"International economic and social determinants of the state economic security: A causal analysis"

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INTERNATIONAL ECONOMIC AND SOCIAL DETERMINANTS OF THE STATE ECONOMIC SECURITY: A CAUSAL ANALYSIS

Abstract

The priority task for ensuring the economic security of a country, which is especially noticeable in the rapidly changing conditions of the contemporary global world, is to forecast challenges and threats. Economic security is one of the necessary conditions for state development, which provides guidelines for making major social and economic decisions. There are a few studies on the determinants of the economic security and no data about security determinants that are required to monitor it. The study aims to identify possible links between leading determinants of the economic security. For this purpose, on the example of Ukraine, causal links between the formation of real GDP (as the leading determinant that characterizes the economic security of the state), 11 determinants that indicate the level of international economic development, and 6 determinants of social development for the period 2014–2020 were determined. With a 5% level significance, the impact on the volume of real GDP of 14 determinants of state economic security was noted and specific time lags were defined. Besides, the bilateral causal effect and lack of causal connection between individual determinants were mentioned. Findings are helpful for effective public administration. In addition, active measures are needed to combat corruption, shadow and criminal economy, and state protection of domestic producers operating in the military, food, information, and energy security sectors.

Keywords	state economic security, GDP, causal analysis, economic development, public administration
JEL Classification	G17, C32

INTRODUCTION

Crisis developments in the world economy, a sharp increase of international economic conflicts, hostile actions of external actors (e.g. sanctions and trade wars) naturally damage the interests of national economies. A revival of interest in theoretical and applied research is related to the economic security of the state. On one hand, digital economy at a current stage of economic and social development expands the possibilities of human development. On the other hand, the transition to a new economic order faces some challenges and contradictions caused by globalization and informatization, which affect all spheres of life and requires a comprehensive approach to national economic security. State economic security is formed due to various determinants, which largely explain differences and features of foreign and domestic policies. An essential task in ensuring the state economic security is its assessment and identification of directions for its strengthening. However, currently, there is a lack of economic research and insufficient attention is paid to the comparative assessment of the economic security.

Economic security affects the effective functioning of the state. In its most general form, an effective state is a state that defends its national

interests and ensures its national economic security, both in good times and in moments of crisis, and in conditions of unlimited international competition. In practice, one cannot solve any of the tasks facing a modern state without ensuring economic security.

The foundation for strengthening the economic security of a country is the development of production and technological base, national innovation system, increasing the country's investment attractiveness, modernization, development of priority sectors of the national economy, creation and improvement of a business climate.

For a country, it is essential to increase the efficiency of economy regulations to achieve sustainable economic growth and stability of the financial system, its functioning and development, thus increasing and ensuring the economic security of the state.

1. LITERATURE REVIEW

The conceptual foundations of economic security take place in conditions of significant uncertainty and are methodologically unsupported to an appropriate extent. Despite this, reforms formation continues, which does not fully meet the characteristics and needs of the economy. In some sectors of the economy, state economic security is now increasingly focused on creating conditions for overcoming the COVID-19 pandemic with attempts to preserve the potential for future growth.

The problems of assessing the state economic security are directly interconnected with the issues of theoretical substantiation of its essence and content. The development of any economy in the face of intensified global competition, globalization of financial flows, and excessive money supply are significantly limited. Kozmenko and Korneev (2014) concluded that the harmonious regulation of the financial and real sectors of the economy in its financialization is the basis for the sustainable development of economic processes in a country. D'yakonova et al. (2018) profoundly investigated methodological bases for the efficiency assessment of economic security management of the enterprises in the global environment.

Isroilov et al. (2020) used a system of determinants, such as budget revenues and income, inflation, external debt, and unemployment, to evaluate social, economic, financial, political, environmental, and epidemiological situations. The study admitted general negative tendentious to strengthen economic security considering the Covid-19 pandemic. Frolov et al. (2017) drew attention to the support

of small businesses, the sustainable development of which is the key to the state economic revival. It was noted that the development of the economic environment is influenced by negative economic factors and insufficient state financial and legal support, which is the basis for the development of the shadow economy. This, in turn, reduces the economic security of the state. In addition, Bulatova et al. (2020) characterized the influence of global financial transformation. The correlation between global and regional financial trends was identified, which shaped CEE countries' economic security and revealed their economic security shifts. Gryshova et al. (2020) used a similar approach. As the basis for assessing the economic security of the state, they identified a hierarchically structured system of determinants, which includes a set of composite, complex, and sub-determinants. The study assessed the level of economic security based on international indices and rankings. They identified government concerns to improve economic security, which should become a priority, based on the analysis of the correlation between the level of GDP per capita and individual determinants of the compositional determinant of economic security. At the same time, these concerns could increase the GDP and ensure the sustainable development of the European Union. Thus, Kozmenko and Savchenko (2013) outlined the procedure for calculating the value of the equilibrium of GDP in the formation of policy rules. The multifactor regression model confirmed a statistically significant relationship between the basic parameters of the monetary rule. This can become one of the main tools for developing and implementing monetary policy, the stable development of which is the key to the economic security of the state.

