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Research Article

Measuring The Business Cycle In The Turkish Economy Using The Samuelson Model for The Period (1970-2020)

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Abstract

The business cycle is a vital and constantly renewed subject since it is one of the faults of the capitalist economic system and numerous other characteristics that contribute to its significance. The first is significant economists, perhaps the most prominent of whom is Samuelson. He was one of the first to touch on the business cycle in their research and develop a model. He attempted to quantify and predict the business cycle by combining the first two concepts of a multiplier and the accelerator. The tools of this model were applied in our research to the Turkish economy during the period (1970-2018). The research identified the economic cycles that he went through accurately and objectively, and four cycles (for the period studied) were specific to the beginning and end.

Keywords: Business cycle, multiplier, accelerator, marginal tendency to consume, economic crisis

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Introduction

Because of the nature of the public business cycle, it may have been hard to predict when it would occur (cyclical, yearly, undigestable, etc.). But this hasn't stopped economists from constructing mathematical models that measure and categorise economic phenomena based on their sorts and then forecast when and where they will happen. It is widely accepted that the multiplier-accelerator model is the best way to quantify and predict the business cycle. However, they couldn't agree on the model's design style. Both Samuelson's linear style and the non-linear manner he was known for were employed by others. There are two fundamentally independent ideas(Pennington et al., 2012), The multiplier and the accelerator, both of which are derived from Keynes, but the multiplier's concept of doubling is originally his, but the way he adopted it in the interpretation was still neglected by the time factor, which led many economists to criticise it extensively but did not disappear thanks to the new treasure school pioneers who revived it through the dynamics of time. While receipts are expected to drop in the third phase, keep an eye out for new discoveries and remember that dynamic multipliers cannot explain how feedback works in the economy except by Albert Aftalion's two-way and Clark's accelerated relics of the most essential economic models for studying the business cycle were merged into this notion. The economic cycle is a manifestation of the capitalism economic system's perpetual disadvantage, which is shown in the economic swings. Check out Samuelson's model to obtain a better understanding of his theory and discover how he applied it in Turkey's economy to explain the relationship between multiplier and accelerator. Other times in Turkey's capitalist economy, Samuelson's mathematical process can assess swings between recovery and deflation(Salim, 2012). According to Samuelson's mathematical model, the multiplier and accelerator interact through a mathematical mechanism. The second portion of research focused on Turkish economic cycles as a way to quantify economic cycles.

Samuelson model

The multiplier-accelerator model of the Samuelson model (multiplier-accelerator) may be among the first attempts to link the multiplier with the accelerator and rely on the multiplier model of treasure balance and consumption equation provided by economist Dennis Robertson to obtain the multiplier(Westerhoff, 2006). :

A. Business transactions in the economy are in decline, and this is the current condition of affairs.
B. Fiscal policy neutrality means that government funding is given and equal to private sector spending (G0).
C. As a result, changes in national income in the preceding period (the existence of a period of slowing production) stimulate production enterprises to adjust their production capacity to meet the demand in the following period, resulting in a lack of effect of automatic investments and investment (catalyst) (Induced Investment).
D. A slow period of consumption and independent consumption has no impact on balance income.

Samuelson used mathematical equations to illustrate his model and derivation as it comes(Westerhoff, 2006),

$$Y_t = C_t + I_t + G_t \dots\dots\dots\dots (1)$$

$$C_t = \beta Y_{t-1} \dots\dots\dots\dots\dots\dots (2)$$

$$I_t = ă(C_t - C_{t-1}) \dots\dots\dots\dots (3)$$

$$I_t = ă(\beta Y_{t-1} - \beta Y_{t-2}) \dots\dots (4)$$

$$I_t = ă\beta Y_{t-1} - ă\beta Y_{t-2} \dots\dots\dots (5)$$

$$Y_t = \beta Y_{t-1} + ă\beta Y_{t-1} - ă\beta Y_{t-2} + G_0 \dots\dots\dots (6)$$

$$Y_t - \beta(1 + ă)Y_{t-1} + ă\beta Y_{t-2} = G_0 \dots\dots\dots (7)$$

$Y_t$national income at the period (t),(C_t) family consumption at the period (t),(I_t) capital accumulation (accessory investment),(Y_{t-1}), and (Y_{t-2}) slow national income for one period and two times respectively,c_{t-1} and (I) and T-1is both slow consumption and investment for one period of time, and (represents the β marginal tendency to consume), and (φ) is accelerated.

