A small macro econometric model for Kazakhstan: a retrospective of alternative economic policies undertaken during the transition process [Working papers]

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A small macro econometric model for Kazakhstan: a retrospective of alternative economic policies undertaken during the transition process

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Abstract

This paper presents a quarterly macro econometric model of the Kazakhstan. The main goal is to provide a stylized representation of the Kazakh economy in order to simulate the consequences of several economic policies viewed by the authorities as essential during the period of transition to a market economy. The policy simulation potential of the model is illustrated by five types of simulations: interest rate shocks, foreign direct investment shocks, world oil price shocks, foreign demand shocks and nominal wages shocks. These sets of simulations show the importance of foreign direct investments in terms of theirs global positive effect, as well as the demand effect of an increase in the wages. We also find that effect of the tight monetary policy in not ambiguous; we argue that in some cases it is not the most efficient policy instrument to sustain the economy.

Keywords: Transition economies, Kazakhstan, Macroeconomic stabilization, Central Asian CIS countries

JEL Classification : O11, P20, P51.

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A small macro econometric model for Kazakhstan: a retrospective of alternative economic policies undertaken during the transition process

Introduction

During the decade of transition, a major challenge facing the CIS countries has been to adopt policies and reform strategies fostering economic growth and cutting the strong inflation rates through a gradual change of their economies[4]. This paper aims to propose a stylized macroeconomic model of Kazakhstan for this period. Among the arguments that motivate our choice of Kazakhstan, we can point out its leading positions in Central Asia as a second post-soviet power (after Russia) in terms of development level and growth rate. Ranking as the ninth largest country in the world, Kazakhstan is among the better performers in the region in terms of external trade and foreign exchange policy and the economic reforms have been more comprehensive than in some other countries in the region[5].

Until now, few macro econometric models exist for this country. One explanation is probably the poor quality of the data available, data characterized besides by various biases (due to measurement errors, weight of the informal sector or the short time span). Consequently, we choose to build a very simple empirical model consisting in a set of error-correction equations. This tool is used to study the behavior of the Kazakh economy for period of transition and external opening. We simulated in particular the impact of some common policy decisions or external shocks as monetary policy, surge of foreign direct investment, rise in nominal wages and crude oil prices hikes. Moreover, the following issues motivate this work:

First, transition is sometimes viewed as catching-up phenomena to the technology level of developed countries. International technology transfers are usually proportionate to foreign direct investment. So, allowing a positive shock on the FDI is one way to envisage the effect of reducing the technological gap existing between Kazakhstan and its foreign partners. Moreover, FDI are prominent driving forces behind country's economic growth, mainly in the booming oil and natural gas industries.

Secondly, there were opposite viewpoints concerning the income policy during the transition times. It is commonly argued that a wages freeze is a cornerstone of a stabilization policy to close the gap between excessive aggregate demand and insufficient aggregate supply. Moreover, wage pressures provoke acceleration of inflation rate, leading frequently to hyperinflation in transition stages. These arguments did not prevent a gradual wage expansion since 1995. Furthermore, the modernization of

[4] For a comparison of economic performance during the first years of transition, see Havrylyshyn et al (1998), Berg et al. (1999), Falcetti et al (2000), Fischer and Sahay (2000), Wyplosz (2000).
[5] The issues of reforms in Kazakhstan is discussed in several papers (see among others Ramaurthy and Tandberg (2002), Medas (2003)).

the treasury system in 2002 were curiously decide as the same time as a rebalancing of the policy mix in favor of a higher exchange rate flexibility, the relaxation of the fiscal policy, and … increasing spending on social needs. And contrary to the orthodox precepts, this package improved the labor market adjustments, with a fall of unemployment and a steady growth of real wages. Our simulations tend to examine the rational of these measures.

Thirdly, as in other CIS countries, the reform strategies adopted by Kazakhstan included trade liberalization and integration into the global economy, with tariff rationalization, and structural reforms to improve the business environment. An important question is whether such a package is conducive to growth, thanks to the channel of external demand. In our simulations, the US GDP growth as a proxy indicator of the world growth. And we examine the contribution of the external anchor to the current growth of GDP.

Fourthly, the Kazakh growth hinges highly on the oil industry. Capital inflows mainly concern the oil sector (half of the foreign direct investments). The oil revenues are determinant for achieving both internal and external balances. Oil amounts for 25-30% of the budget resources and part of the inflows are saved to smooth the impact of oil prices volatility in international markets. Moreover, oil and gas amount to more than 50% of exports and Kazakhstan has a high endowment in other natural resources (minerals). We can add that the prices of oil and other extractive industries are significantly correlated and that productivity gains occur through spillover effects from the oil sectors to non-oil sectors (in particular the sectors of construction and transportation). In regard to these different aspects, we can assume that the oil price volatility will have strong implications on the economy: this assumption justifies a specific simulation.

Finally, as a consequence of the relative mistrust in fiscal policy, the monetary policy became the cornerstone of macroeconomic package. Among the policies required to bring the inflation down and/or stimulate the activity, two monetary instruments have been used by the Kazakh monetary authorities over the recent years: i) expansionary monetary policies based on reduced refinancing rate and lower reserve requirements for commercial bank; ii) short-term interest rate increases as curbing inflation turns necessary. In Kazakhstan, the efficiency of an interest rate-based policy was eased by the modernization of the banking sector, the independence of the Central bank and by the fact that budgets deficits were kept under control. All these factors yield to an interest-rate channel inexistent in many other CIS countries. How much emphasis must be placed on lowering inflation and on stimulating economic growth is subject to debate. In our simulation, we examine the impact of an increase in the short-term interest rate.

According to our simulations, the outcomes are in line with the common knowledge of the “Kazakhstan observers”, giving some support to the policies chosen as priority targets by the authorities for the forthcoming years.

The rest of the paper is structured as follows. Section 1 sums up some stylized facts about the economic development since the independence. Section 2 presents a small model of the Kazakh economy which captures the main links between the macroeconomic aggregates. Section 3 contains the analysis of structural stability and the simulations of various policy experiments. Section 4 concludes.

1. Economic development since the independence

"… Economic growth based on an open-market economy with high levels of foreign investment and internal savings: to achieve higher and more sustainable economic growth."

Kazakhstan 2030 – Strategy - one of seven "key goals"

Kazakhstan is the largest of the republics of the former Soviet Union after Russia. During the Soviet times, Kazakhstan was a raw materials supplier of the USSR. Since the independence, Kazakhstan has made considerable progresses in implementing economic and social reforms on the way to a market economy. While the country has not experienced political disturbances during the transition period, it has faced numerous economic, social and environmental challenges (see various IMF Staff country reports).