The index method is widely used to ensure the state economic security. For example, Ignatov (2019) studied the main subversive determinants that threatened the prospects of the European Union in the period 2007–2017 since they had an impact on its economic security. The calculation by countries of aggregate average scores of such parameters as debt, real GDP growth, fixed capital investment, productivity, technology, and institutional indicators, allowed conducting an overall assessment of the dynamics of economic security of the European Union. The main factor influencing the economic security of the state was outlined – the growth rate of real GDP as a macroeconomic indicator that shows the evolution of economic production of the country, excluding the impact of inflation or deflation. Cherniavskyi et al. (2021) used similar methods and admitted that ensuring economic security guarantees stable state growth and improves the welfare of the population. To ensure the economic security of Ukraine, a comparative legal analysis was made and a proposal to implement the positive experience of EU countries was identified. In turn, Hnatenko (2021) substantiated the essence and generalized the assessment results of the main factors that influence the economic security of the state. It was mentioned that neglecting economic security could lead to negative socio-economic consequences, a depressed state of the economic branches, increased import dependence level, the bankruptcy of market participants, etc.

As for the methodological approach, there are many models for the analysis of state economic security determinants. Using such multivariate data analysis methods as principal components analysis, level of development, canonical correlation, error correction model, and vector autoregression technology, Guryanova et al. (2017) presented a systematic approach to assess the dynamics of financial security determinants. They selected the most sensitive to external shocks financial security subsystems, as well as sources of threat occurrence. To identify threats and prevent their negative impact, it was proposed to use a set of models, which were identified as the basis of the forecasting and analytical mechanism of the financial security system. As a component of economic security, Haber et al. (2018) studied the financial

security of a country. This approach allows the use of the most important determinants, which makes it possible to outline measures to prevent existing threats. Based on a regression analysis of the determinants of influence relevant to the financial component of economic security as a critical element in ensuring sustainable financial development of a country, it was possible to forecast the level of financial security of a country. At the same time, Reutov et al. (2018) determined threats and destabilizing determinants in advance of a comprehensive system of financial security determinants and threshold values. However, it should be noted that when calculating the level of financial security, the implicit use of methods and compliance with guidelines is insufficient for a comprehensive analysis of the financial security of the state. Kolodiziev et al. (2018) identified the causes of the spread of crisis trends and justified the most effective levers of regulatory influence on the parameters of the banking system, as well as analyzed causations. Using a binary logit model, Kozmenko and Belova (2015) found a functional relationship between the crisis in the economy and the activities of systemically important banks. At the same time, Boța-Avram et al. (2018) used similar methods to identify a two-way causal link between components such as country-level governance, economic growth, and sustainable development. This was done to draw attention to the relationship between country-level management and economic growth, on the one hand, and between country-level government and adjusted net savings, as a selected determinant of sustainable economic development, on the other hand. In addition, Hryhoruk et al. (2019) designed the scientific and systematic approach of the economic security composite index. They identified its level based on the double use of Harrington's desirability scale. This proposed approach can be used for another set of partial determinants to assess financial security at the national level.

Systematization of methods to evaluate the state economic security shows that one of the main tasks is to substantiate the criteria and choose a system of their threshold values. State economic security depends on social, economic, financial, political, environmental, and epidemiological conditions.

2. AIM, DATA, AND METHODOLOGY

This study aims to identify possible links between leading determinants of state economic security based on causal analysis of effective public administration.

For the analysis, 18 determinants were selected, which characterize the level of international economic and social development of Ukraine (Table 1). The determinants dynamics are considered in quarterly terms from the first quarter of 2014 to the fourth quarter of 2020 (Table A1). Although most scientists have described 2014 as a year of economic uncertainty, it has been found that this period does not affect the overall quality of the model.