During the state of balance, the national income is constant over time, i.e., at this point the$Y_t = Y_{t-1} = Y_{t-2}$ *the* accelerated effect fades, and Samuelson's model becomes an instance of the treasure model, which only shows the effect of the multiplier and thus produces the following(Pennington et al., 2012):

$$Y^* = \frac{1}{1-\beta} G_0 \dots\dots\dots\dots (8)$$

The current status of the economy is characterised by a decrease in commercial transactions.
According to fiscal policy neutrality, the government does not meddle in economic activity by spending the same amount of money as the private sector (G0).
Changes in national income have a direct effect on consumption, which causes production companies to adjust their production capacity in the following period, since the change in aggregate demand stimulates production enterprises to adjust production capacity in the preceding period. Consequently, there is no effect of automatic investment and investment (catalyst) (Induced Investment).

A. Replacing equation (7) with the equation of homogeneous difference equation or deviation from the balance level of income:
   a. $u_t - \beta(1+ă)u_{t-1} + \beta ă u_{t-2} = 0 \dots\dots\dots\dots (9)$
B. Solve the previous difference equation by* using its characteristic equation, as follows:
   a. $x^2 - \beta(1+ă)x + \beta ă = 0 \dots\dots\dots\dots (10)$

C. The distinctive equation(10)can be solved in the manner of the Constitution or common law (QuadraticFormula)as following:

$$x_{1,2} = \frac{\beta(1+ă) \pm \sqrt{\left(\beta(1+ă)\right)^2 - 4\beta ă}}{2} \dots\dots\dots\dots (11)$$

When it comes to the roots of the unique equation, x-1,2, it depends solely on multiplier and accelerator values. In this situation, the mathematical symbol () shows that there are two possible solutions to the equation, both of which are dependent on the value of the root. genuine solutions can only be found if the root is zero: (), if it is negative, the equation has no real solution and is used to solve it the$x_1 = x_2 = \frac{\beta(1+ă)}{2}$trigonometric functions method because it has two compound solutions, but if the value is positive, it has two real solutions ( ) and$x_1 = \frac{\beta(1+ă)-\sqrt{\Delta}}{2} x_2 = \frac{\beta(1+ă)+\sqrt{\Delta}}{2}$[1] ()

As a result, Samuelson N developed a hypothetical set of values for both the marginal tendency to consume and the accelerated factor in order to better understand and describe the various situations that economic activity may encounter and describe it in accordance with the logic of the economic cycle(Westerhoff, 2006). :

Table (1)
The impact of the double and accelerated interaction on the deviation of national income from the balance level

Status	(Real Roots)	(Complex Roots) $()\beta(1+ă)^2 < 4ă$

* The distinctive equation: is one of the ways to solve differential or exponential equations of the second degree and more in one variable, and is characterized by the advantage of distinguishing between the multi-rooted and one-root equation.

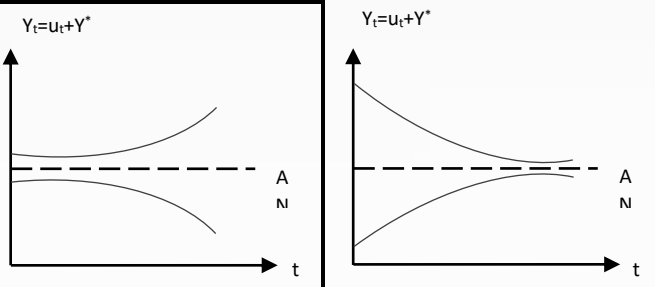
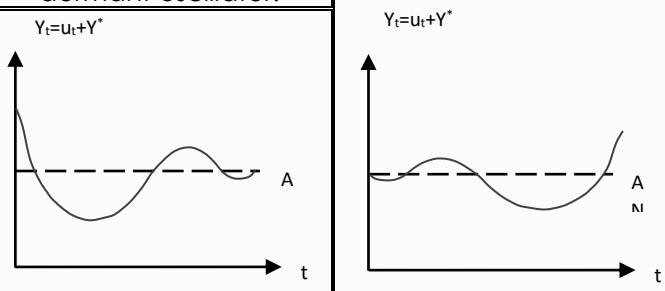
[1]- Gunter Gabisch & Dr. Hans-Walter Lorenz, OP, CIT, PP: (44-48).

