Econometric Modeling of Investment Property Accounting in Joint-Stock Companies

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Abstract. A number of scientific studies are being conducted in the world aimed at organizing investment property accounting based on international financial reporting standards. Currently, the introduction of international financial reporting standards increases the transparency and reliability of financial information, strengthens the confidence of foreign and potential investors and helps to attract them. Also, special attention is paid to scientific work on organizing investment property accounting in joint-stock companies based on international standards, forming its regulatory and legal framework, reflecting it in accounting transactions, documenting it, and reflecting it in the relevant lines of financial statements. Therefore, international scientific projects and studies on improving investment property accounting in joint-stock companies based on international standards are emerging as one of the important areas.

Keywords: Investment Property, Joint-Stock Companies, Fixed Assets, Real Estate, ARIMA, Econometric Analysis, Long-Term Assets.

1 Introduction

As is known, today the Republic of Uzbekistan is one of the countries with a market model of economic development. Changes in management principles, methods and techniques, revision of the legislative framework, strengthening of private property contribute to a significant activation of the activities of various economic entities, and the emergence of broad opportunities for the development of the real estate market.

The above changes serve as a basis for creating favorable conditions for successful business in our country. The simplest and most common form of doing business is to receive economic benefits from investing in the activities of other companies. Such operations, along with the prospect of achieving certain financial results, help to establish corporate relations and, in some cases, allow the investor to influence the activities of the company that is the object of investment. When a company invests its existing funds in real estate, such investments are classified as a special type of asset - investment property.

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R. Hurriyati et al. (eds.), *Proceedings of the 10th Global Conference on Business, Management, and Entrepreneurship (GCBME 2025)*, Advances in Economics, Business and Management Research 407,
https://doi.org/10.2991/978-94-6239-819-1_16

Investment property is a long-term asset, which is accounted for rental purposes, unlike fixed assets, and is regulated in accordance with IAS 40 - Investment Property.

Foreign and local scholars are currently studying investment property in various ways.

According to the Russian economist V.G. Belolipesky, the assets of an enterprise are divided into 4 groups [1]:

1. Assets related to the current maintenance of the enterprise's production capacity;
2. Assets necessary to protect the assets of the first group from various risks;
3. Investment assets related to business expansion;
4. Assets not directly related to the enterprise's production capacity.

According to A.N. Azrilyan, investment property is a property that exists as a long-term investment, generating income [2]. B.G. Ganin defines it in his dissertation as follows: Investment property is a type of investment in real assets and is a special case of investment [3]. Uzbek scientist A.Z. Avlokulov stated in his scientific work: The types of investment property are: movable and immovable property; funds; securities; property rights, licenses, patents, software products, etc.; the right to use natural resources [4].

According to another Uzbek scholar, A.N. Turayev, investment property is understood as real estate owned for the purpose of receiving rental payments or increasing capital value, or both, and is intended for use in the production and supply of goods, the provision of services, administrative purposes, and is not intended for sale in the ordinary course of business [5].

From the above, we can conclude that investment property occupies a major place in the structure of long-term assets of companies.

Investment property accounting is reflected in the research of many scientists. It is worth noting the scientific work of foreign scientists S.M. Arashukova, O.A. Borodin, I.A. Buzova, V.V. Vorushkin, B.G. Ganin, A.Yu. Marenkova, E.A. Naumenko, E.V. Sevastyanova, K.A. Tyutrin, P.S. Bezrukikh [11], Anthony R., Rees Dj. [12] and others on improving the accounting of investment property in joint-stock companies.

Some problems related to improving investment property accounting are highlighted in the scientific works of uzbek scientists B.K. Khamdamov, Sh.T. Ergasheva, S. Muzrapova [10] [14], A. Eshonkulov [9], M. Tulakhodjaeva [13] and others.

We will consider the econometric analysis of the accounting of investment property of enterprises using the example of FOTON Joint Stock Company.