Table 1. Input data for causal analysis of state economic security determinants

	Determinant	Code
1	Real GDP	GDP
International economic development determinants		
2	Exports of goods and services, real value	EXP
3	Imports of goods and services, real value	IMP
4	Balance of payments (current account), goods and services, net	BAL_PMNT_CA
4	Balance of payments (financial statement)	BAL_PMNT_FA
6	International liquidity (total reserves, except gold)	IL_TR

	Determinant	Code
7	International funds (official reserve assets)	IL_ORA
8	Global liquidity (gold)	IL_GOLD
9	Changes in world trade	WT_%
10	The shift in industry volume (world)	IV_%
11	Trade policy uncertainty index	TRP_UN_I
12	Geopolitical risks index	GEO_I
Social development determinants		
13	Household consumption expenditures (actual)	H_CNSP_EXP
14	Social benefits	SC_BNFT
15	Unemployment index	UNMP_I
16	Loans for residential real estate to total gross loans ratio	PR_REM
17	Private remittances to Ukraine volumes	PR_INC_RATIO
18	Gross fixed capital formation	GR_FXD_CAP

Given that the statistical data of the model have a pronounced seasonal effect, before the main calculations, it is necessary to deseasonalize the time series and select the seasonal component based on the smoothing of the series. Determinants of real GDP, exports, and imports of goods and services are presented in the calculation of real value, considering seasonal fluctuations and therefore do not require seasonal adjustment. In addition, indices (Trade Policy Uncertainty Index, Geopolitical Risk Index, and Unemployment Index) are not subject to this process.

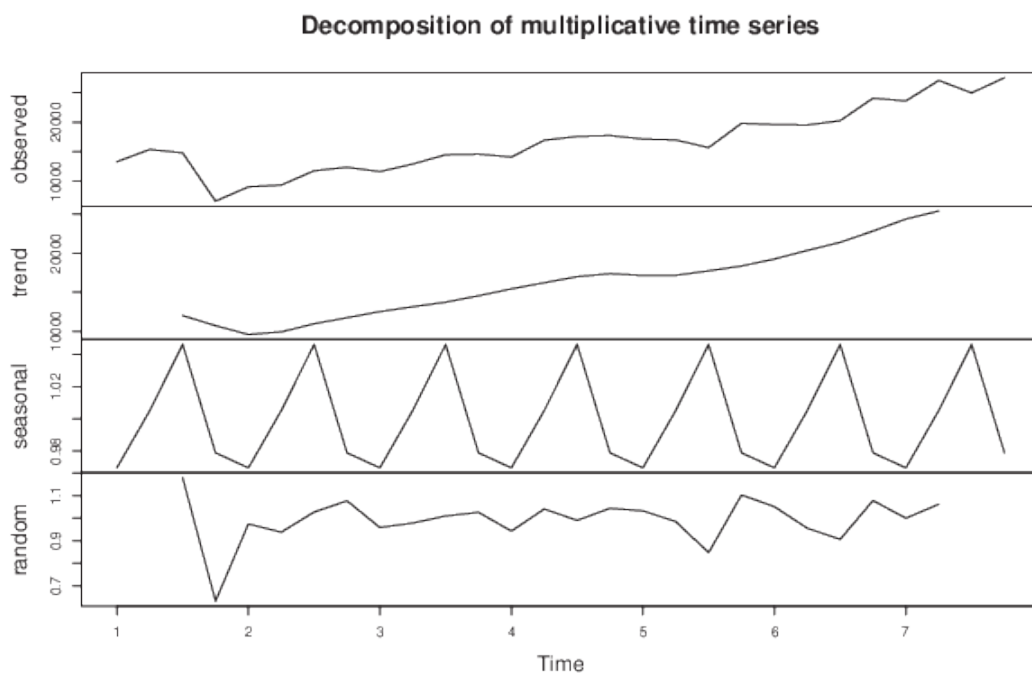The process of deseasonalization was carried out based on multiplicative decomposition with trend

Decomposition of multiplicative time series

Figure 1. International liquidity (*IL_TR*) multiplicative time series decomposition

smoothing. In graphical form, the results of seasonal adjustment of the time series International Liquidity (*IL_TR*) are presented in Figure 1.

Granger's study of causality indicates the influence of selected foreign economic and social determinants on the volume of real GDP.

As already mentioned, an essential prerequisite for the study of causality, according to Granger (1969), is the stationary time series. The most popular test for checking for stationarity is the Augmented Dickey-Fuller test. This study uses the Eviews software and the built-in Unit Root Test package to check the stationary time series of the input data.

