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## Monetary Policy and Labor Markets: A Dynamic Stochastic General Equilibrium Model

Javan, M.<sup>1\*</sup>, Afshari, Z.<sup>2</sup>. and Tavakolian. H<sup>3</sup>

### Abstract

**Goal:** In this paper we try to present a version of the standard New Keynesian model with a real labor market for which we notice to the both side of labor market (supply and demand) for defining unemployment.

**Methodology:** Following Javan, Afshari and Tavakolian (1396), a dynamic stochastic general equilibrium model with unemployment is designed. In their study, they present a general dynamic stochastic general equilibrium model of the New Keynesian type for the Iran, which used the Galí approach to define unemployment (in terms of labor market distortions and staggered wage and price based on the Calvo approach). The model presented in this paper, in addition to commodity market disturbance, has also focused on labor market disturbances. Furthermore, wage markup is identified and the imbalance in the labor market is according to the both supply and demand side of labor market. Monetary policy in Iran does not follow an interest rate rule, so we try to use a modified Taylor rule that is based on monetary base growth rates rather than the interest rates.

We assume that economic agents include household, final goods producer, intermediary goods producer and government and central bank. This study assumes that labor is indivisible, i.e. in each period any given individual either works a fixed number of hours or does not work at all. As a result, all variations in labor input take place at the extensive margin. As in Galí (2010) and Javan et al (1396), we assume full risk sharing within the household. Given this parability of preferences, this implies the same level of consumption for all household members, independently of their work status. We assume that the wage for each labor type  $W_t(i)$  is set by the workers specialized in that type of labor (or a union representing them), whereas the corresponding employment level  $N_t(i)$  is determined by the aggregation of firm's labor demand decisions (and allocated uniformly across households). Thus, both  $W_t(i)$  and  $N_t(i)$  are taken as given by each individual household.

We estimate our model on Iran data for the sample period 1384Q1-1393Q4 using Bayesian method. The data used in this paper is seasonal adjusted data of consumer price index, GDP, government consumption expenditure, total investment expenditure, economic participation rate, construction service wage index, and Liquidity. After estimating the parameters, we examine the effects of technology, monetary and labor supply on the dynamics of macroeconomic variables. Then, in order to investigate optimal policy and optimal simple rule, a loss function was introduced and based on its amount; the losses of different rules were investigated. Following Galí (2010), we have a loss function based on a

second order approximation to the utility of the representative household. Therefore, the loss function is a function of the output gap, inflation, and wage inflation.

In this study, presence of market power in the labor market reacted in the wage markup and accounts for the existence of positive unemployment, even in the absence of wage rigidities. On the other hand, fluctuations in unemployment are a consequence of variations in the wage markup. Under the assumptions made above, wage markup variations are the result of nominal wage rigidities.

**Results:** Results of impulse response functions indicate that a negative labor supply shock, a positive monetary shock and a negative technology shock will reduce unemployment. In addition, the implications of optimal policy and optimal simple rule (OSR) are considered and compared to the results of the estimated model.

**Conclusion:** Output gap fluctuations have been shown to be costly as such in terms of utility, the corresponding welfare losses associated are substantial. The optimal simple rule results as estimated model imply that monetary authorities should respond to output fluctuations more than price inflation fluctuations. Furthermore, the results indicate that the impulse response functions under optimal policy and optimal simple rule are quite similar to each other; it means that the optimal simple rule and Ramsey's optimal policy follow the same path.

**KeyWords:** Monetary policy, Unemployment, Nominal Stickiness, Dynamic Stochastic General Equilibrium.

**JEL Classification:** E24 .E52 .E58.

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## The theory of Measuring Effects of Interest rate shock on the Macro factors in Iran: A Factor-Augmented Vector Autoregressive, Approach

Farahani, M.<sup>1\*</sup>, Marzban, H.<sup>2</sup>, Dehghan Shabani, Z.<sup>3</sup> and Akbarian, R.<sup>4</sup>

### Abstract

**Goal:** Imposing the discretionary interest rate renders the interest rate market susceptible to variety of shocks. Monetary officials should be well aware of the durability and temporal impacts of these shocks on the macroeconomic variables. Using 120 macroeconomic variables of Iran economy within the period of 1984-2013, this study investigated whether there is a statistically significant relationship between the shadow reference interest rate (as a representative of the interest rate market) and prescribed interest rate? If so, what would be the consequence of the gap (difference) between these two rates in terms of the response of macroeconomic outlets?