	$^{*}()\boldsymbol{\beta}(\mathbf{1}+\check{a})^{2} \geq \mathbf{4}\check{a}$	
1	() ($\check{a} \leq \beta$Monotonic Damping)	()($\frac{1}{\beta} <$ ăExplosive Oscillation)
2	() And () there is no deviation from the balance level and the state of the economy is stable$\beta = 1\check{a} = 1$(Stationarity)	()($\frac{1}{\beta} =$ ăHarmonic Oscillations)
3	()($\check{a} > \beta$Monotonic Explosion)	() ($\frac{1}{\beta} >$ ăDamped Oscillation)

Source: Prof. Dr. Gunter Gabisch & Dr. Hans-Walter Lorenz, Business Cycle Theory A Survey Of Methods and Concepts, The Second Edition Springer, Verlag Berlin Heidelberg, 1989, P: (48).

These cases can be graphically represented as follows:

Figure (1). Possible national income situations resulting from the different multiplier and accelerated interactions

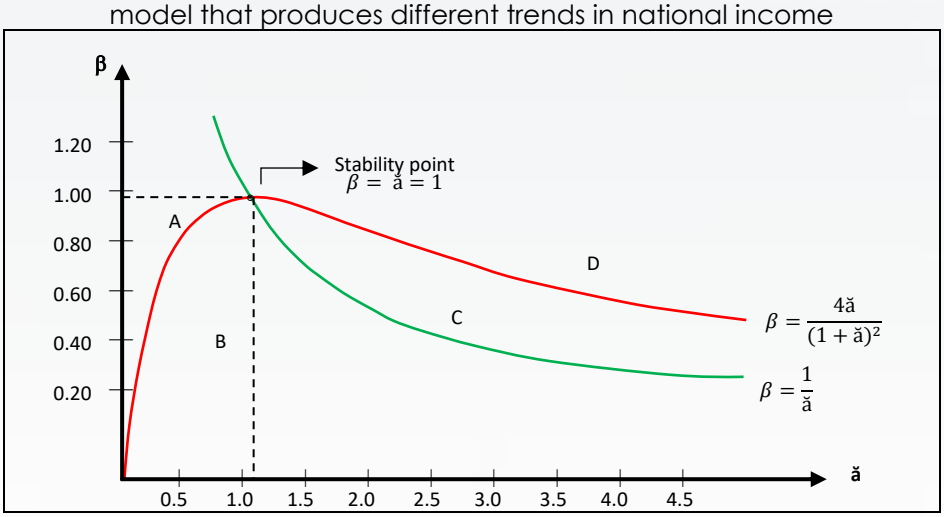
The deviation is dormant.	Monotonous explosive deviation
	
Explosive oscillator deviation	The deviation is a dormant oscillator.
	

Source: Dr. AdanaN Karim Najmuddin and others, Sports Economy, House of Wisdom Publishing, Translation and Distribution, Baghdad, 1989, p. (196-197).

* take place Simplify the formula ($\left(\beta(1+\check{a})\right)^{2} \geq 4\beta\check{a}$To ($\beta(1+\check{a})^{2} \geq 4\check{a}$By exploiting the properties of the mark (≥).

On the basis of his own calculations, Samuelson devised an illustrative form of marginal and accelerated consumption inclination values that he used as a measure and indicator to highlight the influence of their interaction on economic activity.

Figure (2). The multiplier and accelerator interaction in the Samuelson model that produces different trends in national income



Source: Alpha C. Chiang. Fundamental Methods of Mathematical Economics, 3rdEd. McGraw-Hill, Inc. 1984. P: (586).

In order to illustrate this form, Samuelson divided the format into four sections so that each section expresses a certain state of economic activity that can pass through when both the marginal inclination of consumption intersects with the accelerator and achieves an interaction between them, as sections the area of multiplier and the effect of the accelerator is limited to approach its value from zero, which means that the fluctuations in national income as a result of the ch are limited to a maximum of zero. The region is a stable area, but region(B) is experiencing dormant fluctuations around the level of balanced income as a result of the regular periodic changes made by the financial authority in government spending, while area(C) will see explosive and growing fluctuations in national income away from the balance level under a constant level of government spending, and the last region (D)represents the explosive growth of national income and continuously due to t

Test the model

After looking at Samuelson's measurement instrument, it is possible to test the model by applying it to the Turkish economy as follows:

1- Estimate the consumption function of Samuelson $C_t = \beta Y_{t-1}()$ (using the micro-squares method). To obtain the marginal tendency for necessary consumption in the multiplier account and in the calculation of values (X1,X2) that determine the general direction of the business cycle, the test results have come as follows:

A.Consumption function C-t.=0.69,Y-t1.means that the marginal inclination to consume the family sector is (69 percent) of income, i.e, each rise in national income by one unit leads to an increase in consumption by (0.69) units.

