

The Impacts of Unified Exchange Rate System on Domestic Price in Iran

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Abstract

The main purpose of this paper is to examine the impact of exchange rate unification policies on the domestic price in Iran using a co-integration approach between 1971 and 2002.

For doing this, a weighted average of exchange rate under the multiple exchange rate regimes is used as a proxy for the unified exchange rate. The impact of this unified exchange rate on the domestic price alongside with other variables is evaluated by multivariate Johansen's co-integration technique.

The main finding indicates that the unified exchange rate has a positive effect on the domestic price in Iran. In other words, the move from multiple exchange rate system to unified exchange rate maybe accompanied with inflationary pressure.

Keyword: Foreign exchange rate unification, Iranian economy, Co-integration test, Domestic price.

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1- Introduction

In this paper, we analyze the impact of a change in the exchange rate system-from the multiple exchange rates to the single rate- on the Iranian macro economy. The exchange rate unification has been achieved by several less developed countries (LDCs) in the past. The experiences of some of these countries like Turkey, Venezuela, and Argentina have been successful. Here the focus is on the exchange rate unification implemented by the Central Bank of Iran in early 2002. We ask, to what extent has the adoption of a single exchange rate after the exchange rate unification in 2002 affected the domestic macroeconomic variables. Specifically, does the exchange rate unification accelerate domestic inflation? It is our objective to answer this question and provide some policy implications as well.

Prior to the unification, Iran was under a multiple exchange rate system. The exchange rate unification policy was part of a broad structural adjustment, which started during the second Iranian economic planning (1995-99). These changes were in response to the large fluctuations in the exchange rate since the 1979 Iranian revolution. Furthermore, during this time, the exchange rate was subject to a large number of shocks, overall resulting in a devaluation of the domestic currency against major foreign currencies.

To analyze the impact of the adoption of a single currency we construct a multivariate VAR model based on the extended QTM¹. Then, by applying the Johansen' co-integration technique, the long-run relationship between the domestic price level and exchange rate alongside other relevant variables is estimated. The variables that we are considering are exchange rate, GDP, money supply, oil price and domestic price level from 1971-2002.

Although we do not have data on the unified exchange rate for the time period, we are nevertheless able to analyze the impact of a single exchange rate on the economy through the use of a weighted average of official and parallel exchange rates as a proxy for the unified exchange rate. Before the unification of foreign exchange market in 2002 by floating exchange rate, five types of exchange rates have existed in the Iranian economy. One of these was the parallel exchange rate, which was a black market exchange

1- Quantity Theory of Money.

rate. After abandoning the multiple exchange rate system in 2002, all of the exchange rates more or less approached a single rate – the parallel exchange rate. That reflects the managed floating exchange rate in the foreign exchange market today. Since 2002, the new exchange rate has been the same as the parallel exchange rate.

The remainder of the paper is organized as follows. In section 2, the main features of Iranian economy and its foreign exchange rate development are briefly discussed. This is followed by a review of previous studies. The theoretical framework as well as econometric methodology are explored in section 4. In section 5, the stationary test of variables is tabulated. Moreover, the results of co-integration test and estimations are presented and explored. Lastly, section 6 concludes the paper and presents some policy implications.

2- The Iranian Economy and Its Exchange Rate Developments

Like the other oil exporting countries, the major challenge facing Iranian economy is its overwhelming dependence on the petrodollars. According to a 2002 IMF report, the share of oil in the total government revenues varied between 40 to 64 percent during 1998-2002 and the share of oil in total exports was in the range of 67 to 83 percent during the same time period. These figures are presented in Table 1.

Table 1: The Share of Oil and Gas (millions of rials) in the Total Government Revenues and Exports (millions of dollars) of Iran.

Item \ Year	Year				
	1998	1999	2000	2001	2002
Non-oil revenues	22530 (36%)	44487 (43%)	128205 (68%)	103134 (57%)	149031 (60%)
Oil and gas revenues	40351	59404	61784	77841	100965
Non-oil exports	3185	3941	4181	4565	5379
Oil and gas exports	15544 (83%)	10048 (72%)	16322 (79%)	23261 (84%)	18724 (67%)

Source: IMF(2002), Islamic Republic of Iran: Selected Issues and Statistical Appendix, Country Report NO.2/212, pp.38-39.

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A major portion of the Iranian oil revenues is transferred to different segments of the Iranian economy through subsidies that range from implicit subsidies on the price of different consumer goods, such as bread, sugar, and petroleum, to direct subsidies like rationing coupons on consumer goods. According to the IMF report, total subsidies through the consumer goods such as fertilizer, sugar, wheat, milk, cheese, rice and vegetable oil has gone up from 1.9% of GDP in 1998 to 2% of GDP in 2002.¹ It should be noted that government subsidies were not limited to consumer goods, but also included administered foreign exchange rate (to the industrial units) and bank interest rate.