**Methodology:** This paper estimates the "economy-wide" response to shocks to the interest rate using an iterative maximum likelihood estimation method. Applying Factor-Augmented Vector Autoregressive (FAVAR) method, it was investigated how macroeconomic variables respond to interest rate oscillations (shocks). To do so, first, key macroeconomic variables for Iran economy are identified (i.e., the variables that robustly represent Iran's macroeconomic variables). As for the modeling, measurement and transfer equations have been assessed. Technically, the 120 time series constitute the measured part in a state space system. The state transition part of this system contains the dynamics of the driving forces and is represented as a vector Autoregression of the shadow reference interest rate augmented by a few dynamic factors extracted from the large cross-section of time series. This state space system is denoted a factor-augmented VAR (FAVAR) by Bernanke et al. (2005). I estimate the FAVAR by the fully parametric one-step EM algorithm as an alternative to the two-step principal component method and the one-step Bayesian method in Bernanke et al. (2005). The EM algorithm which is an iterative maximum likelihood method estimates all the parameters and the dynamic factors simultaneously and allows for classical inference. I demonstrate empirically that the same impulse responses but better fit emerge robustly from a low order FAVAR with nine correlated factors compared to a high order FAVAR with fewer correlated factors, for instance six factors. This empirical result accords with one of the theoretical results from Bai & Ng (2007) in which it is shown that the information in complicated factor dynamics may be substituted by panel information.

**Results:** According to Bai and Ng criteria, Expectation maximization, and the model, it is argued that GDP, Monetary base, oil revenues, inflation, interest rate, and exchange rate are the key macroeconomic variables. Regarding the first question, it was shown that as the difference between the shadow reference

interest rate and interest rate approaches zero, economic growth increases. This result has important policy implications: Policy makers are advised to set the prescribed interest rate close to the shadow reference interest rate. As for the second question, it was examined how the four main Iran economy outlets respond to the shocks in terms of durability and the temporal impact. The results indicate that as far as the temporal impact is concerned, capital market and exchange rate exhibited the minimum (0.1 percent deviation from the mean) and maximum values (0.4 percent deviation from the mean), respectively. As for the durability, housing and banking outlets show approximately similar responses. It is worth noting that the standard deviations of shocks in interest rates caused delayed responses in GDP, unemployment, consumption, and bank deposits (one year delay). This demonstrated the rigidity of these variables. Inflation and capital market variables, however, do not show any rigidity. The same result has been reported as slow and fast moving variables in Bovin and Eliaz, (2005).

**Conclusion:** The Central Bank should adopt necessary measures in response to the oscillations pertinent to the prescribed interest rate. Moreover, monetary officials should be well aware of the durability and temporal impacts of such oscillations on macroeconomic variables. Based on their thorough understanding of the impacts, the officials can introduce effective measures. In this study shadow reference interest rate significantly explains the macroeconomic variables. Policymakers are advised to set the prescribed interest rate close to shadow reference rate.

**Keywords:** Shadow Reference Interest Rate, FAVAR Model, EM Algorithm.

**JEL Classification:** P14, O53, O16, O11, E43, E44.

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## Effect of monetary and fiscal shocks on macroeconomic Variables of Iran in different volatility regimes: Markov Switching DSGE Approach

Saeidpour, L.<sup>1</sup>, Heidari, H.<sup>2\*</sup> and Faaljou, H. R.<sup>3</sup>

### Abstract

**Goal:** In an environment where economic structures break, variances change, distributions shift, conventional policies weaken and past events tend to reoccur, economic agents have to form expectations over different regimes. This makes the regime-switching dynamic stochastic general equilibrium model (RS-DSGE) the natural framework for analyzing the dynamics of macroeconomic variables. Therefore, unlike other studies that addressed time-invariant parameters, the present paper analyzed the behavior of the major Iranian economic variables using small open-economy DSGE models and allowing for Markov switching in certain parameters estimated by Bayesian methods.