B.According to the model's interpretive strength, which was 98.7% in the problem of self-association between variables, but this uncertainty is eliminated by both the 15.8 percent Lagrange multiplier test, which is less than the 27% table value (27.99) at a degree of freedom of 50, and a moral level (0.5%), which means accepting the hypothesis that nothingness and rejecting the basic premise that provides for an atmosphere are acceptable. This means that the hypothesis of nothingness can be accepted, as well as the D problem, which has a statistical (h) value of (0.15) and is smaller than (1.96) and so does not pose a problem of linear association.

2- A key step in the Samuelson model, the multiplier can be calculated using the simple method Keynes first described (3.22).

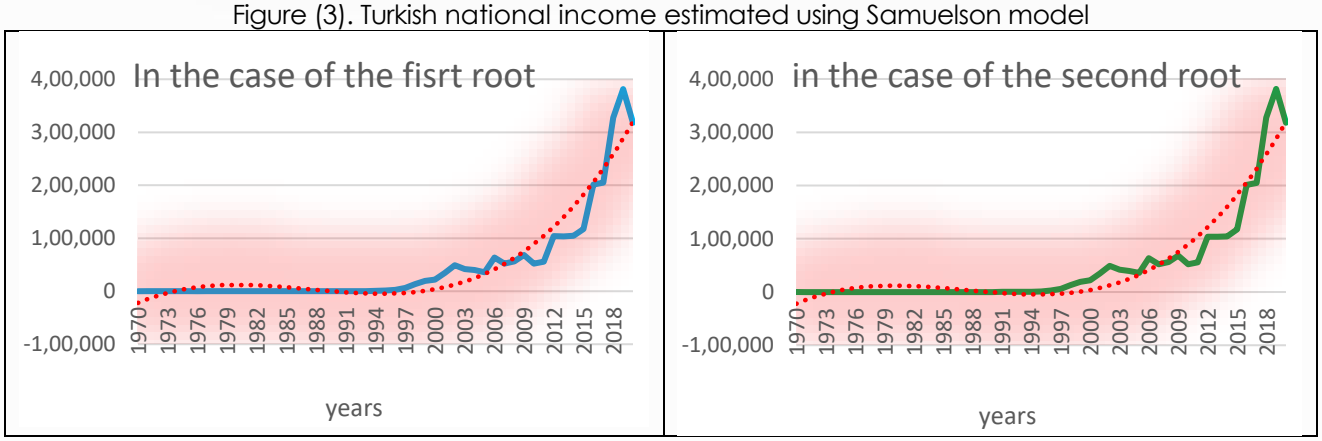
3- Accelerator's value can be determined by dividing the investment variable (total capital formation) by the change in consumption (i.e a = I – (C – t – 1)). In order to obtain a series of accelerated values necessary for extracting measurements of the overall direction of the business cycle (which represents an accelerated effect), and its average estimated value (3.64) for each time series, i.e., every increase in national income by one unit will accelerate the process of capital accumulation by the accelerated amount (3.64), and the change in consumption (aggregate demand) is responsible for explaining (94.9 percent).
4- It is possible to evaluate, compare, and receive results for the historically investigated and documented period after obtaining the Samuelson model's estimated and calculated values. This will help determine the model's trustworthiness in measuring these oscillations through time.