The first few years of Kazakhstan's independence were characterized by an economic slump (mostly due to the destabilizing force of the disintegration of the Soviet Union): by 1995 real GDP dropped to 61,4% of its 1990 level. This economic deterioration exceeded the losses observed during the Great Depression of the 1930s. The wide-ranging inflation observed in the early 1990s peaked at an annual rate of up to 3000% in the mid-nineties. Since 1992, Kazakhstan has actively pursued a program of economic reform: in particular, it owns the strongest banking system in Central Asia and CIS. Moreover, the main market-oriented reforms included the following measures:

- *A substantial privatization of the most part of enterprises (as the small or medium range firms than the big ones, in the "Three-stage privatization program" frazmework).* As a result, 60% of the capital of privatized enterprises has been transferred to private ownership.
- *The adoption of a convertible and fairly stable currency, the Tenge*. The Tenge's stabilization was due in part to the government's determination to control the state budget, in part to the availability of an IMF stabilization fund, and in part to the backing of government reserves of US$1.02 billion in hard currency and gold. The

Tenge was allowed to float and underwent depreciation in April 1999, in reaction to the Russian and Asian financial crises. Introduction of a free-floating exchange rate regime has stabilized the financial market and improved competitiveness of Kazakhstan's producers, easing the monetization (but speeding up slightly inflation).

- *An institutional framework to organize trade unions and collective bargain* (Law "On Labor" in 2000; entry in the International Labor Organization in 1993). The minimum wage has increased every year since 1993, going from 128 Tenge (less than 1$) per month in 1993 to 14 374 Tenge per month in 2000 and 60 805 Tenge (about 410$) in 2008.
- *A price and interest rate liberalization*. Prices are almost completely liberalized in Kazakhstan, with the exception of some basic foodstuffs. Kazakhstan has also made significant improvements in its banking sector, moving assertively toward market-based lending and away from government control over the allocation of capital. Thanks to the improved economic conditions and the authorities' achievement of bringing the inflation rate under control, the banks have increased credit to the economy and reduced interest rates.
- *The elimination of trade distortions (including quantitative restrictions) and an increasing integration into the international trade and capital flows system*. Kazakhstan has no export tariffs; in 1998, the country issued a resolution decreasing its average import tariff rate to 9%. Furthermore, Kazakhstan has adopted the international tariff nomenclature as the basis of its tariff schedule, and its customs valuation rules conform to the WTO Valuation Agreement (Jensen, J., Training, T., and Tarr, D., 2007). As a result, from 1994 to 2011, the value of its exports rose from US$ 3.23 billion to US$ 84.8 billion. In that same period, the value of its imports grew from US$ 3.56 billion to US$ 40.8 billion.
- *The introduction of a new "pro market" legislation*, including a tax code based on international standards, an effective bankruptcy law, rules about competition and the securities market, and other components of the essential legal framework for a market economy.

The Appendix 0 presents some selected economic indicators for the Kazakh economy from 1994 to 2011. The main targets of monetary policy were the internal and external stability of the Tenge and the containment of inflation. During 2000-2001 the authorities have successfully kept a stable real exchange rate (the credit rating agency Fitch upgraded Kazakhstan's local currency rating to BBB/Stable) and inflation rates were lower than the most part of other CIS countries. Since 2002 the guidelines of monetary policy are determined for a crawling period of three years. It is a kind of transition to the principles of inflation targeting: the NBK (National Bank of Kazakhstan) now treats price stability as the key monetary policy target. Its key instruments are open market operations and the official refinancing rates.

Economic improvement is due to the favorable conditions in the oil sector and its associated spillover effects. Despite the large efforts of the Kazakh Government to improve economic diversification, Kazakhstan relies strongly on a petroleum sector linked to all the other sectors; even for monetary policy, the NBK features scenarios linked to oil prices. Therefore, Kazakhstan remains highly vulnerable to commodity price fluctuations. When oil fell to 40 dollars a barrel in early 2009, the economy dived into recession and the currency depreciated. Thus, diversifying the economy and reducing this resources dependence is a key issue for the country (the NFRK - National Fund of the Rep. of Kazakhstan - was created in 2001within the National Bank of Kazakhstan to manage the part of national savings coming from natural resources and to smooth the impact of commodities' price volatility).

Beside oil and gas, the other main driving force behind Kazakhstan's economic growth has been foreign direct investment. Despite the current international "subprimes" crisis, Kazakhstan continues to attract a large amount of FDI. From 1991 to 2008, Kazakhstan has received more than US$ 30 billion of foreign direct investment (the highest per capita index in the former Eastern Bloc): Foreign Investments represented up to 9.7% of GDP in 2008! It is now strongly lowering, with a poor 1.5 in 2011. It is not a good news: if we analyze transition as a catching-up phenomenon to the technology level of developed countries, international technology transfers are usually proportionate to foreign investment.

Despite the strong overall economic trends in Kazakhstan, a spiral of unsustainable growth in commercial credit and foreign borrowing in 2005-2007 set the stage for difficulties in both the financial and the construction sectors. Since mid-2007, problems in the global financial markets blocked local banks' access to cheap external financing. The deepening of the world economic crisis since September 2008 entailed further negative repercussions on the country. Kazakhstan faced simultaneously a short but very sharp terms-of-trade shock and large capital outflows which forced a 20 percent depreciation of the Tenge in February 2009. GDP growth had decelerated to 3.2 percent in 2008.

Responding to the crisis, the government has enjoined the NFRK to deploy a large fiscal stimulus program (US$ 8 billion in 2008-2009), focusing on supporting SMEs (small and medium range enterprises), agriculture, construction, and banks. The latest data suggest that the stimulus may have met with some success, preventing a more severe recession, while the external and fiscal positions have strengthened with the rebound in commodity prices: total external debt is declining (85% of GDP in 2011)

Nevertheless, significant challenges persist (IMF, 2011): we underlined inflationary pressures, fed by international food prices increases and domestic demand dynamic. We can add a structural vulnerability to the external conditions (commodities prices, financial markets) and a weak banking sector.

2. The model: presentation and empirical estimation

The present model is a small, compact, and highly aggregate macro model. It can be divided into four blocks: aggregate demand, labor market, prices and monetary policy. There are 13 behavioral equations and 32 variables in total. The definitions of the variables are in Table 1 (see Appendix 1). All the variables are seasonally adjusted and come from the Kazakh national accounts (Ministry of economy and budget planning of the Republic of Kazakhstan, National Bank, Agency of the Republic of Kazakhstan on statistics) and the IMF database source. We use quarterly data over the period 1994:1 - 2008:4. The capability of the model to reproduce the behavior of the endogenous variables in an ex post simulation can be regarded as satisfactory.