Another characteristic of the Iranian economy is its heavy dependence on import goods, especially intermediate and capital goods. Table 2 indicates that more than 85 per cent of the Iranian imports constitute intermediate and capital goods, which are essential in the process of industrial production. Furthermore, 0.37 dollars worth of imported

Table 2: Composition of Iranian Imports (1997-2001) (in millions of US dollars)

Item	1997	1998	1999	2000	2001
Raw materials, intermediate and capital goods	12185 (86%)	12312 (86%)	10735 (85%)	12235 (96%)	15355 (87%)
Consumer goods	2007	2011	1948	2112	2270
Non-classified goods	4	0	0	0	0
Total	14196	14323	12683	14347	17626

Source:IMF(2003). Islamic Republic of Iran:Statistical Appendix, Country Report. NO. 03/280, p.50.

Primary and intermediate goods were needed to produce 100 rials of non-oil GDP in 1983. In contrast, the import content was more intensive in the manufacturing sector. At the same time, it was essential to import 1.81 dollars of primary and intermediate goods for per 100 rials of value added in

1- IMF, Country Report, p. 31.

the manufacturing sector.¹ Consequently, the exchange rate unification by level of floating exchange rate in the market can have stagflationary impact on the economy, especially in the manufacturing sector.

Now we look at the economic performance of the Iranian economy between 1970 and 2002. According to figure 2.1, both Iranian GDP and GDP per capita growth rates have declined in the post revolutionary period, especially during the years immediately after the revolution, indicating there has been a trade-off between economic growth and more equitable distribution of income as mentioned before.

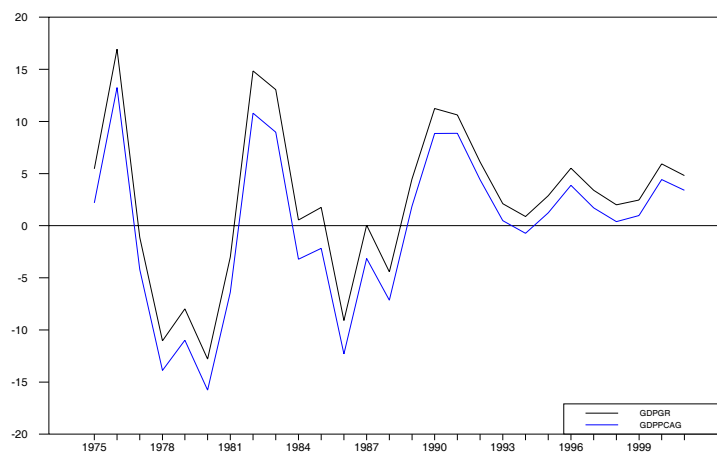


Figure 1: Iranian GDP Growth Rate Versus GDP Per

Figure 2-2 indicates that declining GDP per capita in the post-revolutionary period has caused the consumption share of income to increase.

1- Sohrab Behdad (1988). "Foreign Exchange Gap, Structural Constraints, and the Political Economy of Exchange Rate Determination in Iran." *International Journal of Middle East Studies*, NO.20, p.10.

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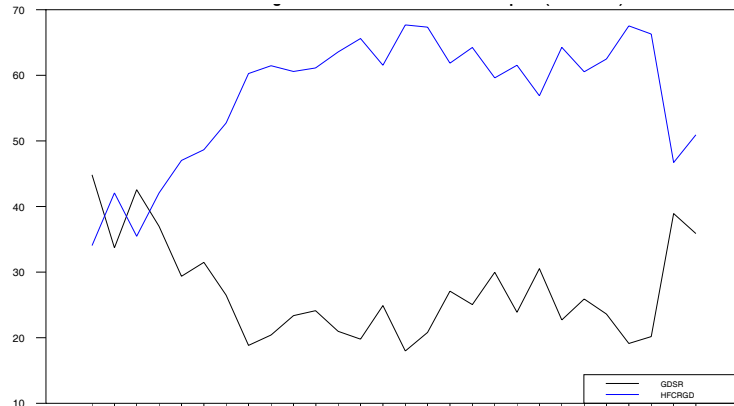


Figure 2: Gross Domestic Savings Versus Household Final Consumption (% of GDP)

Figure 2-3 shows that the capital formation in terms of GDP and its annual growth rate are lower over many years in the post-revolutionary period.