The first recessionary inflation crisis, the two oil crises, and the Nixon shock all occurred during the first decade of the period studied, while the second recessionary inflation crisis struck most of the world's economies during the period (1970-1980). As a result of its predecessor, in addition to other hits on the centre of the capitalist system (the US economy), the depth of these economic fluctuations suffered by all the economy has been reinforced, perhaps the most prominent of which is the debt crisis that hit latin American countries in 1982, which generated a wave of global economic stagnation and was the cause of another crisis There were two major oil price crises that occurred during this period (1986-1989): the decline in oil prices and a financial crisis in Hong Kong in 19987, which resulted in a financial and monetary crisis for the world economy. During this period, the United States and other oil-producing countries suffered greatly from lower oil prices. In the United States, a similar crisis occurred two years later, i.e., in 1989, a precipitous collapse in the prices of stocks and bonds in the U.S. financial markets. There were approximately 8 financial and monetary crises in the period from 1975 to 1997, mainly due to policies of financial liberalisation in Latin American countries and the restructuring of the banking system. (Click here for more information on the financial crisis in the United States and here for more information on financial crisis in Latin America). When Thailand's economy grew rapidly in 1997, the rest of Southeast Asia's economies followed suit, causing a global economic slowdown that deepened throughout this time. In 1998, imports of Asian tigers resulted in a 176 billion dollar trade deficit between the United States and key industrialised countries including Europe (France, Britain, and Germany) and the United States, causing the global economy to contract to its lowest level since the Great Depression. After the September 11, 2001, terrorist attacks, the world economy began to recover from the Asian tiger crisis. The whole global economy suffered as a result of these events, which resulted in increasing fuel prices and the devaluation of the dollar versus other major currencies. 5.7 percent drop in trading activity on the London Stock Exchange, which immediately affected the real economy of the eurozone economies. This crisis began in early 2006 with low interest rates and high real estate prices in the United States, which were affected by the unwillingness of the borrowers to pay. In 2008, when the economic crisis erupted and economic indicators continued to decline, this crisis cast a shadow over all other economies, the most important economies. When it fell by 32.1%, the FTSE composite index of European financial markets caused an economic growth rate to drop significantly. This was the beginning of a crisis that prompted the United States and other affected countries to take several measures, including increasing government spending as well as providing assistance to companies and banks that had declared bankruptcy. N countries are feeling the consequences of these crises, especially the European Union countries, and have been feeling the effects since a new crisis began in 2013, formally putting the economies of the Eurozone into a new economic recession. In 2010, the Greek economy acknowledged that the growth and indebtedness estimates were wrong and that they were unable to pay their loans, causing the eurozone economy to be shaken. Because of its single monetary system, Greece has been impacted by various other European countries, including Italy, Spain, Ireland, Portugal, Spain, and even the United Kingdom, causing the crisis to spread quickly to other economies around the world. For this reason, in 2010, a mechanism called "Facilitating European Financial Stability" was created to help stabilise the financial stability of the Eurozone economies by providing temporary financial assistance to member states with a limit of 440 billion euros, on top of the mechanism already in place to help stabilise the economies. For non-EU countries that have independent monetary resources, this mechanism enables the European Union to help their economies by borrowing from financial markets an amount that does not exceed (60) billion euros by guarantying the joint budget, even though these expansion measures have been implemented Although these EU countries'

economies didn't fully recover from the recession until 2016, the pessimism in the investment sector has kept them from achieving strong growth rates despite the reforms they implemented.

Then, during the year (2019), the world experienced a deterioration in health from the People's Republic of China by a virus called void-19, which then turned into a global pandemic in the first quarter of 2012. 20 A.D.) In the words of the World Health Organization, it imposed its power on all countries and did not distinguish between the developed and the underdeveloped. This pandemic has paralyzed the entire world economic system because of the strict measures adopted by the authorities of the countries of the world to require the obligation of individuals to stay at home and not to go out only to Some developed countries, such as Japan (-7.4 percent) and the United States (-5.4 percent), have been described as the world's toughest economic recession after World War II and are also characterized by a three-month spread that is the opposite of what it took to spread globally in[2]years. In addition to these events, Turkeywitnessed during the period studied many local and regional political conflicts that turned into a military coup against the ruling power, almost every ten years from the coup d'état in 1971 to the failed coup attempt in 2016 against the government of Recep Tayyip Erdogan. It fell to levels that forced the authority to print lira by six zeros but then improved, specifically after the AKP took power. It adopted broad economic reform policies and all sectors that have had its effects in less than two decades, prompting observers of the Turkish economic reality to make the year (2002) a turning point for the Turkish economy. The Samuelson model was able to measure the business cycle quite accurately compared to the history of economic fluctuations in the world of which the Turkish economy is a part when drawing the results of the national income of the Turkish economy measured using the model mentioned

Figure (3). Turkish national income estimated using Samuelson model



Source: Prepared by the researcher based on the outputs of the Model Samuelson applied to the Turkish economy and contained in annex (1).