Nonstationarity problems

A first step is to test for the nonstationarity of the variables. The unit root tests, not reported here, showed mixed results. Some variables were I(0), while others were I(1)4. In this case, the application of the Engle-Granger's approach would yield misleading conclusions in terms of cointegration analysis. Given these results, we prefer to use Pesaran, Shin and Smith (2001)'s methodology (henceforth referred as PSS (2001)). The authors propose a bound testing approach for the analysis of level relationships which is useful because it can be applied irrespective of whether the regressors are I(0) or I(1).

To summarize, they suggest to use a conditional ECM regression of the following type:

$$\Delta y_t = c_0 + c_1 t + \pi_{yy} y_{t-1} + \pi_{yx} X_t + \sum_{i=1}^{p-1} \Psi' \Delta Z_{t-1} + \omega' \Delta X_t + u_t \quad (1)$$

and to test the joint null hypotheses of the existence of a unit root in the endogenous variable, y, and the existence of a level relationship between this variable and its regressors (described by the vector X):

$$H_0 = H_0^{\pi_{yy}} \cap H_0^{\pi_{yx}}, \qquad H_0^{\pi_{yy}} : \pi_{yy} = 0' \;\; and \quad H_0^{\pi_{yx}} : \pi_{yx} = 0' \quad (2)$$

against the alternative:

$$H_1 = H_0^{\pi_{yy}} \cup H_0^{\pi_{yx}}, \qquad H_0^{\pi_{yy}} : \pi_{yy} \neq 0' \ \ and \qquad H_0^{\pi_{yx}} : \pi_{yx} \neq 0' \qquad (3)$$

Z is the vector (y;X). This can be done by computing a Wald statistic.

PSS bounds tests, based on standard F-statistics, to test the significance of the lagged levels of the variables within a univariate error-correction mechanism to determine long-run relations between endogenous variable and its determinants. The F-statistics have non-standard asymptotic distributions under the null hypothesis that there exists no level relationship, irrespective of whether the variables of interest are I(0) or I(1), and are analyzed against two sets of critical value bounds that cover all possible classification of the regressors into purely I(0), purely I(1), or a mixture of I(0) and I(1) variables. If the computed F-statistic falls outside the critical band, a conclusive decision can be made without needing to know whether the regressors are I(0) or I(1). That is, if the computed F-statistic falls outside the lower critical band, we fail to reject the null hypothesis of no level relationship, and if the computed F-statistic falls outside the upper critical band, then we reject the null hypothesis and conclude that there exists a level relationship between our variables of interest. On the other hand, if the computed F-statistic falls within the bounds, then no conclusive inference can be made without first knowing the order of integration of the variables.

It can be shown that the critical values follow a non standard distribution. These values are tabulated in PSS (2001). Note that the ways the intercept and the trend are incorporated in equation (1) refer to a general case. One can envisage different situations (no intercept and no trend, restricted intercept, restricted trend, etc). To estimate the PSS ECM equations, we use a heteroscedastic- and autocorrelation consistent estimator. We also apply various misspecification tests to ensure that the residuals of the estimated models are white noise.

The assumption of normal distribution of the residuals is tested. The null hypothesis of normal distribution is not rejected for any of the equations at the five per cent level (Jarque Bera test). According to the ARCH test, heteroscedasticity does not appear to pose a problem in any of the equations. At last, the Breusch-Godfrey LM test does not reject the null hypothesis of no serial correlation up to order four for any of the equations at the five per cent level.

2.1 Aggregate demand

A first set of equations describes the components of the aggregate demand: real consumption, investment rate, real imports, real exports, changes in inventories, and Government expenditures.[6]

- *Real Consumption*

[6] t-ratios are shown in parentheses.

$$\Delta\log(c_t) = \underset{(4.04)}{3.91} - \underset{(-5.34)}{1.15}\log(c_{t-1}) + \underset{(3.02)}{0.68}\log(y_{t-1}) + \underset{(2.03)}{0.45}\log(w_{t-1}) - \underset{(-2.51)}{0.12}\Delta\log(y_{t-2}) - \underset{(-1.98)}{0.08}\Delta\log(c_{t-5})$$

$$+\underset{(2.22)}{0.59}\Delta\log(w_t)$$

$$Wald = 14.96 \qquad crit = [\underline{l} = 3.79, \bar{l} = 4.85]$$

R^2 = 0.53; *F-statistic* = 8.99; *Prob(F-Statistic)* = 0.0000 and *DW* = 2.06.

Real private consumption exhibits a significant long-run level relationship with real output. The result of the PSS test is read as follows. Because this test is based on a bound testing approach, we have a lower critical value, $\underline{l}$ and an upper critical value $\bar{l}$. These values depend upon the number of exogenous variables used in the level (or long-run) relationships.

Here, at 5% significance level, for k = 2, we have $\underline{l} = 3.79, \bar{l} = 4.85$(see PSS (2001)) The conclusion is as follows. If the computed Wald statistic lies below $\underline{l}$ then we accept the null hypothesis of no level relationship between the endogenous variable and its regressors. If instead the computed statistic lies above $\bar{l}$, we reject the null hypothesis and conclude in favor of the existence of a level relationship. If we find a computed statistic in the interval $[\underline{l}, \bar{l}]$, then it is impossible to conclude. Here, the computed Wald statistics if higher than the upper critical value, which leads us to conclude in favor of a level relationship between the real consumption and its determinants. We see that the long-run real output elasticity is less than $1(\frac{0.68}{1.15})$. The short-run real output coefficient can be expressed as $-0.12 \approx \frac{\Delta^2\log(c_t)}{\Delta^2\log(y_{t-1})}$, so that the coefficient of $\Delta\log(y_{t-2})$ captures the influence of the real output variability (or volatility) on real consumption. A higher volatility means more uncertainty about future growth and this encourages saving, thereby implying a decrease in the propensity to consume. We see that the sensitivity to output uncertainty is high. As expected, we have a high short-run propensity to consume the wages with an elasticity near 1.

- *Investment rate*

$$\Delta\log\left(\frac{INV_t}{K_t}\right) = \underset{(0.81)}{0.38} - \underset{(-6.05)}{1.09}\log\left(\frac{INV_{t-1}}{K_{t-1}}\right) + \underset{(2.32)}{1.02}\Delta\log(y_t) + \underset{(2.32)}{0.50}\log(fdi_{t-1}) - \underset{(-2.90)}{1.12}\Delta r_{t-4} - \underset{(-3.57)}{0.71}DUMMY(2008\_1)$$

$$K_t = 0.95\,K_{t-1} + INV_t \qquad Wald = 18.32 \qquad crit = [\underline{l} = 4.74, \bar{l} = 5.73]$$

R^2 = 0.65; *F-statistic* = 9.48; *Prob(F-Statistic)* = 0.0000 and *DW* = 1.74.