**Methodology:** The method proposed by Farmer et al. (2008) was used to solve the MS-DSGE model. The method consists in rewriting the model so that it includes fixed parameters with extended states, whose MSV solution written as an MS-VAR solves the original model. Therefore, this study investigates the effect of monetary and fiscal shocks on macroeconomic variables under different volatility regimes in Iran by applied Markov switching DSGE macroeconometrics approach. In this regard, theoretical framework of New Keynesian Open Economy (NKOE) and quarterly time series data during the period from 1369 to 1393 has been used. The theoretical structure of the model includes five sectors of households, firms, governments, central banks and the foreign economy. Household consumption is divided into two parts of tradeable and non-tradeable goods, where tradeable goods divided into domestic and foreign goods. Moreover, the firm's section separated into two parts of the domestic and foreign firms, where domestic firms are divided into tradable and non-tradeable firms. In other hand, foreign firms included three parts of importer, exporter and capital goods. The governments and the Central Bank sectors has been modeled based on the dependence of Iran economy on oil revenues. The foreign economy is modelled as a standard three-equation closed economy DSGE model which is included output, inflation and monetary policy equations.

**Results:** The results of volatility regimes filtering probabilities shows that the variance of monetary and fiscal shocks in three time periods of 1372-1375; 1377-1378, and 1390 to 1393 is greater than other periods that is known as a high-volatilities regime. The influential role of increasing inflation is noteworthy in high volatility periods. Results of impulse response functions reveal that the response of macroeconomic variables to fiscal and monetary impulses in high-volatility regimes is greater than low- volatility regimes. However, it is noteworthy that the intensity of the impulse response functions in high-volatility

regimes is short-run, because after a maximum of four periods the reaction of the variables to impulses is very close to the low-volatility regimes. The results of central bank's foreign reserves impulse response function indicated that the production and inflation of tradable goods has been reduction and in contrary, increase of production and inflation of non-tradable goods. Results of government expenditure shock to inflation reveal that the increase of non-tradable and reduce of tradable goods inflation. However, this shock leads to increases production of both goods under consideration. The impulse of government tax revenues has a short-run and little impact on the variables under consideration which that leads to inflation increases and the decline in productions of tradable and non-tradable goods. Eventually, the monetary base shock has the greatest impact on the money supply and also increased other variables under consideration including the production and inflation of tradable and non-tradable goods.

**Conclusion:** According to the dependence of fiscal and monetary policies in Iranian economy on oil revenues, the results implicitly point out the possibility of Dutch disease in Iran. The Dutch disease problem generally refers to a contraction in the industrial or manufacturing tradable sector originating from an increase in the income generated by the export of some commodity that is oil export revenues in Iran.

**Keywords:** Markov Switching DSGE, Fiscal Shock, Monetary Shock, Tradable and Non-tradable Goods.

**Jel Classification:** E32, E63, C51, C11.

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## Implementation of Value Added Tax on Bank Sector in Explaining Iran Economic Fluctuations Using the Approach of New Keynesian Dynamic Stochastic General Equilibrium

Gholami, A.<sup>1\*</sup> and Abasinejad, H.<sup>2</sup>

### Abstract

**Goal:** The value added tax is now being implemented in more than 140 countries. This tax is a tax on the sale of goods and services, which are applied in the chain of import, production, distribution, consumption at a constant (non-progressive) tax rate, and ultimately final consumers are the only payable one. Banking services are exempt from value added tax for technical reasons in most countries of the world.

**Methodology:** Value-added tax not subject to tax is the difference between the interest rate on borrowings from the bank and the interest rate that the bank pays to depositors. Financial institutions also earn revenues from providing some services, such as paying services, which are exempt from taxes.

In this case, everything that the bank purchases from other firms to provide services is subject to value added tax, but cannot claim tax on it. Since the interest rates in Iran are determined by an order and externally and banks cannot transfer their taxes to these rates, the costs of the bank have increased and, therefore, their liquidity has decreased and the loans are reduced. In recession and reducing firms' access to domestic resources, they have to be financed externally, which would increase the cost of firms, as well as the problems caused by shortages of banking resources, these costs increase and ultimately leads to escalation of stagnation. A liquidity shock reduces the ability of firms to finance investment projects. This decrease the value of the assets of the firm would increase the cost of external financing and lead to an increase in the cost of new investments. By reducing investment in economic activity and cash flow in future projects, the effects of the initial shock are repeated.

