC information criteria establish the optimal lag length (k) and the maximum integration levels (d_{\max}) of the model's variables. In the second step, the Toda-Yamamoto causality test uses a VAR model of size ($k+d_{\max}$) by applying a method that handles unrelated equations, after finding the best lag length (k) and the highest level of stability (d_{\max}) of the series being studied. To check if there is a two-way cause-and-effect relationship between the variables, the hypotheses $H_0: \alpha_{1i} = 0$ and $H_0: \alpha_{2i} = 0$ are tested using the modified WALD test statistic, which follows a χ^2 distribution. If the calculated MWALD test statistic is greater than the critical value for k degrees of freedom, we reject the hypotheses mentioned above. If the computed MWALD test statistic exceeds the critical value for k degrees of freedom, the aforementioned hypotheses are rejected. The Toda-Yamamoto causality test results of the study are given in Table 5.

Table 5. Toda-Yamamoto Causality Test Results

Causalities	k+dmax*	Wald Test	Chi-Square Table Value	Decisions
		Chi-Square Test Stat.		
LNEXB - LNEXP	2+1	0.010782**	9.059731	Casual Relationship LNEXB => LNEXP
LNEXB - LNGDP	2+1	0.359936	2.04366	No Casual Relationship
LNEXP - LNEXB	2+1	0.654679	0.847221	No Casual Relationship
LNEXP - LNGDP	2+1	0.799379	0.447841	No Casual Relationship
LNGDP - LNEXB	2+1	0.001083**	13.65552	Casual Relationship LNGDP => LNEXB
LNGDP - LNEXP	2+1	0.000000**	23.03498	Casual Relationship LNGDP => LNEXP

**Considered at a 5% significance level.

*k + dmax = VAR (d: Lag Length + dmax: Maximum Degree of Stationarity)

Table 5 indicates a causal relationship between Eximbank loans and exports. This outcome indicates that the Eximbank loans significantly influence exports, with export rates expected to rise with an increase in export credit availability to stimulate and enhance exports. Furthermore, we can identify a causal link between economic growth, Eximbank loans, and export rates. This position may be viewed as a desire for economic growth to stimulate exports, hence augmenting Eximbank loans and volume while simultaneously influencing exports—a fundamental aspect of macroeconomics.

4. Conclusion and Recommendations

This study analyzed theoretical and empirical literature to investigate the link among the economic growth of the Turkish economy, Eximbank loans, and exports in all aspects. A time series was constructed with yearly data from 1999 to 2024. A model was developed for the provided dataset, and ADF and PP unit root tests were conducted to ascertain if the series exhibited stationarity at the same level. The findings indicated that the series was appropriate for the Toda-Yamamoto (1995) Causality test. The test revealed a causal association between the variables identified in the study.

The findings of the causality test shown in Table 5 indicate a causal link from Eximbank loans to Türkiye's exports. In other terms, Eximbank loans may influence alterations in exports. Advancements in national financial systems can influence the evolution of their capital structures. A unilateral causal link from export loans to export rates may be identified. Numerous research studies in the literature (Melitz, 2003; Chor and Manova, 2012; Wamboye and Mookerjee, 2014; Agarwal and Wang, 2016) indicate a comparable link.

Correspondingly, the data shown in Table 5 indicate that an increase in economic growth influences financial deepening. This circumstance yields a substantial outcome on a macroeconomic level. The resource framework established for export finance may evolve concurrently with the expansion of the nation's economy. This unilateral causal outcome is also documented in the literature by many investigations (Rousseau and Wachtel, 1998; Ceylan and Durkaya, 2010).

The unidirectional causal link between economic development and exports is also acknowledged in the literature (Chow, 1987; Hsiao, 1987; Chaudhary, Shirazi, and Choudhary, 2007). Economic growth may stem from exports or serve as a catalyst for them. This circumstance is explicitly shown in the equation of income growth derived from expenditure in macroeconomics.

Upon examination of all identified causal links, it is evident that each possesses significance from a macroeconomic perspective. Unilateral or bilateral ties may fluctuate based on the economic frameworks of nations and certain timeframes. This research may differ from others in terms of economic frameworks and timeframes. In this regard, it also enhances the literature. This study serves as a resource for researchers and professionals in the field who are interested in the topic.

Çıkar Çatışması Beyanı / Conflict of Interest

Çalışmada herhangi bir kurum veya kişi ile çıkar çatışması bulunmamaktadır.
There is no conflict of interest with any institution or person in the study.

İntihal Politikası Beyanı / Plagiarism Policy

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Bu çalışmada Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi kapsamında belirtilen kurallara uyulmuştur.
In this study, the rules specified within the scope of the Higher Education Institutions Scientific Research and Publication Ethics Directive were followed.

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