To construct the series of capital stock, we choose a depreciation rate such that the constructed series is compatible with the observed evolution of the gross fixed capital formation series. We also include a dummy variable in the regression that accounts for the important fall of real investment during the year 2008. The choice of an appropriate depreciation rate is subject to debate in regard to the empirical implications. On one hand, given the important amount of inefficient capital, one could choose a high depreciation rate. But this choice is not compatible with the statistical properties of the investment series. Indeed, applying a unit root test, we found that the gross capital formation series was, at least I(1), thereby indicating the presence of an important smooth component in the investment series. One is thus confronted to the problem of choosing a depreciation rate compatible with this statistical property. In this view, one can do the following remarks. Capital stock series are constructed by cumulating investment data. Choosing a high depreciation parameter would imply that the contribution of investment to capital disappears rapidly (if the assets included in the capital stock depreciate rapidly, then the contribution of the new flows of capital is small). The implications would imply that capital stock and investment do not evolve in phase. However, this contradicts several economic observations. In general, investment and capital stocks share similar downward or upward trends. Further, investment series are more volatile than capital stock series, thereby implying that the latter have more inertia than the former. As a consequence, if the investment variable is at least I(1), the capital stock is expected to be at least I(2). This is the case if one assumes a small depreciation rate in the capital stock equation, as above.

Foreign direct investments have a positive impact on the investment rate. This estimate indicates that FDI can help to measure the amount of efficient capital. Each year, the country receives large inflows of resources, which stimulate development. Finally, we note the negative and significant impact of the real interest rate and the positive and significant influence of the real output (as expected). The Wald test yields to conclude that foreign direct investment are the major determinant of the investment rate in the long-run.

- *External trade: real exports and real imports*

$$\underset{}{\Delta \log(x_t) =} \underset{(-4.17)}{-13.9} \underset{(-4.08)}{- 0.39} \log(x_{t-2}) + \underset{(4.18)}{1.85} \log(y^*_{t-3}) + \underset{(2.55)}{0.36} \Delta \log(BRENT_{t-4}) - \underset{(-3.65)}{0.41} \Delta \log(x_{t-1}) + \underset{(3.39)}{0.78} \Delta \log(s_{t-3})$$

$$Wald = 8.78 \qquad crit = \left[\underline{l} = 4.94, \bar{l} = 5.73\right]$$

R^2 = 0.42; *F-statistic* = 7.363; *Prob(F-Statistic)* = 0.00003 and *DW* = 1.96

$$\Delta \log(m_t) = \underset{(1.05)}{0.008} + \underset{(11.9)}{0.87} \Delta \log(y_t) - \underset{(-2.36)}{0.05} \Delta \log(m_{t-4})$$

R^2 = 0.75; *F-statistic* = 52.3; *Prob(F-Statistic)* = 0.0000 and *DW* = 1.88

We choose the American GDP as a proxy of the world demand. We do this in regard to the efforts made by the Kazakh authorities to diversify trade and expand their international links. Consequently we find that they are positive relationship between these variables. It is important to notice that the study of this dependence was not successful during the transition period due to the previous heavy dependence on Soviet trade routes for input supplies and exports. Since 2000 Kazakhstan was recognized as an open market economy, exports began rise considerably. Depreciation of Tenge stimulates increase of real exports but foreign demand and oil prices are the crucial factors that explain real exports, while real imports heavily depend upon the domestic demand. The exogenous variables have long-term effects in the exports equation where the assumption of a long-run relationship is accepted. We deed not succeed to find any role for competitiveness as a determinant of Kazakhstan's external balance (this variable was not significant in the regression). The reasons are the following: the country is price-taker for a large part of its exports the price of which is determined by the international markets (gas, oil, grains, cotton, minerals, metals). This is also true for the imported products (petroleum products, electrical and mechanical equipments, vehicles).

- *Changes in inventories*

$$\underset{(6.08)}{\Delta stock_t = 0.000005} - \underset{(-3.39)}{0.108}\, stock_{t-1} - \underset{(-6.58)}{0.000043}\Delta\log(x_{t-2})$$

R^2 = 0.65; *F-statistic* = 32.82; *Prob(F-Statistic)* = 0.0000 and *DW* = 1.93

Inventory stocks change in proportion to the exports growth. So, this equation captures the fact that inventories serves to meet changes in the demand of Kazakh products by the rest of the world. Note that, in terms of stock-adjustment model, the estimation would imply a very small desired level of stocks (0.000005/0.108). A possible justification of such a behavior may be the structure of the Kazakh's external balance. It is known that energy and agricultural markets are volatile. So, the costs of stocking can become very high, especially during the periods of oversupply and falling prices. Note that this implies a smooth dynamics of the stocks (the previous period level accounts for 68% of the current level).

- *Real Government expenditures*

$$\Delta\log(G_t) = \underset{(9.69)}{5.53} - \underset{(-11.6)}{1.16}\log(G_{t-2}) + \underset{(3.37)}{0.43}\log(BRENT_{t-2}) - \underset{(-5.24)}{1.49}\Delta\log(s_{t-2}) - \underset{(-12.08)}{1.11}\Delta\log(G_{t-1}) - \underset{(-4.4)}{3.53}\Delta\log(P^c_{t-1})$$

$$Wald = 68.3 \qquad crit = \left[\underline{l} = 4.94, \bar{l} = 5.73\right]$$

R^2 = 0.86; *F-statistic* = 43.16; *Prob(F-Statistic)* = 0.0000 and *DW* = 1.97

This equation shows that the impact of changes in the oil price has a positive effect on the Government expenditures. Higher oil prices imply increased resources in the Public finances allowing for higher expenditures. Economy are highly depends on the situation in the oil market. This can have a negative effect related to the variability of the oil prices changes. More volatile prices can increase the uncertainty on future budget resources. This renders future fiscal balances less credible and exposes the Government to capital outflows. To avoid this, the Government may decide to temporarily reduce its expenditures, signaling to the markets its commitment to meet the budget targets. In Kazakhstan, such a behavior has been illustrated by the creation of a national fund to save part of the inflows to the budget from oil and extractive industries in order to smooth the impact of prices volatility. Moreover, the acceleration of inflation reduces the government consumption and a depreciation of the national currency has a negative impact through the pressure to the inflation level of the increasing disposable recourses.