**Results:** The value added tax has many features that have made it one of the attractive ways for governments to increase revenue. This tax is levied on all sales, including wholesale and retail, and allows firms to pay taxes on their purchases at each stage. So that tax is transferred to the next stage and ultimately the final consumer will be the taxpayer. In practice, most goods and services are not subject to the standard rates of value added tax, and some of them are subject to tax exemptions. One of the cases that has been exempted in most countries of the world is banking services. In this case, the banks do not charge value-added tax on the sale of their services, but likewise do not receive input credits for VAT paid on their inputs. Exemption creates a number of distortions in economy. This study in order to understand the importance of VAT in macroeconomic fluctuations and fundamental role of financial intermediaries shocks on the economy investigates

the effects of VAT levied on banks using a standard dynamic stochastic general equilibrium model for the Iran economy. Banks have a central role in model and different interest rates for deposits and loans are considered. Vat is levied on the difference between the two rates. The imposition of VAT on the difference these rates, resulting in sudden changes in other macroeconomic variables has been investigated. By determining the input values and model parameters using the calibration procedure during the period 1370-1394 the results of the simulation variables of the model indicates a model describing the dynamics of the Iran economy.

**Conclusion:** In addition, the response functions due to the increased rate of VAT on banking and monetary and productivity shocks has been investigated. The results suggest that imposing VAT on banks reduces their costs and increases bank reserves and their lending power so the supply of credit, investment and production increases. Improved technology also appears to increase the productivity of manufacturing firms and increases the demand for bank loans and on the other hand increases the loan supply. As a result of this process, investment and consumption will be increased.

**Keywords:** New Keynesian dynamic stochastic general equilibrium, Bank services, Macroeconomic fluctuations, DSGE Model, VAT, Tax Exemption.

**JEL Classification:** H30 .H25 .H20 .E52 .E58.

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## The Effect of Business Intelligence on Financial Performance of Iranian Banks

Zarei, B.<sup>1\*</sup>, Zarei, Zh.<sup>2</sup>

### Abstract

**Goal:** Business Intelligence systems couple operational data with analytical tools to produce information of competitive value for planners and decision makers. These systems can handle huge amounts of information and are capable of identifying information to develop new opportunities. Thus competitive market advantage and effective strategy insight are gained by implementing Business Intelligence based systems.

**Methodology:** So that, studies show that benefits Business Intelligence bring to companies: faster and more accurate reporting, an improved decision-making process, improved customer satisfaction, increased revenues, savings in IT; and savings in other areas (in addition to information technology). In addition, the benefits of Business Intelligence as: an increase in revenue, an increase in profit, improved customer satisfaction, a reduction of costs, and an increase in market share. However, very few studies have empirically evaluated these assertions theoretically and a dearth of studies exists in the literature when it comes to empirical evidence to ascertain some of these claims of Business Intelligence systems benefits.

On the other hand, Contemporary banks face challenges such as fierce competition, a highly dynamic market, the necessity of strict control, varying client demands and risk management are only some of the features of the business environment where modern banks conduct their operations. In addition, concerns such as suppression and detection of fraud, risk management, customer management, loss prevention and product management, are some of the primary problems of financial institutions.

In recent years, banks strive to adopt diverse forms of Business Intelligence tools to curtail the challenges they face. Some of the areas Business Intelligence covers in the bank include: "Customer Relationship Management (CRM), Performance Management (PM), Risk Management (RM), Asset and Liability Management (ALM), and Compliance". Online analytical processing (OLAP) and data warehouse are used for the informational basis for the application of Business Intelligence in the banks, whilst data mining and knowledge retrieval handle "complex statistical analysis discovering hidden relationships between data and forecasting the behavior trends of business systems".

Iranian's banking industry is undergoing through a phase of major transformation, with entry of more players in an already competitive environment and as a result one common theme being seen across banks in Iran is increased Implementation of Business Intelligence and analytics to drive their overall

profitability, competitiveness, performance management and risk management. This study wanted to answer this question, “Are the banks that have implemented Business Intelligence systems really benefitting from these reported benefits? Is it true that Business Intelligence systems can improve the banks financial performance”?

So, this study examines the effect of Business Intelligence on financial performance of banks in Iran over the period 2006-2015.

The data is collected from Financial Statements Analysis of Iranian banks Sector . **Results:** This study has chosen to use Principal component analysis (PCA) method and panel data regression models as a quantifiable measure to assess the Business Intelligence index and then, its effects on financial performance of Iranian banks respectively .

Independent variable used in this research is Business Intelligence and dependent variables used are Return on assets (ROA), Return on equity (ROE), loans to assets ratio and cost-to-income ratio that they are proxy variables of financial soundness indicators.