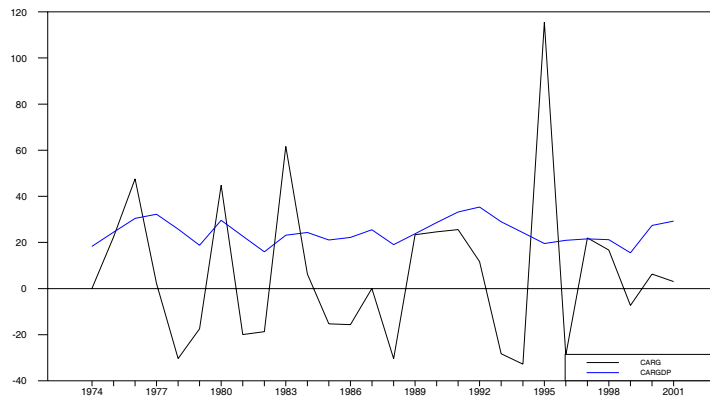


Figure 3: Gross Capital Formation in Terms of % GDP and Annual % Growth

In figure 2-4, there has been a correlation between trends of money growth and inflation. However, in some years like 1995, the inflation is more

likely explained by the parallel exchange rate surge rather than by the money growth. Moreover, the trends indicate the average growth rate of money and inflation has been 20 and 21 percent.

2-1- The Foreign Exchange Rate Developments in Iran

A study by World Bank on the eight developing countries, including Argentina, Ghana, Mexico, Sudan, Tanzania, Turkey, Venezuela, and Zambia has revealed that in case of Argentina, Mexico, and Venezuela, the emergence of the parallel foreign exchange market¹ has for a temporary period been in response to the severe balance of payments crisis by a drop in oil price, massive capital flight, and debt crisis by delaying macroeconomic adjustments and avoiding the domestic inflation. In second group countries, mainly African countries with unconvertible currencies, a gradual growing of the parallel exchange markets mainly reflect tightening control on capital account transactions at the official exchange rate and to some extent numerous transactions in current account by government which presumably have resulted from fiscal deficit and domestic inflation. The main objective of creating parallel markets has been to preserve the exhausting foreign exchange reserves and to maintain the over-valued domestic currencies².

The size of parallel exchange rate premium depends on the government control on capital account.

With respect to foreign exchange market developments in Iran, under the Breton-Woods system (1944-1973), the parity rate between US dollar and Iranian currency, rial, was pegged; there was no significant margin between the official exchange rate and market rate. With skyrocketing world oil price in the early 1970's, the exchange rate of rial against major foreign currencies was relatively stable, even after the collapse of the Breton-Woods agreement in 1973.

1- In segmented exchange market of developing nations, the parallel exchange rate is a market determined exchange rate which coexists with the official market exchange rate.

2- Kiguel & O'Connell, 1994, p.23-24.

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Up to the 1979 revolution, a review of the US dollar exchange rate in terms of rials indicates that the rate has been relatively stable in the black market.

Moreover, since the Iranian government has a monopoly power over the oil export and is a major supplier of foreign exchange in the domestic market, it is obvious that the world oil price as well as the petrodollars derived from the oil exports can have a profound effect on the foreign exchange rate equilibrium in Iran. It means that any external oil price shock can destabilize the foreign exchange rate.

In the period immediately after the 1979 Iranian revolution, a heavy restriction was imposed on the transactions of capital and current accounts at the official exchange rate by the government in order to deal with the capital flight overseas. Allocation of foreign exchange at the official exchange rate was just limited to the government transactions for importing the essential foodstuffs and intermediate inputs for the public-related enterprises. The foreign exchange for importing non-essential goods had to be provided from the black market. In this way, a parallel foreign exchange market gradually emerged and a dual exchange rate system was developed. Overtime, the gap between parallel exchange rate and official rate has widened (Figure 2.6). This widening gap can be attributed to several factors. First of all, uncertainties surrounding the private property rights, confiscations and nationalization of the private properties in the early years of the revolution have led to the huge flight of capital out of Iran (outflow of capital during 1979 and 1980 has been 6884 and 843 million rials respectively).¹ In addition, Iran and Iraq war and reduction in oil exports and its price caused a shortfall in the oil earnings. All of these factors have put a heavy pressure on the parallel foreign exchange market; consequently, the parallel rate premium over official rate during time has increased, indicating a high domestic inflation which was caused by strong monetary expansion. In 1985, a major oil price shock in downward direction in world has reduced sharply Iranian oil revenue. As a result, the premium of the parallel rate reached to

1- Central Bank of Iran

the highest level (578 percent).¹ This shows that the Iranian currency has been highly overvalued. Then, the dual rate system was extended to multiple exchange rate system (seven exchange rates), indicating partial depreciation of domestic currency.

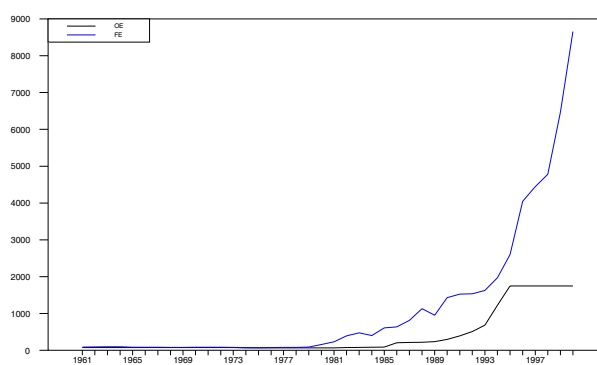


Figure 2.6: the comparison of the official exchange rate (OE) with the Parallel exchange rate in Iran (FE), 1961-2000,(dollar in terms of rial).