The previous figure (2) shows that the Turkish economy during the period studied has been subjected to many economic fluctuations, in addition to the model Samuelson which generates two real values of national income calculated con () but the results reached are close and did not see much$\beta(1+ă)^2 \geq 4ă$difference, as in the following schedule:

Table (2). Number of business courses measured for the Turkish for 1970-2019

Session	Length of course	Extent of deflation	Ways to shrink	Extent of détente
The first	1970-2006	1970-2002	Instability of the political environment Turkey's debt crisis and currency collapse	2002-2006
2nd	2006-2012	2006-2010	Mortgage crisis	2010-2012
Third	2012-2016	2012-2014	European Debt Crisis	2014-2016
Fourth	2016-2019	2016-2017	Coup attempt	2017-2019

[2]- A World Bank group, global economic prospects, World Bank group, JAN 2021, PP: (3-4).

Signs of the collapse of the lira
Source: Prepared by the researcher based on the outputs of table (2) and figure (6).

When reading the periods during which the Turkish economy experienced economic contraction (as shown in table (2) above), we find that the Turkish economy has experienced actual crises. But, there are economic cycles that the model used was unable to show its impact on the Turkish economy, especially during the first three decades of the period studied, perhaps due to the size of the Turkish economy compared to the world economy in addition to economic isolation and the decline of its economic sectors and the imbalance of the investment environment as a result of violent political fluctuations during this period, But then the Turkish economy merged with the global economy and became affected by it, and the model used to measure the Turkish business cycle and identify the coup points. It should also be emphasized that the results (periods of contraction and expansion) reached through this model applied during this research on the economic leave, it is not conditional and specific during the same time, but may vary through another study and another model by(t±1) and by the nature of the* series studied whether it is annual, quarterly or so on, which means that the results reached could be a seed for a subsequent study adopting series Quarterly or monthly course schedules more accurately.

Conclusion

Samuelson's model has been able to measure and determine the business cycle throughout the carefully studied period compared to the history of economic volatility experienced by the Turkish economy. Especially during the first three decades, which was overshadowed by a deep economic recession as a result of internal conflicts, so it can be said that the nature of Turkish economic activity after a year (2000) is not what it was before. It was only during the last two decades of the period studied that the accelerated economic recovery, following the trends adopted by the Justice and Development Party (AKP) when it came to power, showed recessions as well. It should be noted that the impact of the government spending multiplier is greater than the impact of the accelerated on the size of national income. so we find that the volatility experienced by the national income calculated across the two roots was identical to the oscillation resulting from the impact of the multiplier only on national income. The general trend taken by the change in national income resulting from the equation of the clearly homogeneous differences in figure (3) is consistent with the result reached in advance after calculating the value of the marginal tendency for consumption and accelerated, that the fluctuating deviations of Turkish national income during the period studied were of the explosive type. The results of the two roots (X1 and $_{X2)}$ are no different and almost apply to each other except for some negligible differences, indicating the accuracy and correctness of Samuelson's ability to test the business cycle in the Turkish economy during the period studied.

Appendices

Appendix (1). Inputs and outputs of the Samuelson model applied to the Turkish economy for the period 1970-2020

The year	Inputs 1 billion euros					Output				
	National income	total composition Capital	Consuming Domestic	Spending Government	Accelerated	AND*	X_1	X_2	AND_1	AND_2
1969	0.1743	0.023	0.090	0.017		0.012	1.70	0.60	1.713	0.608
1970	0.1956	0.029	0.102	0.021	2.33	0.023	0.69	0.67	0.714	0.693
1971	0.2412	0.033	0.136	0.028	0.97	0.011	1.29	0.63	1.304	0.645
1972	0.2874	0.049	0.163	0.031	1.79	0.032	0.84	0.68	0.870	0.708
1973	0.3621	0.056	0.211	0.041	1.20	0.036	0.69	0.66	0.729	0.698

* This time limit in the accuracy and right of the model used to measure the business cycle is not only for the Samuelso modelט It is for the rest of the models used for the same purpose when you look at the measurement models used by (NBER(and)AFSE) It is noted that it mentions the same period (t±1).