2.2 Labor market

A second set of equations describes the labor market: employment, productivity and the industrial wages.

- *Employment*

$$\underset{(0.69)}{\Delta\log(E_t) = 0.27} - \underset{(-3.15)}{0.25\log(E_{t-1})} + \underset{1.97)}{0.22\log(y_{t-1})} + \underset{(2.00)}{0.23\Delta\log(y_t)}$$

$$+\underset{(3.66)}{1.57\Delta\log(LF_t)} - \underset{(-4.18)}{0.47\Delta\log(E_{t-2})} - \underset{(-5.12)}{0.209\log(Prod_t)}$$

$$Wald = 10.71 \qquad crit = \left[\underline{l} = 3.79, \bar{l} = 4.85\right]$$

R^2 = 0.67; *F-statistic* = 10.48; *Prob(F-Statistic)* = 0.0000 and *DW* = 2.07

All the coefficients have the expected signs: the labor productivity has a negative impact on employment while the real output has a positive influence. Further, the four variables evolve in phase in the long-run, as indicated by the Wald test. In the short-run, the strongest influences are those of the real output and labor productivity. Although the official statistics do not give the distribution of employment among the different sectors, historically the employment growth is due to several factors.

The first factor is the expansion of the service sectors favored by a policy encouraging private sector development. The second factor is the policy of import substitution which is viewed as a mean to accelerate industrialization. This resulted in increased Government investments in the manufacturing sector, which boosted the industrial output (the manufacturing sector accounts for half of the industrial production). The third factor is the authorities' diversification policy into labor-intensive sectors.

- *Productivity*

$$\Delta\log(PROD_t) = -0.09 + 0.86\Delta\log(depsoc_t) + 0.91\frac{INV_t}{K_t} - 0.06\Delta\log(PROD_{t-1})$$

(-1.60) (24.6) (2.04) (-1.82)

$R^2 = 0.93$; $DW = 1.83$

Labor productivity varies positively with social expenditures (which include education, health care and social security spending) and the rate of investment. Higher social spending in Kazakhstan including the transition period were associated with the policy of economic diversification in order to reduce the economy's dependence on a few commodities (crude oil, natural gas and metals). Such spending was viewed as a mean to increase labor productivity through a higher level of human capital, particularly in some sectors such as petroleum and petrochemical products. The latter are less affected by the swings of the world prices and have greater value added. The investment rate captures the productivity spillovers and externalities of foreign direct investment. In Kazakhstan, such spillovers have operated through two channels. Firstly, inflows of direct investment financed imports of tradable goods, such as equipments, that required a high level of human capital. Secondly, as indicated before, foreign direct investment induced resource reallocations from old inefficient activities to new productive sectors.

- *Wages*

$$\Delta\log(w_t) = -0.04\Delta\log\left(\frac{P^c_{t-2}}{P_{t-2}}\right) + 0.11\Delta\log(PROD_{t-1}) - 0.51\log(w_{t-1}) + 0.19\log(P^c_{t-1})$$

2.49) (5.65) (-5.26) (5.41)

$$Wald = 18.7 \qquad crit = [\underline{l} = 4.94, \bar{l} = 5.73]$$

$R^2 = 0.64$; $DW = 1.83$

The wage equation is representative of both the behavior of workers and firms. From the viewpoint of the workers, higher consumer prices involve claims for an upward adjustment of the nominal wages. From the viewpoint of the firms, the ratio of the consumer prices over the producer prices determines their profit margins. An increase of profits necessarily means lower wages. As expected, labor productivity has a positive influence on the wages. Finally, the Wald test yields to conclude in favor of long-run relationships between the wages and their determinant.

2.3 Prices

A third set of equations indicates how prices are determined.

- *Consumer prices*

$$\Delta \log(P_t^c) = \underset{(0.73)}{0.024} - \underset{(-5.72)}{0.108} \log(P_{t-1}^c) + \underset{(7.02)}{0.04} \log(y_{t-1}) + \underset{(5.17)}{0.09} \log(s_t) - \underset{(-4.5)}{0.08} \log(s_{t-2}) + \underset{(2.88)}{0.01} \Delta \log(P_{t-1})$$

$$+\underset{(26.3)}{0.606} \Delta \log(P_{t-1}^c) + \underset{(2.57)}{0.03} \Delta \log(BRENT_t)$$

$$Wald = 25.8 \qquad crit = \left[\underline{l} = 3.23, \bar{l} = 4.35\right]$$

R^2 = 0.98; DW = 2.45

- *Producer prices*

$$\Delta \log(P_t) = \underset{(7.06)}{3.95} - \underset{(-4.14)}{0.01} t - \underset{(-4.14)}{1.003} \log(P_{t-1}) + \underset{(5.07)}{0.31} \log(BRENT_t) + \underset{(4.63)}{0.22} DUMMY(1999) + \underset{(3.93)}{0.09} \Delta \log(P_{t-7})$$

$$Wald = 31.2 \qquad crit = \left[\underline{l} = 4.94, \bar{l} = 5.73\right]$$

R^2 = 0.69; *F-statistic* = 16.59; *Prob(F-Statistic)* = 0.0000 and DW = 1.87

We assume that the consumer price is fixed by adding a mark-up to the marginal cost, the latter being proxied by the producer price. The coefficient of P_t is, as expected, positive. Since the mark-up is a function of the elasticity of demand, it is usually empirically proxied by some variables representing the capacity utilization or the output-gap. Here, we use the real GDP. As expected, the latter has a positive influence on P^c. We further introduce a pass-through effect. World prices influence the domestic prices through the nominal exchange rate variations. The impact of depreciation depends on several factors: the degree of price controls, the degree of openness of the economy and the structure of external trade. One expects a positive sign if, for instance, depreciation yields an increase in the import prices and correlatively an increase of the domestic prices. We indeed obtain such a positive sign in our equation for the long-run coefficient.

The specification for the producer prices includes the following elements. Changes in the prices of intermediate goods are captured by the price of oil. As is seen, the impact on the producer prices is positive and statistically significant. We further introduce a dummy variable for the year 1999, in order to capture the influence of the decrease of the prices in world commodity markets and the impact of the depreciation of the Ruble following the 1998's Russian crisis. Finally, we have a negative coefficient trend, illustrating the important contribution of the producer prices to the decreasing inflation rate during the transition period.

2.4 Monetary policy

The last equations reflect the monetary policy.