The results of the extended Dickie-Fuller test to the input data of the model (18 determinants) allow concluding the stationarity of the time series.

The paper rejects the hypothesis of non-stationarity *I(1)* of the following 5 determinants: *EXP, IL_ORA, GEO_I, PR_INC_RATIO,* and *GR_FXD_CAP.*

10 time series were stationary in the first differences: *GDP, D_IMP, D_Bal_Pmnt_CA, D_Bal_Pmnt_FA, D_IL_TR, IL_ORA, D_WT_%, D_IV_%, D_TrP_Un_I, D_Sc_bnft,* and *D_UNMP_I.*

3 time series were stationary in the second differences: *D_D_IL_gold,D_D_H_cnsp_exp,* and *D_D_Pr_Rem.*

It is optimal to check four lags, which corresponds to 4 quarters or one year. Lags number choice can be explained by the connection between the determinants characterizing the level of social and economic development of Ukraine, and the level of real GDP of the country (at a 5% level of significance). In addition, the statistical significance of selected lags was confirmed based on the Schwartz information criterion.

3. RESULTS

According to Granger (1969), causality is one of the most popular concepts in econometrics. It is based on the hypothesis that the future cannot influence the past.

Granger (2001) presented this hypothesis in the information aspect. To determine whether the variable x is the reason for the formation of the variable y, it is necessary to determine what proportion of the variance of the current value of the variable y explains the previous value of the variable y and whether the change of previous values of the variable x variable y.

The variable x will be the cause of y if x generates a prediction of y from the position of decreasing variance. The results of the Granger test are presented in Figure 2.

Thus, the function built into Eviews allows testing the null hypothesis in both directions and the hypothesis that $b_j = 0$ for $j = 1, ., p.$ for each equation.

Based on the calculations, pairs of time series were selected between which the connection is found (Table 3).

First, the impact on the volume of real GDP is noted, with a 5% level of significance for the following determinants:

- with a lag in the 1 quarter – export of goods and services, import of goods and services;

- with a lag in 1-2 quarters – the balance of payments;

- with a lag in 3-4 quarters – international reserves, changes in world trade.

In turn, the determinants that were influenced by the volume of real GDP included:

- with a lag in the 1 quarter – international liquidity, volumes of private money transfers;

- with a lag in 1-4 quarters – unemployment index, the ratio of loans for residential real estate;

- with a lag in 3-4 quarters – index of geopolitical risks, household consumption expenditures.

A bilateral causal effect was found between the real GDP and the gross fixed capital formation with a lag in the 3 quarter.

Figure 2. Granger test results (fragment)

Table 2. Statistically significant causal links

Null hypothesis	Obs.	F-Statistic	Prob.
1 lag			
D_EXP does not Granger Cause D_GDP	26	5.11289	0.034
D_GDP does not Granger Cause D_GEO_I	26	5.38732	0.03
D_GDP does not Granger Cause D_GR_FXD_CAP	26	4.73645	0.04
D_GDP does not Granger Cause D_IL_TR	26	17.9003	0.0003
D_IMP does not Granger Cause D_GDP	26	5.12004	0.033
D_GDP does not Granger Cause D_UNMP_I	26	14.9209	0.0008
D_GDP does not Granger Cause D_PR_INC_RATIO	26	36.0173	0.000004
D_GDP does not Granger Cause D_PR_REM	26	7.99264	0.01
2 lags			
D_GDP does not Granger Cause D_BAL_PMNT_FA	22	9.69999	0.002
D_GDP does not Granger Cause D_H_CNSP_EXP	25	3.50497	0.05
D_GDP does not Granger Cause D_IL_TR	25	5.20772	0.015
D_GDP does not Granger Cause D_UNMP_I	25	4.54532	0.024
D_GDP does not Granger Cause D_PR_INC_RATIO	25	13.0064	0.0002
D_GDP does not Granger Cause D_PR_REM	25	5.21322	0.015
3 lags			
D_GDP does not Granger Cause D_BAL_PMNT_FA	21	11.37	0.0005
D_GDP does not Granger Cause D_GEO_I	24	3.3125	0.045
D_GR_FXD_CAP does not Granger Cause D_GDP	24	3.31572	0.045
D_GDP does not Granger Cause D_GR_FXD_CAP	24	11.0724	0.0003