2 Methods

The importance of econometric forecasting in determining the solution to this problem is high. To begin econometric forecasting, one can estimate the likely future change in the value of an investment property, taking into account the current dynamics and rates of change of the analysis. To do this, it is advisable to identify the main factors and forecast the values based on them through time series analysis and regression models. At the same time, integrating the growth and decline trends observed in historical

data into the forecast will provide a more reliable indication of future results. One of the most suitable models for integrating growth and decline trends observed in previous periods into the forecast is the ARIMA model. The use of ARIMA models (Autoregressive Integrated Moving Average) in econometric forecasting helps to more accurately estimate future changes in investment property values. The importance of ARIMA models is reflected in the following aspects:

- Detecting trends and seasonality: The autoregressive and moving average components of ARIMA models allow us to capture the overall trend and short-term seasonal fluctuations in the data series. This is especially useful for deeper analysis of the downward trend of Foton JSC in 2021-2023.
- Studying periodic changes: ARIMA models perform autocorrelation analysis over time, which is important for identifying relationships between data and incorporating them into forecasts.
- Accounting for uncertainties: When data contains random components of change, ARIMA reduces these uncertainties and produces a reliable forecast. This is useful in clarifying a company's financial plans.

The general appearance of the model is as follows [6] [15]:

$$\text{ARIMA}(p, d, q) \tag{1}$$

where, p – autoregressive procedure, d – level of integration and q – moving average order.

The general mathematical form is as follows [7]:

$$\Delta^d y_t = c + \sum_{i=1}^{p} a_i \, \Delta^d y_{t-i} + \sum_{j=1}^{q} b_j \, \varepsilon_{t-j} \tag{2}$$

where, c, a, b – model parameters.

3 Results and Discussion

An analysis of the dynamics of the value of investment property of Foton JSC for 2014-2023 shows that the average value of the company's investment property during this period was 702,969.0 thousand sums. The process, which began in 2015 with a growth of 12.38%, reached its peak in 2018, amounting to 796,114.0 thousand soums (an increase of 18.48%). However, starting in 2021, values began to decline and by 2023 reached 616,123.0 thousand soums. This shows a consecutive decline over the past three years (5.64%, 9.01%, 9.42%) (see Fig. 1).

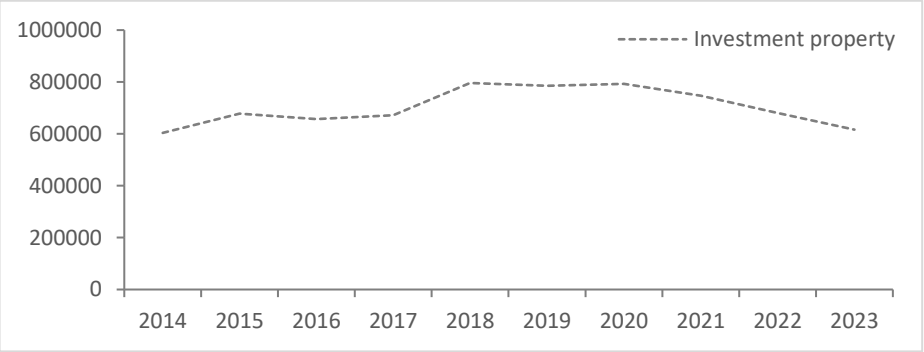

Fig. 1. Investment property of FOTON JSC in 2014-2023 (in thousand soums).

Overall, the company's investment property value has seen small increases over the past 10 years, although (CAGR: 0.23%), There is a steady downward trend after 2021. This may indicate that the company is facing financial or management problems. In order to increase the value of investment property in the future, it is necessary to implement effective management strategies, attract new investments and effectively use existing assets. At the same time, it is recommended to conduct a thorough analysis to identify the causes of the decline and eliminate them.

When using ARIMA models, the time series is required to be stationary. If the series is not stationary, its first-order differences ($\Delta y = y_t - y_{t-1}$) can be used, and in cases where it is also non-stationary, second-order differences can be used.

The ADF test (augmented Dickey-Fuller test) was used to test the stationarity of the time series of investment property of FOTON JSC (Table 1)

Table 1. Results of the Augmented Dickey-Fuller test.

Augmented Dickey-Fuller test for y
unit-root null hypothesis: a = 1

test without constant
including 0 lags of (1-L)y
model: (1-L)y = (a-1)*y(-1) + e
estimated value of (a - 1): -0.00187334
test statistic: tau_nc(1) = -0.0631719
asymptotic p-value 0.6618
1st-order autocorrelation coeff. for e: 0.198

test with constant
including 3 lags of (1-L)y
model: (1-L)y = b0 + (a-1)*y(-1) + ... + e
estimated value of (a - 1): -1.58554
test statistic: tau_c(1) = -4.15497
asymptotic p-value 0.0007831
1st-order autocorrelation coeff. for e: -0.745

In Table 1, the p-value for the constant test is 0.0007831, with significance levels less than 0.01, 0.05, or 0.1. This indicates that the time series is stationary. This in turn indicates that the ARIMA model has a q-order of 0. Information criteria were used to determine other orders of the ARIMA (p, 0, d) model, which helps to determine the most appropriate model order (Table 2).