Source of data: Central Bank of Iran

According to figure 2.6, the gap between parallel exchange rate and official rate has widened since 1979.

It has been argued that the main beneficiary of the overvalued domestic currency has been the industrial sector; especially, all of the large industrial enterprises which were in control of government, had access to the cheap foreign currencies (preferential exchange rate) to import intermediate and raw material inputs. These large manufacturing units have produced about 86 percent of the industrial output. Moreover, the large modern enterprises, to a large extent, depend upon imports. The share of imported primary inputs (1983) in total inputs and output of the large industrial units has been 54% and 28.2 % respectively. Any attempt by the government to unify the multiple exchange rates will end the preferential exchange rate for the

1- The premium of the parallel exchange rate is calculated as $\text{Premium} = ((\text{FE}/\text{OE}) - 1) * 100$.

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industrial sector. As a result, industrial units have to pay at a higher exchange rate to import the intermediate inputs. It means the cost of production for these producers will go up and eventually they will lose their competitive edge and cut production (exchange rate through inflation).

Just before the year of 2002, there was a multiple exchange rate regime in Iran. Under this regime, the government could control the demand for the foreign exchange by rationing the foreign exchange at the various administrative exchange rates. As a matter of fact, five different foreign exchange rates existed which can be classified as follows:

1-The official floating exchange rate:

Since October 1995, this rate was set up at the level of 1750 rials per dollar and basically used to import the essential goods, such as wheat, sugar, pharmaceuticals, and others at subsidized exchange rate by government agencies. This exchange rate would be reflected in the subsidized prices of essential foodstuffs like bread and other related consumer goods in the market.

2-The official export rate:

This rate was fixed at 3000 rials per U.S. dollar from May 1995 to March 2000. This rate was applied to the exchange earnings of non-oil exporters. In the beginning, the merchants had to surrender their earnings to the central bank and convert them into domestic currency according to this rate. The exporters also had two to three months to finance their own imports from their earnings or transfer them to another importer. This export rate also was applied to the imports of state-owned enterprises. From 1997 on, the exporters could trade their foreign earnings at the Tehran Stock Exchange Market (TSE) at a rate which was higher than the export rate.

3- The official Tehran Stock Exchange rate:

By 2000, the Central Bank of Iran followed a managed floating rate in TSE and for most of 2000; the rate was less than 8200 Rials per US dollar. In this year, the official export rate was abolished.

The central bank of Iran was the main supplier of foreign exchange to TSE (60 percent).

4-The unofficial negotiated rates:

The commercial banks traded with one another or by their own customers at these rates. In 1998, the negotiated rates were at a premium

over the TSE rate, but by the end of 2000, the differences between these rates were insignificant and reflecting the transaction cost.

5- The parallel exchange rate:

In addition, there has been a black market exchange rate, which immediately emerged after the Iranian revolution in 1979. After abolishing this MERS in early 2002 by the government, all rates more and less approached to a single rate, which reflects the managed floating exchange rate in the foreign exchange market. The table 2.4 indicates the multiple exchange rate developments during 1998-2002 before the unification.

**Table 2-4: The Multiple Exchange Rate (US Dollar in Terms of Rial)
Developments in Iran (1998-2002).**

Type of Exchange Rate Year	Official floating Rate	Export Rate	TSE Rate	Parallel Rate
1998	1750	3015	5404	6468
1999	1750	3015	7908	8634
2000	1750	-----	8078	8188
2001	1750	-----	7921	8008
2002	7958	-----	-----	8019

Source: IMF (2003). Country Report: Islamic Republic of Iran. NO.03/280. P.53.

2-2- Justifications in favor of the unified exchange rate (UER) regime

Some economists believe that the structural trap, which has prevented Iran from achieving its potential economic capacity in terms of efficient allocation as well as full employment of resources, is a main obstacle to its economic growth. The structural trap refers to a state in which political and economic barriers prevent reallocation of capital from low productivity firms to high productivity firms. Alongside the structural rigidities of economy such as domination of government' inefficient enterprises, widespread

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government interventions in the market, lack of competitiveness in the domestic market as well as the international markets, labour law, and revolutionary institutions, the multiple exchange rate regime has contributed to this structural trap. According to the World Bank Report, a prolonged heavy interventionist policy by the government in economy has been a main challenge to the economic growth of Iran.¹ In early 2002, some measures of economic structural adjustments, including privatization of banking systems and the government-controlled enterprises, gradual liberalization of foreign trade and foreign direct investment, tax reforms, liberalization and unification of foreign exchange rate were undertaken with the aim of breaking the structural trap. In addition, in the age of economic globalization, the economic integration of Iran into the world economy is possible, when it is exposed to these reforms.

The multiple exchange rate regimes have been a source of price distortion. Based on the following arguments, the adoption of a unified exchange rate can be advocated.