In this study, Business Intelligence index (independent variable) calculated on according to Wixom (2008) study to use of 4 variables. These variables are information technology, human resource, customers and competitors.

Findings show that, Business Intelligence has positive and significant effect on banks' Return on assets (ROA), loans to assets ratio and first lag of Return on equity (ROE). Also, Business Intelligence can decrease cost-to-income ratio of banks after year.

**Conclusion:** Practically, this study has shown that the adoption of Business Intelligence systems can have both financial and nonfinancial effects on banking performance. This has provided an insight to managers and policymakers that in evaluating the effects Business Intelligence systems, they should take a comprehensive approach and consider both the financial and non-financial aspects due to the intangibility of some of the benefits. In addition, it is recommended that bank managers should also encourage the use of Business Intelligence systems in all their operations which with time can translate to the financial gains of the banks. Then, banks can use of this technology for Improvement financial performance. That's while, only 3 banks use Business Intelligence in Iran.

**Key Words:** Business Intelligence, Financial Soundness Indicators, Financial Performance, Information Technology.

**JEL Classification:** C23 .O22 .O31 .E19.

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**Analysis of the Role of Importing Partners in the Vulnerability of Iran's Inflation: Evidence from Global Vector Error-Correcting Model (GVECM)**Hajamini, M.<sup>1\*</sup>**Abstract**

**Goal:** Increasing interactions of real and financial sectors is regarded as one of the inevitable characteristics for the world economy. These international interdependences can lead to higher degree of inflationary vulnerability to global and foreign shocks. Therefore, the national inflation management is one of the most important challenges that different countries are facing in the global economy. In addition, Iran is a net-food-importing and net-oil-exporting country, and food and energy have considerable share in consumer basket. Hence, Iran's economy has a higher degree of inflationary vulnerability. Iran's Inflation not only is directly affected by the oil and food shocks, but also is influenced by changes in the inflations of Iran's importing partners (spillover effect). In this regard, the present study examines the role of oil and food shocks and foreign inflation on Iran's inflation. However, the paper is focused on both direct and indirect (spillover) effects of the oil and food shocks. For instance, the shock in oil price may lead to some changes in global food price and accordingly some changes in inflation in Iran trading partners. Therefore, Iran's inflation is also affected by increasing oil price and the inflation changes in trading partners. Similarly, a food price shock can lead to higher inflation of Iran trading partners. Therefore, not only Iran's inflation is directly affected by food price shock but also it may be affected by the changes in the inflation of trading partners.

**Methodology:** The present study aims to evaluate the spillover effect of global shocks on Iran's inflation. In this regard, the long-run relationship and short-run dynamics of inflation for 34 countries were analyzed based on a global vector error correction model (GVECM). This model is estimated for 34 countries during 1988Q4-2013Q1. The selected countries have more than 80 percent of world GDP during 1988-2013. On average, 80 percent of the imports in each country were provided by the 33 other countries. In addition, more than 80 percent of Iran's imports were done through the countries involved in the GVAR model. Then the regional and global transmission channels of inflationary shocks among the countries are properly included in the GVAR model. The data included inflation rate, exchange rate and gross domestic production for each country, global food and oil prices, and import shares of each country with respect to the other countries. The ability for capturing the interactions and interdependencies in the context of the global economy is one of the most advantages of GVAR models. In this regard, the macroeconomic of each country is modeled as a part of global multi-country model. Hence, the GVAR model captures the spillover effects of cross-countries shocks well.

**Results:** The findings are as follows: 1) the spillover effects of oil shocks on Iran's inflation are often in the opposite direction of the direct effect, so that the initial change of inflation is neutralized by Iran's importing partners. Food shocks have a direct and significant effect on Iran's inflation, which the spillover effects amplify it. 2) Inflation in China and Latin American is sharply influenced by the oil and food shocks. The spillover effects of these countries are transmitted to Iran's economy, and hence accentuate the effect of the original shocks. 3) But developed countries (Europe, Japan and South Korea) is able to curb inflationary pressures, and so do not impose inflationary pressures to their trading partners. 4) Variety of Iran's importing partners has declined in favor of focusing on developing and more vulnerable countries in particular from the 2000s.

**Conclusion:** Therefore, the dispersion of Iran's international trade among developed and emerging countries improves the economy resilience against future inflationary pressures.