Table 2 (cont.). Statistically significant causal links

Null hypothesis	Obs.	F-Statistic	Prob.
3 lags			
D_GDP does not Granger Cause D_H_CNSP_EXP	24	22.8481	0.000003
D_IL_ORA does not Granger Cause D_GDP	24	4.15897	0.022
D_IV_% does not Granger Cause D_GDP	24	6.09487	0.005
D_GDP does not Granger Cause D_PR_INC_RATIO	24	11.5331	0.0002
D_GDP does not Granger Cause D_PR_REM	24	6.00406	0.006
4 lags			
D_GDP does not Granger Cause D_BAL_PMNT_FA	20	13.7052	0.0003
D_GDP does not Granger Cause D_GEO_I	23	3.45675	0.037
D_GDP does not Granger Cause D_GR_FXD_CAP	23	5.15455	0.009
D_GDP does not Granger Cause D_H_CNSP_EXP	23	16.9881	0.00003
D_IL_ORA does not Granger Cause D_GDP	23	4.93895	0.011
D_IV_% does not Granger Cause D_GDP	23	4.97434	0.011
D_GDP does not Granger Cause D_PR_INC_RATIO	23	5.08869	0.01
D_GDP does not Granger Cause D_PR_REM	23	4.7567	0.012

Table 3. Causal relationships between time series

Null hypothesis	1 lag	2 lags	3 lags	4 lags
D_GDP does not Granger Cause D_BAL_PMNT_FA	−	+	+	+
D_EXP does not Granger Cause D_GDP	+	−	−	−
D_GDP does not Granger Cause D_GEO_I	+	−	+	+
D_GR_FXD_CAP does not Granger Cause D_GDP	−	−	+	−
D_GDP does not Granger Cause D_GR_FXD_CAP	+	−	+	+
D_GDP does not Granger Cause D_H_CNSP_EXP	−	+	+	+
D_IL_ORA does not Granger Cause D_GDP	−	−	+	+
D_GDP does not Granger Cause D_IL_TR	+	+	−	−
D_IMP does not Granger Cause D_GDP	+	−	−	−
D_IV_% does not Granger Cause D_GDP	−	−	+	+
D_GDP does not Granger Cause D_UNMP_I	+	+	−	−
D_GDP does not Granger Cause D_PR_INC_RATIO	+	+	+	+
D_GDP does not Granger Cause D_PR_REM	+	+	+	+

It should also be noted that according to the results of calculations, no causal links were found between real GDP and the determinants balance of payments (current account), international liquidity (gold), change in the volume of industry (world), trade policy uncertainty index, and social benefits.

CONCLUSION

The study aimed to identify possible links between leading determinants of state economic security based on the causal analysis. It recognized the feature characteristics of the situation when the real GDP affects the foreign economic and social development determinants of state economic security and vice versa. In summary, 14 main determinants of state economic security affect the level of real GDP and could be managed by public administration.

For ensuring national security through economic growth, the primary efforts should be focused on developing science, technology, and education, improving domestic investment and financial institutions to achieve the required level of security in the military, defense, industrial, and international sectors. Low efficiency of state regulation of the national economy, a decrease in economic growth, the appearance of a deficit in the trade and balance of payments, and a reduction in budget revenues can lead to a slowdown in the transition to innovative development and subsequent accumulation of social problems in a country.

Effective and transparent management of state economic security and coordination of actions of different branches of government in implementing economic reforms do not require only the selection of parameters of economic policy instruments. It is essential to build a comprehensive model that would formalize the impact of monetary, budgetary, tax, etc., components of state economic security on sectors of the economy, develop a forecast of significant macroeconomic changes, and conduct a qualitative analysis. A causal analysis of state economic security adequately reflects the current economic situation. It is quite simple and clear to apply for both scientists and all public officials.

AUTHOR CONTRIBUTIONS

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Project administration: Volodymyr Orlov, Marcin Marczuk.
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APPENDIX A