- *Interest rate*

$$\Delta\log(i_t) = 1.82 - 0.17\log(i_{t-2}) - 0.73\Delta\log(P^c_{t-4}) - 0.29\log(s_{t-1}) - 0.38\Delta\log(i_{t-2})$$

(3.8) (-4.12) (-2.87) (-3.51) (-4.28)

$$Wald = 8.9 \qquad crit = \left[\underline{l} = 3.79, \bar{l} = 4.85\right]$$

R^2 = 0.66; *F-statistic* = 18.79; *Prob(F-Statistic)* = 0.0000 and *DW* = 2.061

- *Nominal exchange rate*

$$\Delta\log(s_t) = 0.26 - 0.05\log(s_{t-1}) + 0.034\Delta\log(P_{t-2}) + 0.36DUMMY(1999{:}2)$$

(3.8) (-3.7) (3.9) (17.08)

R^2 = 0.87; *DW* = 2.062

For the interest rate equation, we unsuccessfully tried to estimate a Taylor rule equation including different combinations of the following variables (the inflation rate, the output-gap, the money growth, unemployment, foreign interest rates). We finally consider an empirical interest rate rule that accounts for the Kazakh monetary authorities' main targets during the transition period. Their main intention has been to restrain inflation, to maintain the value of the National currency and to avoid the contagion effects of the financial crises occurring in other emerging countries (South-East Asia, Czech Republic, Russia). Theoretically, raising the interest rate helps to reduce the inflation rate. But in the case of Kazakhstan we observe a kind of puzzle: in spite of the increase in interest rate, inflation speed up. It can be due to the following factors: high rates of growth of aggregate demand, inflow of foreign currency, steady wages hikes, acceleration of production costs, and low level of competition in markets for goods and services.

Raising the interest rate also simulate capital inflows, entailing an appreciation of the currency (a decrease of s_t in the model) in the context of a floating exchange rate regime. In this case, an appreciation of the national currency is negatively correlated with higher interest rates. The authorities have decided to give up a fix peg in April 1999, so the negative sign may apply for quarters after this date. But, even when the Tenge was pegged to the US Dollar (before 1999), it was hard to maintain the fixity of the nominal currency because the sterilization of capital inflows was very costly given the lack of liquidity of local security markets. Given the initial situation of excess security's demand over security's supply, investors preferred to place their assets on international markets at lower interest rates. Keeping them at home supposed to propose very high interest rates which would have a depressing effect on the real activity. So, even before 1999 increased interest rates were concomitant with an appreciation of the Tenge. Note, however, that the appreciation has sometimes implied lowering the interest rates in order to avoid a Dutch disease.

We finally add a simple formulation of the purchasing power parity condition. The law of one price implies that any domestic price increase is compensated by a nominal depreciation. In the above equation, we have an expected positive sign for the coefficient of the variable $\Delta\log(P)$. We choose the producer price index because the PPP applies for goods that are internationally mobile. In the CIS countries, including Kazakhstan, tradable goods have a stronger influence on producer prices than on consumer prices. We also include a dummy variable for 1999:2, the date of "de facto floating" of the Tenge (before the official announcement in April).

3. Policy issues

A wide body of research suggests that growth experience in transition economies, especially the CIS countries, depends upon the success or failure of the institutional and structural reforms (see, among many others, Falcetti et al. (2000), Havrylyshyn and Ron van Rooden (2000)). In this work, we omit the institutional aspects of the reforms in Kazakhstan (due to the non availability of reliable data). More modestly, we study the effects of different adjustment scenarios, taking the estimations of the previous section as the main macroeconomic relationships governing Kazakhstan's economy during the transition period. Under the assumption that the estimated equations remain valid for the near future, the simulations used, though they apply to the years 2000:1 -2008:4, can give some favor of the macroeconomic adjustment over the subsequent years.

3.1 Choice of the policy scenarios

We base our simulations on some policy scenarios that the Kazakh authorities found desirable to meet ten years after the beginning of the transition period and after the opening to the international trade. Further economic development of the Republic of Kazakhstan will also be ensured by implementing the Plan of Priority Actions to Ensure Stability of the Socioeconomic Development of the Republic of Kazakhstan. According to the authorities' economic program, as given in different international organizations' reports (IMF, World Bank, Asian Development Bank), several macroeconomic policies have been identified as priority targets (for the years 2010-2011), among which the following:

1. Taking into account the recent situation on the world markets three scenarios for economic development was developed by the monetary authorities (according to the world oil prices levels). The main priority of all is to restrain annual inflation within the limits of 6.0-8.0 percent. When inflation is established on a downward path, there will be scope for some further easing of policy, although it is important to keep real interest rates at positive levels to support domestic deposits and help banks move toward a sustainable funding base. According to the third scenario which NBK estimate more realistic, the official interest rate will increase to 1%. So, in our simulation, we examine the impact of an increase in the short-term interest rate of 1 point.
2. Encourage further developments of the new capital in a context of limited domestic resource mobilization. This is necessary for the realization of the strategy on industrial development and innovations. The building of a new capital is positively linked to international technology transfers. The latter act as a catching-up factor that contribute to the GDP growth. It is common wisdom that FDI's are conducive of technology transfers. The inflow of foreign direct investment will remain strong despite the previsions of a little decrease in 2010 (due to the cuts in funding for the North-Caspian project, which peaked in 2009). Our purpose is to study the impact on the real activity of a 10% increase of foreign direct investments.
3. Raise the wages of civil servants and employees of public institutions. It was always one of the priorities of the fiscal spending of the government. First, in a context of rapid growth, increasing the wages is a mean to ensure that the population reaps the benefits of growth. This can be viewed as a redistributive policy. In particular, it may help to flight poverty (the authorities' goal is to reduce the share of population that has income below the line of poverty to 20%). A second argument is based on efficiency wages: increased salaries are an incentive to higher the workers' labor productivity and seem essential to attract highly qualified labor. The potential inflationary pressures of higher wages should be limited by the concomitant increase of labor productivity. In July 2010 the wage of civil servants will be increase by 30%. We simulate in our model the impact of a 30% increase of the nominal wages.
4. Sustain economic growth, development capacity of the deposit market, the recovery of credit activity of the banking sector, as well as a public confidence to the national currency. In Kazakhstan, economic performance is highly influence by external factors, in particular changes in the prices of oil, natural gas, metals and by the business cycle phases of the trading partner countries. In our simulations, we envisage two favorable external shocks: an increase

of 10$ in the price of crude oil and an international recovery leaded by a 10% increase in the US GDP.

3.2 . Structural instabilities issues:

The specification of the model developed above doesn't take into account structural changes. Nevertheless, everybody knows that this period has been perturbed by various mayhems due to the dislocation of the CIS and the following institutional and political changes. It might have strong consequences on the stability of a model. The following steps consist in the detection of structural breaks. We proceed as follows, using the Kalman filter methodology.