**Keywords:** inflation; spillover effect; importing partners; global vector error-correcting model.

**JEL Classification:** F10, F41.

## The Impact of Various Combinations of Corruption on Attracting Capital in Developing Countries Parallel with Iran

Khodaparast Mashhadi, M.<sup>1</sup> and Kordi, A.<sup>2\*</sup>

### Abstract

**Goal:** Although capital as the most important factor in the economic growth of developing countries is of great importance for these countries, and due to the constraints on its attraction in domestic level, much attention is also given to foreign investment. But there are several factors that reduces benefits from investment, especially foreign investment. Among the most important of these factors, the rate of corruption in the country is the capital destination. Many studies have shown that corruption (with an emphasis on Corruption Perception Index) has a negative impact on investment in countries.

**Methodology:** Therefore, due to the importance of this issue, especially in developing countries, this study examines the factors affecting investment (foreign direct investment and private investment in the private sector) with an emphasis on the Corruption Perception Index, Control of Corruption, and other modifying variables of corruption that govern governments and Hence, capital attraction is more effective. For this purpose, this study apply panel data and vector self-regression models among 30 developing countries between 2005 and 2015 and estimates combined cross-sectional and time series data. In this study to obtain information on the impact of corruption on the rate of capital appreciation in developing countries, based on theoretical foundations and past studies (including and private direct investment (FDI) and private investment (DP)), the variables of Corruption Perception Index (CPI), Control of Corruption (COC), Political Stability (PS), Inflation Rate (IN), GDP per capita (GDPPC) and economic freedom (EF) have been used.

**Results:** The results indicate that corruption perception have no effect on foreign investment, but corruption control has a positive effect and significant effect on it. Also, both indicators of corruption perception and control of corruption have a positive effect and significant effect on private sector investment. The variables of economic freedom and political stability have also had a positive effect and significant effect on investment as other modifying variables. According to the results, the scale of the market has a positive and significant relation with the investment of the private sector.

**Conclusion:** According to the results of this study, corruption perception did not have a significant effect on foreign direct investment. This can turn back to the point that if the return on capital covers the uncertainties of corruption, foreign investors should not worry about their investments in countries that do not have a stable political or economic system or high inflation. In other words, what matters to an investor is the positive and high rate of return on capital that is determined

by the difference in the nominal return on capital and the rates of losses caused by corruption and inflation, but corruption control has a significant effect on this variable because it is often Foreign investors prefer to invest in a country whose profits are guaranteed and do not threaten their investment risk. As a result, it must be combated with economic corruption and it high-risk. If is not taken serious the fight against corruption, economic diseases is growing increasingly. While unrealistic struggle can threaten investors and lead to the destruction of the security system of investment.

**Keyword:** Foreign Direct Investment, Private dimestic Investment, Corruption Perception, Control of Corruption, Developing Countries, Panel-Var Model.

**JEL Classification:** C23, F21, K4.

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## Forecasting Electricity Demand in Iran: The Application of a Hybrid Dynamic Partial Adjustment and ARIMA Model

Rostami, M.<sup>1\*</sup>, Khademvatani, A<sup>2</sup> and Omidali, M.<sup>3</sup>

### Abstract

**Goal:** Electricity consumption in Iran was reached to historical level of 255,724 million kwh in 2017 which shows 7.7 percent increase compared to the year 2016. Considering the dramatic increase in electricity use mainly due to population growth, urbanization, economic and industrial development, providing a better picture of the future electricity demand for policy makers seems necessary. In addition, specification of the most important variables and their effects on the electricity demand would help policy makers to decide which policy instrument, such as price or non price policies, to choose in order to manage electricity demand.

**Methodology:** The aim of the present study is to propose and estimate per capita electricity demand function in Iran and forecast electricity consumption over the next 15 years (2015-2029).

To do so, via a dynamic partial adjustment model (DPAM), we first estimated the per capita electricity demand function using historical data over the years 1981-2014 to see the long term and short term effects of independent variables such as real per capita gdp, real electricity price, real natural gas price as an alternative fuel, and population on electricity demand. Then based on estimated values of the independent variables from an ARIMA model in the hybrid dynamic partial adjustment and ARIMA model, we predicted the electricity consumption up to the year 2029. We used Augmented Dickey-Fuller test to check the unit root in the time series data and we found that none of the variables were stationary and we could not reject the null hypothesis at 5 percent statistical significance level. However, the first difference of the variables were stationary at 5 percent level. We also did Engle-Granger and Cointegrating Regression Durbin Watson (CRDW) Tests and the results show that cointegration exists among the variables.