- **Eliminating economic rents between private and government sectors.**

Before the year of 2002, the existence of the multiple exchange rate regimes had created an economic rent between the private sector and government sectors. The state-owned enterprises could receive a low preferential exchange rate, while the private sectors had to obtain the foreign exchange either from the black market or the government in a higher rate. This has led to an economic rent in favour of the government's firms. Therefore, the efficiency of the private sector versus government sector could not be evaluated clearly. The unified exchange rate policy enforced the state-owned enterprises to observe real cost of production and remove the implicit foreign exchange subsidies from them.

1- World Bank. A Memorandum On Interim Assistance Strategy For the Islamic Republic of Iran, Report No. 220550 IRN, Dec. 2001,p.1.

- **Allocating the economic resources among different users more efficiently and correcting the economic signs to the economic agents.**

The low exchange rate to the government sectors had distorted the price ratio of the commodities, which is critical for economic efficiency in allocation of resources. The exchange rate unification was designed to eliminate distortion in prices and correct real prices of commodities, which was a sign of scarcity in the economy. In this case the unification has created an incentive for the government to purchase the goods, especially agricultural products, from the domestic producers rather than to import from outside at a

high exchange rate. So, it can be argued that the policy may have an expansionary effect on the domestic output.

- **Revealing the real implicit cost of importing essential goods (the real cost of scarce economic resources) in Iranian budget.**

The unified exchange rate was implemented at 7700 rials per dollar in Iranian annual budget for the first time in 2002. It meant that there was no preferential exchange rate of 1750 per dollar for the expenditures on the imports of basic necessities any more. As a result, the expenditures on the basic necessities raised from 10 trillions in 2001 to 33 trillion Rials in 2002, indicating a clear picture of subsidy to the basic commodities¹. As a matter of fact, it was a first step for the reforms in the structure of subsidies in Iran.

A successful unification of exchange rate depends on adoption of the suitable exchange rate regime in the post- unification period which should be consistent with the fiscal and monetary policies of the country. For instance, in the case of Iran, which has a persistence fiscal deficit and monetary expansionary policies, the exchange rate should be unified by a managed flexible exchange rates or crawling pegged exchange rate system. As mentioned before, the process of exchange rate unification in the developing nations, where the parallel exchange market has been developed temporarily in response to the balance of payments crisis can be quick (like Argentina, Mexico, and Venezuela). This process has been slow in other countries (such

1- Parvin Alizadeh , “ Iran’s Quandary: Economic Reforms and the “Structural Trap,” The Brown Journal of World Affairs, 2, V. IX, Winter/Spring 2003: 267-281.

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as Ghana, Tanzania, and Turkey) where the parallel exchange market has been active for a long time.

3- Previous Studies

By using macroeconomic balance approach, Sundararajan (1999) defines the equilibrium real exchange rate (ERER) in the context of simultaneous equilibrium in the internal and external sectors of the economy. Through specification of influential exogenous and endogenous variables in the external and external balances, a linkage between the REER (real effective exchange rate) and these variables have been developed and subsequently, estimated by co-integration approach.

Bahmani-Oskooee (1996) based on the co-integration analysis and by using annual data over the 1959-90 periods, has shown that massive depreciation of the Iranian rial has had contractionary impact on the domestic output. In another paper, he (1995) has used a monetarist model augmented with imported inflation and exchange rate depreciation to identify the determinants of inflation in Iran. The conclusion is that inflation is not only a monetary phenomenon, but it is also a product of the depreciation of domestic currency and import inflation.

Another study as a research proposal (Salikhova, Flora) is concerned with the exchange rate unification in Uzbekistan and its effect on the domestic price level, following the foreign exchange market liberalization. For this purpose, a VAR model is developed with four endogenous variables, including consumer price index, money supply (M2), official exchange rate and market exchange rate.

McCarty (2000) examines pass-through of exchange rates and import prices to domestic inflation in some industrialized economies by using the VAR model over the post-Breton Woods era. His conclusion indicates that exchange rate shocks have a smaller impact on the domestic inflation in most of these countries in the sample, while import price shocks are more pronounced on the domestic inflation in countries with higher import share of domestic demand.

Concerning the linkage between devaluation domestic currency and inflation in less developed countries, Ahmad and Ali (1999) explain that

there is consistent evidence in Pakistan, indicating domestic price level over time responds gradually to the exchange rate depreciation.

Most studies relevant to the Iranian case, has indicated that the rise of exchange rate (depreciation of domestic currency) has led to the inflation in the Iranian economy. Adeli (1992) believes that by unification and correction of exchange rate from multiple exchange rate systems, it is expected that inflationary pressure will appear.

A study by Kandil (2004) on 22 less developed countries revealed that a depreciation of domestic currency (both anticipated and unanticipated) lowers output growth and raises price inflation.