Illustration in the real consumption equation case

In aim to initialize the Kalman filter we use the period 1994:1 - 1998:3. The calculation of expected state vector and the current estimate of the state vector start from the fourth quarter of 1998.

Figure 3.1.1 (in Appendix 3) reproduces the parameters time path of the consumption equation. We note that the filter fit not quickly due to the fact that the greatest fluctuations in the values of the coefficients persist before 2002. The largest part of fluctuation takes place during the Kazakh transition period. From 2000, the parameters became more stable, indicating the beginning of a steady and sustainable growth.

The CUSUM and CUSUMSQ tests applied to the model residuals. The CUSUM test is based on the cumulative sum of residuals based on the first set of "n" observations. It is updated recursively and is plotted against the break points. If the plot of CUSUM stays within 5% significance level (portrayed by two straight lines whose equations are given in Brown *et al.*, 1975), the coefficient estimates are said to be stable. Similar procedure is used to carry out the CUSUMSQ based on the squares recursive residuals. Graphical representations of these two tests for the above model are provided in Figure 3.1.2.

From the figures, we note that both CUSUM and CUSUMSQ statistics stay in the critical intervals (meaning no evidence of a random break reflecting instability of regression coefficients over this period). But taking into account global testing approaches, we will try to get more of these results. Harvey and Collier phi test's value is -0.151. It rejects the hypothesis of global rupture in the coefficients because the Student's *t*-statistic associated ($t_{5\%}$(39ddl) = 1.68) exceeds the value of phi. Nevertheless, Figure 3.1.3 (the recursive phi test) confirms a break before 1998-2000.

Using the same approach, we have examined all of the set of model equations. We can note some evidences of strong structural changes concerning different explanatory variables. More precisely, we can distinguish two periods of instability, before 1999 and after 2007. The first one, named "transition and institutional changes" was marked by the chaos of the end of USSR and the mayhems of the first years of independence with:

- For the period of common currency, the depreciation of the Ruble, the crash of the monetary union and the sharp decline of the purchasing power of households in 1991-1993;
- Then the creation of the national currency and the debates about the choice of the exchange rate regime during 1993-1995;
- The 1997 Asian crisis, worsening the price competitiveness and export conditions of the country;
- The 1998 Russian crisis (when Russia was the main trade partner of Kazakhstan);
- The adoption of the free float exchange rate in 1999;
- And in 2007 the American crises of subprime and the world finance crisis;

How can we build-in the effects of these shocks in new simulations? Because we are in non-linear cases, we cannot use the linear methods for full period estimation and simulations. The alternative options to solve this problem are the followings:

- We can use the non-linear models (like Markov-Switching VAR models) computing either recursive least squares or rolling regressions (i.e., econometric procedures in which the same linear equation is estimated multiple times using either a growing sample or partially overlapping subsamples);
- A more simple solution is to estimate and run simulation with the model using only period in which we have a full stability of the coefficients (i.e. the years 2000 – 2008). We choose this last solution.

3.3 Results of the simulations

The baseline scenario describes the path of the endogenous variables, solving the model[7]. The model agregates the behavioral equations plus the following national account identity linking aggregate output and its components (the common deflator is the producer price index):

$$\frac{Y_t}{P_t} = \frac{C_t + STOCK_t + INV_t + EXP_t - IMP_t + GOV_t}{P_t}$$

The real output consists in the real consumption, the real inventory stocks, the real investment, the real net exports and the real government spending. In Appendix 2, we report the difference between the simulated trajectories after a given shock and the trajectories corresponding to the baseline scenario. A positive (*resp*. negative) value indicates an increase (*resp*. a decrease) of a variable in comparison to its baseline value. All the shocks are permanent ones

[7] The model is solved with the nominal variables. Then, the endogenous variables are expressed in real terms.

10% permanent increase in foreign direct investments

As checked in Figure 2.1 (Appendix 2 – results of simulations), a higher amount of foreign direct investments (FDI) carries on a rise in output. FDI yield an increase in the real investment, creating a positive multiplier effect on the components of the GDP: real consumption, imports. In response to the output boom, the government expenditures rise, allowing wage hikes. The increase of wage and real consumption entail more inflation. More precisely, the inflows of FDI push interest rates downwards in a first time. Indeed, FDI concern essentially the oil sector while the business climate remains less dynamic in other activities. On supply side, FDI affect factor productivity. More generally, in spite of the demand effects, higher FDI can be viewed as a restructuring factor helping to close the gap between the excessive aggregate demand and the aggregate supply. The upturn of the output and its components may thus be interpreted as an adjustment process. Our simulations sum up theses forces, showing the positive impact of increased FDI, both on the demand side (multiplier effects) and supply side of the economy (productivity effects).

Permanent increase in the crude oil price of 10$

An exogenous shock on the oil price boosts the exports (usually rises in energy prices are correlated with a positive turnaround of the world demand) and drives the producer prices upward (because oil products enter as intermediate goods in the domestic products). The favorable in this case conditions contribute to rise in GDP. The law of one price in international markets implies a depreciation of the nominal exchange rate. The impact of the rises in oil prices on inflation is limited in accordance with the increasing importance given by the monetary authorities to control of inflation targets. Probably measures of authorities to diversify economy and the objectives of the monetary policy were successful.

As showed in Figure 2.2, the nominal wages decreases sharply (in response to the decrease of the consumer prices). The positive multiplier effect explains why the employment rise (the real wages and productivity have decreased). Notice that the multiplier effect is reinforced by the fact that increased oil prices implies higher resources for the Government and thus higher public spending.

Finally, it can be noticed that the monetary authorities modify their behavior over time. We see that the interest rate are first lowered and then raised. The explanation the nominal interest rate enters as a target in the Central Bank's reaction function (see the interest rate equation). The depreciation of the nominal exchange rate improves the external competitiveness, which is favorable for both external and internal balances. This reduces the inflationary pressures and allows to follow an accommodative monetary policy.

10% permanent increase in the US GDP

The reforms undertaken by Kazakhstan during the transition period implied lower trade barriers and a higher diversification of the external trade. Analyzing the contribution of aggregate demand to growth, it is important to acknowledge that the country's growth rate has been heavily influenced by the world business cycle (this is a major difference with other CIS countries whose growth has continued to depend upon the Russian growth). Here, we study the impact of a world expansion leaded by a strong recovery in the USA. The implications are those expected. As observed in Figure 2.3, the result is a jump in the exports, causing the output components to adjust upward through a positive multiplier effect. This creates a rise in the real wage and upper consumer prices as a consequences. If the central Bank reacts by raising the interest rate latter, among the different components of the aggregate demand, investment is the only variable durably negatively affected. Lower investments bring labor productivity down and this raises employment. As a whole, the simulations show features that happen in export-oriented growth countries. The positive impact of the foreign growth compensates the negative effects of a restrictive monetary policy.