**Results:** According to the results, short-term and long-term price elasticities of electricity demand are -0.014 and -0.026 percent respectively which indicate that electricity demand is inelastic with respect to price changes, thus electricity price increase would not lower electricity demand. Moreover, income elasticities both in short-run (0.192) and long-run (0.36) had much higher effects on electricity demand. Among the independent variables, per capita gdp with coefficient equal to 1.47 had the strongest effect on the electricity demand. Finally, our estimation shows that the cross price elasticities in short-run and long-run are 0.006 and 0.011 respectively which show that one percent natural gas price decrease would reduce electricity consumption less than one percent. Overall, these results revealed that price policies are not effective to manage electricity demand.

Based on AIC and SBC criteria, we found that ARIMA (2,1,1), ARIMA(1,1,1), ARIMA (2,1,2) and ARIMA (2,1,2) are appropriate to predict per capita GDP, real electricity price, population, and real natural gas price respectively. The results from the hybrid dynamic partial adjustment and ARIMA model also show that the average annual growth rate of the electricity consumption per capita between 2015 and 2029 was 2.03 percent and the electricity consumption in 2029 will be 4134.7 million kwh which is 45 percent higher comparing to the year 2015.

**Conclusion:** To test the credibility of our prediction, we compared the historical figures of per capita electricity consumptions with the predicted numbers by our hybrid model over the years 1981-2014 and realized that the average deviation of the prediction was only 1.3 percent which is in the range of acceptable error level. To cope with this predicted electricity demand, appropriate energy policies including planning to increase electricity production and/or managing electricity demand side must be designed and implemented. Examples of such policies in supply side would be more investment on power plants and their productivity improvement. On the demand side, non-price policies such as consumers education and providing better conversion technologies like more energy efficient appliances to consumers are advised.

**Keywords:** Forecasting, Iranian electricity demand, Hybrid Model, Dynamic partial adjustment, ARIMA.

**JEL Classification:** C51, Q41, Q47.

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## Saving, Investment and Economic Growth in Iran: Results from ARDL Model and Cointegration Approach with Structural Breaks

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### Abstract

**Goal:** Economic growth has been considered as one of the most important development indicators for analyzing the level of community welfare and economical status. Explaining the relationship between saving and investment with economic growth can play a crucial part in regulating and codifying macro-economic policies. These relationships depend on absence or presence of structural breaks, could alter considerably. Therefore, regarding structural breaks in empirical analysis is very crucial and disregarding them could lead to unreliable and misleading results.

**Methodology:** In most of the existing studies in the Iranian economy, the problem of structural failure in data and patterns has received little attention and it can be argued that in examining the long-term relationships between variables, this issue is almost neglected. Even in the case of attention, the fracture points are assumed to be exogenous, which is distinguished from other studies in relation to Iran's economy with these features.

In this paper, using Iran's economic annual time-series data from 1960 to 2016, we aim to analyze the relationship between saving and investment with economic growth in terms of structural breaks. In doing so, Zivot & Andrews unit root test (1992) and Lumsdine & Papell unit root test (1997) have used to determine structural changes time endogenously and also Saikkonen & Lutkepohl (2004) cointegration test is applied for analyzing the long-term relationship between saving and economic growth with a focus on structural break. For estimating the model the ARDL method is used.

In this research, the existence or absence of meaningful relationships between investment, savings and economic growth has been investigated and for estimating the model, the ARDL econometric method has been used in which livestock variables are included for the Islamic Revolution and imposed war. The consistency and recognition tests (Cusum and CusumQ) have been used to determine the model stability and to determine the structural stability.

**Results:** The results of the research show the stationary of the variables with the degree of cointegration (I) and the existence of a long-run equilibrium between savings, investment and economic growth in Iran in terms of structural failure. According to the ARDL method, gross national income and gross fixed capital formation have a meaningful and positive relationship with economic growth, in line with theoretical expectations. Thus, a one percent increase in savings and investment will increase economic growth by 0.16 and 0.15 percent respectively.

**Conclusion:** The coefficient (ECM) in the affirmation pattern of estimated model error in the economic growth function is statistically significant and indicates a strong relationship between short-run and long-run relationships. In addition, as the F statistic boundary test is co-integrated, as the coefficient (ECM) is meaningful it indicates the existence of a long-term relationship that is consistent with Gregory-Hans..en and Saikkonen & Lutkepohl tests. The suggestions of this article can be stated as follow.