Table A1. Input data for causal analysis of state economic security determinants

	GDP	EXP	IMP	BAL_ PMNT_ CA	BAL_ PMNT_ FA	IL_TR	IL_ORA	IL_GOLD	WT_%	IV_%	TRP_ UN_I	GEO_I	H_CNSP_ EXP	SC_BNFT	UNMP_I	PR_REM	PR_INC_ RATIO	GR_FXD_ CAP
2014Q1	686595	385089	406445	−1258	−2	13316.27	16.06	1769.26	2.1	3.5	27	310	460079	9.40	5.75	1547	7.9	73973
2014Q2	658887	371329	405197	−742	1	15386.03	6.26	1697.28	2.9	3.4	28	279	474996	9.00	6.04	1686	8.3	77174
2014Q3	629195	330605	334824	−956	1	14816.51	1.11	1568.73	4.5	3.3	20	286	482918	9.30	6.3	1778	8.8	81989
2014Q4	606067	292289	326021	−1650	1	6622.24	3.74	911.09	4.3	3.1	29	246	507014	9.70	6.68	1478	8.2	103976
2015Q1	587734	302569	333209	−660	1	9058.61	5.59	911.31	2.5	1.9	21	236	368591	10.00	7.73	1482	12.5	56401
2015Q2	578056	305926	304005	−241	2	9356.93	5.53	906.77	2.6	2	45	252	348058	9.60	6.12	1769	11.2	66231
2015Q3	581667	305443	296961	−579	2	11783.77	5.92	989.78	0.7	1.5	29	289	392115	9.40	5.97	1840	10.7	77915
2015Q4	581071	283784	292819	−882	4.6	12368.08	8.82	931.91	1.1	0.5	32	208	438377	9.50	6.32	1868	8.6	105570
2016Q1	590087	289637	326394	−1772	−0.5	11631.44	1.39	1090.07	0.6	1.4	54	185	363251	10.30	6.26	1572	9.3	59440
2016Q2	592988	290613	315164	−562	−0.1	12914.06	1.81	1067.64	1.6	1.6	75	122	363303	9.80	6.12	1885	9.1	78206
2016Q3	597449	291348	349831	−2298	−1.3	14495.59	2.87	1093.15	1.5	1.6	44	198	412090	9.60	5.68	2053	8.8	96600
2016Q4	604843	304355	349726	−1821	−3.1	14597.62	2.70	941.71	3.6	3.4	106	225	449957	9.70	5.59	2025	6.9	134445
2017Q1	603978	306262	367033	−1380	−4.2	14102.06	2.65	1021.24	6.6	3.3	91	191	383431	10.50	5.32	1925	7.1	70258
2017Q2	607892	300076	371307	−1766	−4.6	16954.02	3.16	1017.18	4.4	3.7	60	160	406669	10.00	5.06	2262	7	94687
2017Q3	614552	306592	378188	−2736	−4.8	17591.86	2.76	1045.62	5.4	3.9	51	200	442696	9.70	4.74	2466	6.6	108953
2017Q4	617769	307241	393494	−2862	−6	17747.80	2.17	1060.65	5	4.1	47	202	503965	9.90	4.45	2611	5.5	154021
2018Q1	625007	297054	374989	−1890	−7.3	17154.11	1.56	1037.79	2	3.9	261	209	415494	10.00	3.98	2571	6	85856
2018Q2	628465	305686	390168	−1982	−6.3	16993.06	0.91	985.51	3.6	3	229	208	436265	9.30	3.84	2714	6	113461
2018Q3	632826	293426	391730	−4247	−5.6	15700.10	0.30	937.59	2.5	2.6	150	185	496382	9.00	4.19	2865	6.1	125373
2018Q4	641125	308288	398329	−3259	−9.3	19818.21	3.53	1002.22	−1.2	1.6	165	249	550417	9.10	3.83	2961	5	174220
2019Q1	648325	319901	399160	−1865	−8.5	19605.96	1.69	1026.91	1.6	2.3	94	201	462147	9.60	3.79	2678	5.1	97481
2019Q2	656836	325807	432442	−2923	−9.3	19532.68	5.88	1106.29	−0.9	1.1	266	186	492347	8.80	3.62	2898	5.5	118127
2019Q3	655567	327618	412985	−4168	−13.2	20258.62	12.33	1179.19	−0.8	0.5	137	150	543478	8.40	3.43	3125	5.7	138561
2019Q4	648115	319417	399622	−3555	−10.1	24083.37	9.87	1218.79	−0.1	0.7	146	159	608166	8.60	3.1	3220	4.7	203255
2020Q1	640601	313211	385274	−1148	−7	23610.31	7.49	1313.44	−5.1	−4.4	61	169	501363	8.90	3.23	2873	5.2	77039
2020Q2	586178	298485	345024	796	−4.6	27085.23	1.47	1429.97	−9.2	−7.1	60	222	442927	9.60	3.28	2740	5.8	90935
2020Q3	635981	308096	373969	−1113	2.7	24975.95	6.13	1549.8	−1.5	−1.7	68	203	552158	9.70	3.37	3115	5.6	103842
2020Q4	641199	300623	381666	−973	3.2	27549.02	4.52	1583.87	1.2	1.1	98	166	639847	9.90	2.92	3160	4.6	149353