Predicting the Dynamics of Private Sector Investment in Iran*

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Abstract
Despite significant capacities and potentials, Iran has performed differently in attracting investors and economic actors in recent decades, and if this situation continues, we will see more economic distance with other developed countries in the future. After examining the economic factors affecting private investment in the Iranian economy, using a new and efficient method called DMA, to predict the factors affecting investment in order to accurately identify how the investment responds to changes in these variables during the years 1397-1380. Evaluate and determine which variable (or variables) has been the most influential factor on private sector investment at any point in time in order to provide appropriate policy recommendations to guide economic variables to increase private investment. The results show that the presence of the inflation variable after 2009 is less than 0.5, the probability of the presence of the liquidity variable in 1996 and 1997 is much higher than other years, the probability of the presence of the variable government expenditure from 1389 onwards is high, the GDP variable in Most years are present with high probability in investment forecasting. With the realization of the exchange rate in the years 92-97, the presence of the exchange rate variable is more probable. The probability of the presence of the variable of bank facilities from 1390 onwards is higher. Business is very low in the years under review.
Keyword: Sector Investment, Dynamic Averaging Model, Models of Variable Parameters Over Time, Predicting Variables.

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1. Introduction

Sustainable growth and development is the main economic ideal of any country and the most important criterion for determining and measuring economic growth is the growth of GDP and the main driver of production is the amount of investment. Therefore, economists have always assumed that they should study the conditions that lead economic factors to save and ultimately, to make investments at any time and place (Salimifar and Gavy 2003).

According to studies and researches, private sector investment has always had more positive effects than public sector investment, and if public investment can provide the necessary conditions for private sector investors, we will see rapid economic growth. The growing importance of forecasting for government, banking and private sector policymakers has gradually provided new conditions and perspectives for modeling. One of these perspectives, typically called time series, is the task of predicting economic variables above all else.

The overall purpose of this study is to predict private sector investment in Iran using TVP methods and DMA[1] dynamic averaging model, which is assumed to be much more powerful than previous methods and has the ability to provide large models with a large number of variables in Predict a dynamic model simultaneously and present a process in which to estimate $2 \wedge m$ of the model at each time point in which m is the number of variables and none of the problems of previous models such as bias are specified and the alignment between the variables And provides more reasoned and reliable results. In this study, the quarterly data of the Central Bank for Iran from 1380 to 1397 have been used.

In recent decades, several studies have been conducted to estimate private sector investment using common econometric methods, some of which have been conducted in-country, including studies by Hojabr Kiani and Khodamoradi (1381), Ahangari and Saadatmehr (1387), Esfandiari and Samimi (1393), Keshavarzian (1381), Hadian and Voham (1389), Pajouyan and Khosravi (1391) and Soheili et al. (1396).

In the form of structural models and using the basic method of TVP, several studies have been conducted at the international level, which can be used in Goodness Aye (2015) studies to predict the price of gold by examining six global factors (trade cycle, nominal, interest rate, commodity, Exchange rates and stock prices) showed

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[1]. Dynamic Model Averaging

that the dynamic averaging model (DMA) and the dynamic model selection (DMS) are better than the linear models (such as random walking) as well as the Bayesian averaging model (BMA) and (DMS), Gupta and Et al. (2014) to Predict China's Foreign Exchange Reserves Using the Dynamic Mean Model: The Role of Macroeconomics, Financial Stress, and Economic Uncertainty, Huber et al. To Predict US Business Cycles, Adrian et al. (2019) To predict US macroeconomic financial variables, Cope et al. (2020) cited.

2. Research model and method

The general structure of the generalized private equation investment equation is as follows:

$$y_t = \emptyset + x_{t-1}\beta + \sum_{j=1}^{p} \gamma_j\, y_{t-j} + \epsilon_t \qquad (1)$$

Where y_t is the private sector investment rate and is calculated as $\ln\left(\frac{y_t}{y_{t-1}}\right)$, where y_t is the private sector investment and x_t is the vector of the women's estimates. With these interpretations in this study, the x_t vector includes exchange rate variables, inflation rate, GDP, interest rate, facilities granted to agriculture, industry, services, tourism, construction and housing, government spending, liquidity, business climate index (doing business).The method of collecting library information and data source is the Statistics Center of Iran and various statistical reports. In this study, macroeconomic data of Iran related to investment are used.But because the more observations, the more powerful this method is, seasonal time series data is used. Dynamic averaging model is one of the approaches of TVP models that can be used to calculate the average probability of the presence of each variable in the best predictive model.

The experimental work of this study is divided into two parts. The first part of this study presents the results based on DMA and DMS methods, and in this subsection, events will be shown to determine which variables are more appropriate for predicting private sector investment and can better reflect changes in private sector investment over time. To interpret.

The second section examines the performance and efficiency of DMA and DMS methods compared to other private sector investment forecasting methods. In this

study, two standard indices of total squared prediction error[2] (MSFE) and absolute mean predicted error[3] (MAFE) are used, which are as follows:

$$\text{MSFE} = \frac{\sum_{\tau=\tau_0}^{T}[y_\tau - E\,(y_\tau | \text{Data}_{\tau-h})\,]^2}{T - \tau_0 + 1} \tag{2}$$

$$\text{MAFE} = \frac{\sum_{\tau=\tau_0+1}^{T}[y_\tau - E\,(y_\tau | \text{Data}_{\tau-h})\,]^2}{T - \tau_0 + 1} \tag{3}$$

Where $\text{Data}_{\tau-h}$ is the information obtained from the period τ-h, where h is the prediction time horizon, and $E\,(y_\tau | \text{Data}_{\tau-h})$ is the point Forcast y_τ.

3. Findings

Table 1: Model independent variables and their symbols

doing business	facilities	Inflation	Liquidity	Interest rate	government expenses	GDP	exchange rate	Fixed sentence	Variable name
Va8	Va7	Va6	Va5	Va4	Va3	Va2	Va1	c	Variable symbol

The results of the present study indicate that the dynamic models are more accurate in predicting private investment in the Iranian economy, so that the MAFE and MSFE values of DMA and DMS models with full dynamic state α = 0.95 and λ = 0.99, compared to TVP-BMA models, BMA is lower. The low MSFE and MAFE values indicate that almost all DMA family models, which are understood with different approaches based on different amounts of forgotten factors, can be considered as reliable, reasoned and documented models in order to advance. Private investment noses to be used.

4. Conclusion and suggestion

• The relationship between investment and other related variables, including exchange rates, has been examined over time horizons. In the short run, the exchange rate does not have much of an impact on investment; in this horizon, the exchange rate is not present in the best investment forecasting model, except for a limited period. With the realization of the exchange rate in the years 92-97, the presence of the exchange rate variable is more likely.

• The results of investment forecasts in the time horizon clearly indicate the relationship between changes in liquidity and investment. In the short run, the results indicate that in the short run, liquidity volume is present in the best investment forecasting model in many time periods and can practically use the liquidity volume variable as one of the factors creating investment.

• As observed, DMA and DMS models are sensitive to changes in λ and α, so that in studies of changes in the results of the models based on different values of λ and α are called sensitivity analysis.

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[2] Mean Squared Forcast Error.

[3] Mean Absolute Forcast Error

• The calculations show that in each of the time horizons and considering the values of the transfer matrix, which indicates the probability of the presence of each of the research variables in each period, the variables present in the best investment forecasting model in each period can change. In addition, this model can be used to predict the behavior of the variable in the future based on the changes and interactions of the present and past influential variables in all areas, which can be used as the latest studies in this area. The nose pointed to an epidemic of coronavirus (COVID-19) in the world.

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