Table 2. Information criteria evaluation results

p	q	AIC	BIC	HQC	loglik
0	0	2.551.006	2.557.058	2.544.368	-1.255.503
0	1	2.530.609	2.539.686	2.520.651	-1.235.304
0	2	2.546.770	2.558.873	2.533.492	-1.233.385
0	3	2.575.376	2.590.505	2.558.779	-1.237.688
1	0	2.530.588	2.539.666	2.520.630	-1.235.294
1	1	2.543.623	2.555.727	2.530.346	-1.231.812
1	2	2.563.614	2.578.743	2.547.017	-1.231.807
1	3	2.554.118	2.572.273	2.534.202	-1.217.059
2	0	2.540.455	2.552.559	2.527.178	-1.230.228
2	1	2.525.990	2.541.119	2.509.393	-1.212.995
2	2	2.508.043	2.526.199	2.488.127	-1.194.022
2	3	250.0482*	252.1663*	247.7247*	-1.180.241
3	0	2.551.882	2.567.011	2.535.285	-1.225.941

Note: Estimated using AS 197 (exact ML), Dependent variable y, T = 10. Criteria for ARMA(p, q) specifications

Usually, when several models give positive results in modeling an economic phenomenon or process, the one with the smallest information criterion value is chosen. Akaike, Schwartz, and Hennan-Quinn achieved the smallest results when the information criteria were p=2 and q=3.

So, the overall look of the model is as follows:

$$\text{ARIMA}(2,0,3) \tag{3}$$

The results of the model evaluation are presented in Table 3.

Table 3. Regression analysis results

	Coefficient	Std. Error	z	p-value	
const	714501	4910.66	145.5	<0.0001	***
phi_1	1.50210	0.0666144	22.55	<0.0001	***
phi_2	−0.999594	0.00239529	−417.3	<0.0001	***
theta_1	−2.59750	0.611177	−4.250	<0.0001	***
theta_2	2.59750	1.08181	2.401	0.0163	**
theta_3	−0.999999	0.602220	−1.661	0.0968	*

Mean dependent var	702969.1	S.D. dependent var	72314.08
Mean of innovations	−4862.512	S.D. of innovations	16980.11
R-squared	0.958294	Adjusted R-squared	0.924930
Log-likelihood	−118.0241	Akaike criterion	250.0482
Schwarz criterion	252.1663	Hannan-Quinn	247.7247

Note: Model 1: ARMA, using observations 2014-2023 (T = 10), Dependent variable: y, Standard errors based on Hessian

Looking at Table 3, all parameters of the model are significant according to Fisher's z test (marked with "*"). To assess the significance of the model, the approximation error was estimated and it was found that MAPE=2.09%.

Thus, the ARIMA(2,0,3) model fully meets all the requirements of the verification head, and its mathematical expression is as follows:

$$y = 714501 + 1{,}5y_{t-1} - 0{,}9y_{t-2} - 2{,}6\varepsilon_{t-1} + 2{,}6e_{t-2} - 0{,}9e_{t-3} \quad (4)$$

Forecast values were developed using the model (4) (Table 4).

Table 4. Forecast values

Years	Forecast values, (in thousand soums)	95% interval lower bound	95% interval upper limit
2024	640235,37	606954,97	673515,78
2025	664685,92	615324,38	714047,46
2026	724925,17	675538,33	774312,00
2027	779954,12	730561,03	829347,21
2028	802398,59	752928,44	851868,75
2029	781105,93	731521,75	830690,11

4 Conclusion

From the above, we can conclude that the forecasts for the values of investment properties of Foton JSC for 2024-2028 show an upward trend, from 2024 to 2028, values are expected to increase from 640,235.37 thousand soums to 802,398.59 thousand soums. During this period, the company will show an average growth rate of about 10%. However, in 2029, the value is projected to decrease to 781,105.93 thousand soums. This decrease is likely to occur due to external or internal economic factors. Therefore, the company needs to develop appropriate strategies to continue its growth.

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