Aljebrin (2006) investigation is related to the main determinants of inflation in developing oil-exporting countries. In this study the Johansen's co-integration technique has been used to estimate the long-run relationship between inflation and money growth, exchange rate, growth of non-oil GDP and growth of oil prices. The results of this study indicate that in the long-run, inflation rate depends on growth of money, growth of non-oil GDP and growth of oil price. Moreover in the short run the main determinants of inflation rate are money growth and non oil GDP growth.

In other study Pahlavani and Rahimi (2009) examines the major determinants of inflation in Iran by applying of annual time series data and ARDL co-integration technique over the period of 1971 to 2006. In this study empirical model has been specified according to Aljebrin (2006) which emphasizes the effects of liquidity, the exchange rate, GDP, the expected rate of inflation and imported inflation factors on domestic inflation of Iran. The empirical results show that in the long-run, the main determinants of inflation in Iran are the liquidity, exchange rate, the rate of expected inflation and the rate of imported inflation.

The impact of exchange rate unification on macroeconomic variables in Iran has been investigated by Mohammadi & Gholami (2008) using VAR technique. The main result from IRF¹ and VD² indicates that the shock from exchange rate unification has a positive impact on the domestic inflation of Iran.

1- Impulse Response Function

2- Variance Decomposition

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In other study by Mohammadi et al (1996) used a co-integration approach, and concluded there is no long-run relationship between exchange rate and CPI in Iran.

They argue that the main reason for lack of linkage between exchange rate and CPI is due to subsidies by the government on basic commodities, which are consumed by the majority of Iranian households. Furthermore, according to Bahmani-Oskooee's discussion (2003), the devaluation of Iranian currency, rial has had an inflationary impact on the domestic price in Iran. Then, he has concluded in order to counteract inflation not only should the government follow tight monetary policy but also the foreign value of rial should be strength by the exchange rate unification.

Consequently, the past studies indicate that there is a linkage among the exchange rate, domestic price level, GDP, money supply and oil price. This linkage can be organized in the framework of an extended monetary model for Iranian economy and estimated by Johansen's co-integration approach based on VAR model.

Before moving to the empirical methodology, two basic assumptions are set up:

i) Prior to the exchange rate unification, a proxy for unified exchange rate was defined which is a weighted average of official and parallel exchange rates.

ii) The government maintains its subsidies to the different economic agents in such a way that the final consumers do not observe the cost effect from switching to the unified exchange rate. This means that the government still subsidizes the consumers implicitly by paying the difference between the market and official exchange rates, and still provides the basic imports such as foodstuff and other essential goods at subsidized prices. However, in the annual budget of the government, the real cost of the foreign exchange (the free market exchange rate) for the essential imports is recorded.

These two assumptions are essential for validity of our conclusion.

The unification of exchange rate in Iran in 2002 implies domestic currency devaluation where multiple exchange rates are unified to the level of parallel exchange rate. So in order to evaluate impact of this currency depreciation on the domestic price level at first in next section the transmission mechanism of currency depreciation on the domestic price within a theoretical model will be presented.

4- The Theoretical Framework and Econometric Methodology

4-1- Theoretical Framework

The domestic inflation can be explained by several alternative theories. The Quantity Theory of Money is the first traditional theory which hypothesizes the direct linkage between the money supply and price level in a closed economy. A new development in this stream of thought related to the monetarist school headed by Milton Friedman. Friedman and Schwartz (1970), argue that inflation *is* always and everywhere a monetary phenomenon. Whereas Neo-Keynesians and other critics of monetarism argue that the demand for money is directly linked to supply and that the Demand for money cannot be predicted. Stieglitz and Greenwald (2003) have proposed that the relationship between inflation and money supply growth cannot be separated for ordinary inflation, in contrast to hyperinflation, which is mostly considered an effect of monetary policy.

Blinder (2002), a representative of the second school of thought, the Keynesian economists, states that the main determinants of inflation are aggregate demand in the economy rather than the money supply.

According to the Keynesians, the natural level of gross domestic product is a level of GDP where the economy is at its optimal level of production. If GDP increases beyond its natural level, inflation will accelerate as suppliers increase their prices. If GDP decreases below its natural level, inflation will decelerate as supplier's attempt to fill excess capacity by lowering prices. Keynes argued that money has no significant relationship with inflation, but inflation is an outcome of the goods market (Pahlavani and Rahimi, 2009, P.63).

However, in an open economy, in addition to direct impact of money supply on domestic price, the exchange rate fluctuations can contribute to the domestic price movements. The degree of sensitivity of domestic prices to the exchange rate changes has been examined by estimating the exchange rate pass-through to import, producer and consumer prices; the degree of pass-through exchange rate changes has been considered as one of the main sources of domestic inflation. In this context, the more important question is the transmission mechanism through which, the exchange rate fluctuations are transmitted to overall domestic price level. The aggregate demand and supply channels reflects this mechanism.