1974	0.4933	0.089	0.303	0.052	0.96	0.061	1.11	0.65	1.175	0.711
1975	0.6428	0.121	0.380	0.071	1.56	0.074	1.49	0.62	1.563	0.690
1976	0.8197	0.167	0.462	0.094	2.05	0.113	1.10	0.65	1.212	0.766
1977	1.0505	0.218	0.604	0.129	1.54	0.202	0.71	0.51	0.908	0.713
1978	1.5700	0.240	0.917	0.192	0.77	0.433	0.71	0.42	1.148	0.854
1979	2.7467	0.403	1.541	0.326	0.65	0.895	0.72	0.37	1.615	1.260
1980	5.1441	0.950	3.199	0.604	0.57	0.558	0.69	0.65	1.251	1.212
1981	7.7405	1.412	4.680	0.778	0.95	0.856	0.80	0.68	1.655	1.536
1982	10.256	1.779	6.235	1.043	1.14	0.844	0.69	0.64	1.539	1.484
1983	13.583	2.265	8.660	1.306	0.93	1.700	0.71	0.45	2.413	2.149
1984	21.456	3.559	13.87	1.834	0.68	2.589	0.70	0.60	3.287	3.191
1985	34.288	5.795	20.43	2.638	0.88	3.987	0.96	0.67	4.943	4.653
1986	49.822	9.627	27.56	3.876	1.35	6.342	0.70	0.55	7.045	6.893
1987	72.929	19.18	51.02	5.845	0.82	12.854	0.73	0.69	13.580	13.541
1988	125.63	32.49	82.05	9.837	1.05	36.715	0.70	0.53	37.420	37.250
1989	222.39	53.36	149.14	21.24	0.80	70.337	0.70	0.54	71.041	70.876
1990	386.51	96.49	269.56	43.08	0.80	113.26	0.70	0.55	113.96	113.81
1991	618.99	143.11	444.87	78.26	0.82	203.06	0.70	0.55	203.76	203.61
1992	1,075.33	255.44	760.26	141.32	0.81	367.79	0.70	0.59	368.49	368.38
1993	1,951.57	527.49	1,369.34	255.54	0.87	629.24	0.72	0.40	629.96	629.64
1994	3,771.19	824.77	2,706.26	450.96	0.62	1,243.84	0.71	0.48	1,244.6	1,244.3
1995	7,615.86	1,977.37	5,457.90	837.24	0.72	0.012	1.70	0.60	1.713	0.608
1996	14,533.88	3,626.75	9,937.70	1,709.25	0.81	2,807.85	0.70	0.55	2,808.6	2,808.4
1997	28,377.70	7,240.92	19,619.10	3,535.10	0.75	5,879.26	0.71	0.50	5,880.0	5,879.8
1998	71,114.64	17,151.21	46,486.09	7,635.65	0.64	13,203.76	0.72	0.42	13,204.5	13,204.2
1999	105,683.11	22,870.68	70,954.41	13,602.77	0.93	19,214.13	0.69	0.64	19,214.8	19,214.8
2000	168,164.59	40,618.95	114,886.68	20,456.96	0.92	22,070.47	0.70	0.63	22,071.2	22,071.1
2001	239,300.83	44,509.66	160,429.23	31,269.09	0.98	34,815.07	0.69	0.67	34,815.8	34,815.7
2002	352,494.96	76,339.18	231,290.82	46,479.19	1.08	48,976.51	0.75	0.68	48,977.3	48,977.2
2003	459,674.72	105,179.45	308,606.62	59,448.40	1.36	41,760.88	0.96	0.66	41,761.8	41,761.5
2004	569,027.66	145,440.57	374,914.07	71,779.49	2.19	39,706.10	1.60	0.61	39,707.7	39,706.7
2005	666,487.90	182,125.81	431,595.43	82,898.24	3.21	35,802.38	2.37	0.53	35,804.8	35,802.9
2006	780,678.26	233,337.00	491,457.67	102,712.57	3.90	63,802.13	2.89	0.49	63,805.0	63,802.6
2007	872,281.08	252,813.19	551,480.23	118,862.21	4.21	52,001.85	3.13	0.46	52,005.0	52,002.3
2008	984,888.69	287,849.41	612,911.89	136,337.71	4.69	56,271.09	3.49	0.43	56,274.6	56,271.5
2009	987,323.80	229,998.35	619,462.06	157,576.39	35.1	68,388.56	26.63	-1.71	68,415.2	68,386.9
2010	1,150,222.92	312,887.84	731,460.49	173,684.93	2.79	51,869.50	2.05	0.56	51,871.6	51,870.1
2011	1,382,335.42	436,034.80	880,851.52	191,075.15	2.92	55,996.50	2.15	0.56	55,998.6	55,997.1
2012	1,557,840.06	444,282.35	979,068.04	223,401.70	4.52	104,091.51	3.37	0.44	104,094.9	104,092.0
2013	1,793,302.61	538,809.69	1,120,356.92	255,615.06	3.81	103,727.00	2.83	0.49	103,729.8	103,727.5
2014	2,026,508.88	593,577.47	1,242,228.53	288,096.26	4.87	104,589.47	3.63	0.42	104,593.1	104,589.9
2015	2,312,298.78	663,287.78	1,411,800.26	324,551.51	3.91	117,385.90	2.90	0.49	117,388.8	117,386.4
2016	2,580,791.86	736,299.16	1,560,518.48	386,976.64	4.95	201,008.92	3.69	0.41	201,012.6	201,009.3
2017	3,070,360.18	964,098.51	1,836,229.73	450,634.68	3.50	204,978.89	2.59	0.51	204,981.5	204,979.4
2018	3,667,413.17	1,101,641.63	2,111,251.43	552,357.47	4.01	327,547.39	2.98	0.48	327,550.4	327,547.9
2019	4,247,486.90	1,071,380.15	2,457,039.36	670,808.74	3.10	381,413.09	2.29	0.54	381,415.4	381,413.6
2020	4,987,039.76	1,603,543.81	2,864,500.18	769,460.90	3.94	317,659.95	2.92	0.48	317,662.9	317,660.4