First, applying active policies to encourage investment and directing savings to investment leads to economic growth. Second, establishing discipline and security in the monetary and financial markets of the country in order to prevent fluctuations of inflation and exchange rates in domestic markets for increasing the willingness and confidence of investors to invest.

Third, the reciprocity is aimed at investing and increasing deposit rates in commercial banks through monetary policies that are available to the central bank in a way that encourages people to increase their savings and deposits to the banks. And finally, providing low-level facilities and improving the business environment and the necessary support from investors to implement projects will lead to post-sizing of people towards productive investment and economic growth.

Increasing the degree of openness of the economy, which requires accelerating trade, tariff reform and accelerating customs duties, will increase the willingness to invest and attract investment.

**Keywords:** Saving, Investment, Economic Growth, Structural Break, Co-integration Techniques

**JEL Classification:** C32, E21, E22, O11.

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## Monetary Policy in a Financial Accelerator Models with Sticky Price and Wage

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### Abstract

**Goal:** The financial system could be a source of prosperity or decline of the economy. Asymmetry of information in this system can cause adverse selection and moral hazard, that can increase the risk of facilities.

As a result, the risk reward increased and cause increased interest rates to facilitate comparison with the interest rates on deposits. By raising interest rates Facilities, risk taker people, attempted to take more facilities that the result will be an increase in deferred bank.

On the other hand, Raising interest rates make it more facilities in the purchase and sale of property and speculative which on average have high efficiency in Iran's economy to be used, that cause diversion of resources

In such situation, economic actors stated that Lack of necessary liquidity, especially from the banking sector and high interest rates on the facility are the major constraints to the manufacturing sector.

To check this subject, and the effectiveness of monetary policy in such situation from a financial accelerator model in a New Keynesian dynamic stochastic general equilibrium model was used.

**Methodology:** The financial accelerator model used in this research is based on Nolan and Thoenissen (2009) study that is a new Keynesian fairly standard model with financial frictions. The model includes the household sector, retailers, entrepreneurs (producers of wholesale goods), the government and the central bank.

The representative household acquires utility from consumption goods and services and maintenance of money, and by working their utility is reduced. Entrepreneurs use the services of capital and labor to manufacture wholesale goods and sell to retailers.

The entrepreneurs need external funds to purchase capital, that they are exposed to financial market frictions. The retailers buy wholesale goods produced by the entrepreneurs and make changes and offer them to the final consumer.

Retailers operate in monopolistic competition and in accordance with the method of Calvo, acting in their pricing. Government revenue includes oil revenues, money creation and tax revenues that provide their cost to them. In Iran, the interest rate is determined in an order of magnitude. Therefore, in this study, the rate of money growth is used instead of the interest rate. In which, with regard to the conversion of oil revenues into domestic currency and the independence of the central bank and the provision of part of the government's expenditure from

the seigniorage income, oil revenue shock and government's expenditure on the volume of money is effective.

**Results:** After solving and log - linearization model using Bayesian method for the Iran economy in the period 1357-1393 using annual data for the gross domestic product, inflation, private consumption, investment, monetary base and government spending, was estimated as the observable variables from time series database of the central Bank of the Islamic Republic of Iran, Survey the immediate response function figures show that:

Monetary shocks, as much as the estimated standard deviation by creating conditions of inflation, Because of falling real interest rates, increased consumption via Euler Equations And also Because of falling real wage increase employment and investment.

Oil revenue shocks in this model via a change in the monetary base and through changes in government oil revenues, affect the government spending and ultimately stimulate aggregate demand in the economy. With increasing oil revenues, consumer goods by households increases.

**Conclusion:** The positive shocks in government spending, cause increased in private consumption. An increase in government spending causes inflation because government spending is as one of the important components of aggregate demand, assuming all other factors be constant, cause an increase in the general price level, we are seeing the effect of crowding out of public sector rather than the private sector.

Scenario Building of financial friction parameters indicates that with greater transparency and reducing financial friction, The impact of monetary policy on production increases and money has a smaller effect on inflation.

**Keywords:** Monetary policy, Financial Accelerator, Sticky Price and Wage, Dynamic stochastic general equilibrium model.

**JEL Classification:** E52, C60, E30, J30.