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Traditionally, the impact of exchange rate fluctuations on economy mainly has been examined through the shift of aggregate demand because of changes on the net exports, demand for money, and level of output. For instance, the depreciation of domestic currency can stimulate economy through increase in the aggregate demand components and leads to shift of aggregate demand to right.

However, the recent studies by Kandil (2004) suggest that the exchange rate fluctuations can also shifts the aggregate supply; especially, in the semi industrialized countries which are overwhelmingly dependent on the imported intermediate goods for manufacturing. It means that depreciation of domestic currency can lead to higher cost of production and has a contractionary impact on the output level through shifting aggregate supply to left and up with higher price.

If the reduction in aggregate supply is more than offsets by the increase in aggregate demand, the depreciation will result in a reduction of domestic production. In this case, the depreciation is said to be contractionary. Otherwise, it could be expansionary. The final result depends on which effect is dominated.

Generally, it could be argued that in less developed countries, the impact of the aggregate supply channel dominates on that of the aggregate demand channels and the economy faces the higher domestic price with lower output.

Overall, it can be concluded that in an open economy, the domestic price is jointly determined by money supply, exchange rate, aggregate output. In the oil exporting countries such as Iran, another explanatory variable, oil price as a exogenous variable can incorporate in this framework which has a negative impact on the price level through the providing more foreign exchange reserves and more imports.

Within this framework, the specification of the theoretical model with respect to the impact of exchange rate unification on the domestic price of Iran can be identified according to Aljebrin (2006), and Pahlavani and Rahimi (2009) works. The theoretical model can be stated as follows:

$$P = M^{\alpha_1} E^{\alpha_2} GDP^{\alpha_3} OP^{\alpha_4} \quad (1)$$

The Iranian experience from the past as mentioned before and past studies confirm this systematic association among the exchange rate (ER), domestic price (P), real GDP (GDP), money supply (M), and oil price (OP).

4-2-Econometric Methodology

The empirical methodology of this research is co-integration approach which is based on the VAR (Vector Auto- Regressive) model. A general VAR model can be written as follows:

$$Z_t = \sum_{i=1}^k A_i Z_{t-i} + \varepsilon_t \quad (2)$$

Where Z_t is a column vector of all the variables ε_t is a column vector of the all error terms, A_i is matrix of parameters in the model. A VAR model can be considered as a reduced form of a structural model, where all of regressors on the right hand side of the equations are predetermined lagged variables, which have no correlation with error terms.

As a result, these equations can be estimated consistently by using OLS.

In order to examine the impact of unified exchange rate on the domestic price level in Iran empirically, based on the theoretical model, the Johansen's multivariate co-integration method for estimation the following model in terms of logarithm has been applied.

$$LP_t = \alpha_1 + \alpha_2 LWER_t + \alpha_3 LM_t + \alpha_4 LGDP_t + \alpha_4 LOP_t + U_t \quad (3)$$

In this model, $LWER_t$, LP_t , LM_t and $LGDP_t$ are weighted exchange rate as a proxy for unified exchange rate, consumer price index, real GDP ($LGDP_t$), nominal money supply (LM_t) respectively and are endogenous variables. The oil price (LOP_t) is exogenous variable.

4-3- Data Collection and Description

The Iranian time series data for the macro variables, mainly GDP, foreign exchange rate (official and free market exchange rates), money supply (M2), domestic price level, and oil price OPEC basket per barrel in the interval 1971-2002 (period before the exchange rate unification) has

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been extracted from the 2007 annual statistical bulletin (OPEC) and the Central Bank of Iran.

Since the world oil price is determined in terms of US dollars and oil is the main Iranian export (more than 80 percent of total export), most of the foreign exchange reserves of Iran is kept in dollars and a significant amount of foreign transactions are conducted in the terms of the U.S. dollar. For this reason, the value of the U.S. dollar in terms of rial is considered as the foreign exchange rate. In the post-exchange rate unification period, the multiple exchange rates are unified to the level of floating exchange rate in the free market.

Under this assumption that the production of crude oil is stable in the short run, index of oil revenues is presented by the oil price. The value of all variables is explained in the logarithmic form to avoid the different scales of measurement of the variables and to get a better behaviour of residuals in the model.

5- Estimation Results

The co-integration technique is based on the assumption that all variables in the model are integrated of order 1. Therefore, at first, the variables of the model (LP, LGDP, LWER, LOP, LM) must be tested for stationary using unit root test ADF (Augmented Dickey-Fuller) and PP (Philips-Perron) statistics. The unit root test is based on autoregressive function, which includes constant terms as well as a trend variable. The resulting unit- root tests for the variables are tabulated in table 5.1

Table 5-1: The ADF and PP Values for the Variables of Model (1970-2002).

Variables	ADF		PP	
	Intercept	Intercept and trend	Intercept	Intercept and trend
DLP	-3.35	-3.78	-3.35	-3.44
DLWER	-3.72	-4.24	-3.7	-4.13
DLGDP	-3.44	-3.35	-3.29	-3.18
DLM	-3.82	-3.90	-2.88	-2.99
LOP	-3.05	----*	-3.74	---*

Mackinnon (1996) critical value for of intercept at 5% level (-2.96)

Mackinnon (1996) critical value for of intercept and trend at 5% level (-3.56)

*: This indicates that variable is stationary with intercept.