Source: Turkish Statistical Institute(TURKSTS), available at: https://www.tuik.gov.tr/Home/Index
Outputs: From the work of the researcher.

Appendix (2). Estimate of the consumption function in the Turkish economy for the period (1970-2020)
Dependent Variable: C^T

Method: Least Squares
Date: 08/26/21 Time: 18:06
Sample (adjusted): 1971 2020
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$Y^T(t-1)$	0.688071	0.003821	180.0904	0.0000

R-squared	0.987932	Mean dependent var	4.25E+11
Adjusted R-squared	0.987932	S.D. dependent var	7.05E+11
S.E. of regression	3.21E+10	Akaike info criterion	51.23970
Sum squared resid	5.04E+22	Schwarz criterion	51.27794
Log-likelihood	-1279.992	Hannan-Quinn criteria.	51.25426
Durbin-Watson stat	0.497854		

Appendix (3). LM-test for estimated consumption function in Turkey for the duration (1970-2020)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	10.86312	Prob. F(2,47)	0.0001
Obs*R-squared	15.80636	Prob. Chi-Square(2)	0.0004

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 08/26/21 Time: 18:59
Sample: 1971 2020
Included observations: 50
Pre sample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$Y^T(t-1)$	-0.004150	0.003535	-1.174062	0.2463
RESID(t-1)	0.493125	0.143948	3.425717	0.0013
RESID(t-2)	0.190189	0.163017	1.166680	0.2492

R-squared	0.227853	Mean dependent var	1.07E+10
Adjusted R-squared	0.194996	S.D. dependent var	3.02E+10
S.E. of regression	2.71E+10	Akaike info criterion	50.93971
Sum squared resid	3.45E+22	Schwarz criterion	51.05443
Log-likelihood	-1270.493	Hannan-Quinn criteria.	50.98340
Durbin-Watson stat	2.057626		

Appendix (4). Estimating the duration of investment function in the Turkish economy (1970-2020)

Dependent Variable: I^T
Method: Least Squares
Date: 08/26/21 Time: 23:51
Sample (adjusted): 1971 2020
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔC^T	3.640932	0.103346	35.23067	0.0000

R-squared	0.949586	Mean dependent var	2.02E+11
Adjusted R-squared	0.949586	S.D. dependent var	3.57E+11
S.E. of regression	8.02E+10	Akaike info criterion	53.07370
Sum squared resid	3.15E+23	Schwarz criterion	53.11194
Log-likelihood	-1325.842	Hannan-Quinn criteria.	53.08826
Durbin-Watson stat	1.515219		

Appendix (5). LM-test for estimated investment function in Turkey for the duration (1970-2020)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	6.881734	Prob. F(2,47)	0.0024
Obs*R-squared	11.32545	Prob. Chi-Square(2)	0.0035

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 08/26/21 Time: 23:52
Sample: 1971 2020
Included observations: 50
Pre sample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔC^T	-0.074199	0.095601	-0.776131	0.4416
RESID(t-1)	0.077776	0.139334	0.558200	0.5794
RESID(t-2)	0.497689	0.152189	3.270195	0.0020

R-squared	0.221748	Mean dependent var	-6.21E+09
Adjusted R-squared	0.188631	S.D. dependent var	8.00e+10
S.E. of regression	7.20E+10	Akaike info criterion	52.89686
Sum squared resid	2.44E+23	Schwarz criterion	53.01158
Log-likelihood	-1319.421	Hannan-Quinn criteria.	52.94054
Durbin-Watson stat	1.731707		

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