According to table 5.1, having established that the first difference of all variables is stationary, I(1) by unit root test except LOP which is stationary at the level, we proceed to test for co-integration between variables on levels.

5-1- Johansen Co-integration Test

Before we run co-integration test, by using the Schwarz Bayesian Criterion (SBC), the optimal lag length of 1 is determined for the VAR system (Table5-2).

Table 5-2: VAR lag Order Selection Criteria.

Lag order	SBC criteria
0	0.96
1	-7.66
2	-6.69

Source: Author Calculations

The results of the $\lambda - Max$ and trace test to identify the number of co-integrating vectors are reported in the table (5.3). According to both LR test statistics ($\lambda - Max$ and trace) the null of no co-integration is rejected because both statistics are greater than their critical values. However the null of at most one co-integrating vector cannot be rejected in favour of $r=2$. Thus the empirical support for one co-integration vector implies that all four variables, LWER, LGDP, LM, and LP are co-integrated.

Table 5-3: Johansen- Juselius Co-integrating Tests Results.

Null Hypothesis	Statistics λMax	5% Critical Value	Null Hypothesis	Statistics $\lambda trace$	5% Critical Value
$r = 0$	35.24	27.58	$r = 0$	61.66	47.86
$r = 1$			$r \leq 1$		
$r \geq 1$	16.54	21.13	$r > 1$	26.37	29.79
$r = 2$			$r \leq 2$		

Source: Author Calculations.

Table 5-4: The Results of Normalized Co-integrating Equation by LP

Variables	Coefficient	standard deviation	t statistics
LWER	0.15	0.054	2.79
LGDP	-0.33	0.155	-2.11
LM	0.81	0.05	15.95
C	-2.0006	-----	-----

Source: Author Calculations.

The sign of the coefficients of co-integrating equation is consistent with of a priory expectation that the weighted exchange rate (LWER) and money supply (LM) have a positive and real GDP (LGDP) has a negative effect respectively on the domestic price level.

After confirming the long-run relationship among the variables, we can proceed to the model that relates the short-run adjustments behaviour of variables to the long-run path.

More specifically ECM model explains the immediate short-run changes in dependent variable by means of deviations from particular equilibrium relationship between the dependent variable and the explanatory variables. The common approach is to reformulate the long-run relationship to include lagged values of first differences in the relevant variables with the error correction term explicitly included.

The result of ECM model presented in table (5.5) suggests that the estimated value of error correction coefficient -0.32 is statistically significant at 5% level and indicates convergence to equilibrium in right direction.

Table 5.5: The Results of VECM Model Estimation

Variables	Coefficient	t statistics
ΔLP	-----	-----
ΔLP_{t-1}	0.28	1.81
$\Delta LWER_{t-1}$	0.07	0.89
$\Delta LGDP_{t-1}$	0.006	0.036
ΔLM_{t-1}	0.22	1.37
C	0.35	2.96
LOP	-0.11	-2.57
ecm_{t-1}	-0.32	-3.008*
$R^2 = 0.38, R^2 = 0.51, F = 3.88$		

Source: Author Calculations.

*: Significant at 5% level.

6- Conclusions and policy implications

As earlier indicated, the basic aim of this research was to find out the impact of exchange rate unification on the domestic price level in Iran by using co-integration approach.

As ADF and PP tests have shown the time series of all variables except that of oil price are non-stationary of order one, I (1). Furthermore, using Johansen's co-integration technique confirms a long run relationship among the variables LP, LWER, LGDP and LM.

In this co-integrating regression function, the weighted exchange rate has a positive impact on the domestic price. Regarding to policy implications, the macroeconomic results show that depreciation of Iranian currency under flexible and unified exchange rate system may create domestic inflationary pressure and highlight the inflationary expectations. Since the money supply has a positive impact on the domestic price, therefore the government should avoid the easy money policy in order to control inflation (follow a disciplinary financial policy where the budget deficit is tighten and does not rely on expansion of monetary base) while pursuing unified exchange rate policy. This leads to the situation where the unified exchange rate is accompanied with stabilized exchange rate.

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Finally, the depreciation of Iranian currency which has resulted from unified exchange rate could lead to more exports and less imports and consequently stimulate more domestic output which itself stabilizes domestic prices. In order for domestic output to be sensitive to the fluctuation in the exchange rate, the productive capacity of Iran should be more responsive to the exchange rate, so Iran should overcome some economic bottlenecks such as lack of strong infrastructures, including vocational trainings, skilled manpower and entrepreneurship, backwardness of the agricultural sector and the obsolete industrial units. It means that the unified exchange rate plan would be accomplished with less domestic inflation.

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