1 point permanent increase in interest rate

The National Bank sets the official refinance rate according to the situation on the money market and the inflation rate. So the refinance rate stays positive in real terms with increasing inflation rate and will be the upper limit of rates at the short-term money currency market.

An increase in the interest rate tights the monetary policy, turning difficult the access to the credit and, consequently, slowing investments. These measures cause a contraction of GDP components, worsening the labor market. The slow increase in the interest rate curbs the consumer price level. The reaction of wages is not monotonous, because the increase of volatility. This fact can be explained by the strong government policy of permanent year-per-year increase of the wage level in the country. A higher interest rate, by lowering the rate of investment, also induces a decrease in the labor productivity yielding an upward shift of the employment. The negative response of labor productivity can be interpreted as the result of loss of productivity spillovers and positive externalities incorporated in the capital stock.

Lower investment rate in transition economies is synonymous of modernization, which implies layoffs, in the short-run, as firms reduce their inefficient capital. This has two implications. The workers can change their skills and move to activities with more value added. They can choose to work in activities that are more labor intensive, which implies that they accept lower real wages. Kazakhstan's situation seems more in line with the second explanation. The country lacks highly qualified workers and further the authorities have been looking for way of diversification into labor intensive sectors. An exogenous increase in the interest rate thus generates a positive price-output and price-employment correlation over the business cycle but a negative price-employment correlation over the long-run (prices diminish while employment increase). This comes from the fact that, in our model, employment responds to both aggregate demand (positively) and productivity (negatively).

In brief, the monetary policy impact (in term of increase of the interest rate) on the main macroeconomic variables is not unambiguous. This question causes some debate among researchers and economists. In certain cases, it helps to restrain inflation and has a detrimental effect on the output. But if we analyze the development trend of the economy since 1995 and we look into the response of the economy to the change in the monetary policy instruments we can note some facts. In the period 1994 to 2007 the year 1999 is very important due to the adoption of the full floating regime of the national currency. So we can analyze first the sub period before 1999, and then the sub period since 2000 characterized by macroeconomic stability. After the 1994 - period of slowdown and high inflation - the main objective was the reduction of the inflation rate; so the Central Bank sought to quell inflation using monetary contraction. Latter, substantial increase in money supply in real terms in 2000-2007 was offset by strong economic growth rate. For the same period, the refinance rate has not played a significant role. Its modifications were rare, and expected by the agents.

30% increase in wages

Wages hikes cause an increase in real consumption, stimulating the activity through a positive multiplier effect. As the monetary authorities attempts to control the inflation by raising the interest rate, the investment rate decreases, causing a fall of labor productivity. It triggers an improvement of employment. But, as the nominal wage increase continues, higher labor costs entail a deterioration of labor market. So, the global effect of the contradictory forces seems positive in the short run for private consumption and employment.

However, this positive result is transitory. The rise in the output triggers an upward move of the consumer prices and the interest rate is bid downward by the Central bank to restrain inflation. This restrictive monetary policy causes the aggregate demand components to move down. Since 2003 rise of the wage level is one of the main priorities of the social policy of the Kazakh authorities. It is necessary to take into account that a permanent increase in the real wage can provoke a risk of slowdown of the economic growth, higher level of inflation which can lead in its turn to the both inflation and economic stagnation. As is known, if these two phenomena occur simultaneously, no macroeconomic policy can address both of these problems at the same time. The best solution would be to combine wages hikes with productivity increase!

4. Concluding remarks

This paper describes a quarterly macro econometric model of the Kazakhstan. The principal goal was to providing a stylized representation of the Kazakh economy in order to simulate the consequences of several economic policies viewed by the authorities as essential. The modeling process follows the empirical-based approach by estimating error-correction equations. To ensure coefficient invariance, we used parameter constancy tests. The resulting model demonstrates good potential for policy simulations. The results we obtain are in line with the economic observations. There is a clear distinction between temporary and permanent responses, as in the case of temporary shock, the overall effect of the policy shock is permanent in the long-run.

The policy simulation potential of the model is illustrated by five types of simulations: interest rate shocks, foreign direct investment shocks, world oil price shocks, foreign demand shocks and nominal wages shocks. These sets of simulations show the importance of foreign direct investments in terms of theirs global positive effect. They can be viewed as a restructuring factor helping to close the gap between the excessive aggregate demand and the aggregate supply. Despite large authorities' efforts to diversify economy, Kazakhstan suffers still a large dependence of the commodity prices. Along with the external demand simulations, they show the vulnerability of the Kazakh economy to external shocks. We find that effect of the tight monetary policy is not unambiguous; we argue that in certain cases that is not the most efficient policy instrument. It is possible that some measures combination or short-run solutions like credit control would be the better solution for temporary and exogenously generated disequilibria. It is strongly recommended to take particular attention to the permanent government policy of wage expansion due to the possible threat of inflation and economic stagnation, which cannot be excluded.

However, the model suffers from some limitations that need to be mentioned. The specification and estimation of an econometric model for an economy in transition, such as Kazakhstan, are often complicated by data problems such as short, inconsistent, or unreliable time series. Nevertheless, a simple model for policy evaluation, like that which was constructed, can be developed which fits empirical data quite well in spite of the short time horizon. Of course, there are still several specification issues and statistical features that may be subject to objections from the theoretical or econometric point of view.

Second, policy reforms are accompanied by institutional transformations that imply changes of the economic structure. So, we cannot absolutely take for granted that the simulations done here should characterize Kazakhstan for the future years. However, this criticism yields us to formulate the following remarks. Until the transition is achieved, structural changes will occur. This means that any model describing the current situation of the CIS countries cannot be extrapolated into the future. A more serious argument is the following. The main problem posed by structural changes in macroeconomic models refers to the so-called Lucas-critique: the policies may be non operating if they induce reactions from the agents. Our model contains no assumptions concerning the domestic agent's expectations. In Kazakhstan and other CIS countries, the agents that react to the policy decisions are international organizations (IMF, World Bank, Bank for Development and Reconstruction ...). Private investors, before taking a decision, refer to these organizations viewpoint concerning the economic situation of the countries. But unlike what is observed in the case of domestic agents, the international organizations cannot directly modified the impacts of a given policy. What they do is to provide a general operating framework to implement the policies.

This paper also opens perspectives for a future research agenda. In particular, it would be interesting to compare the Kazakhstan case with those of other CIS countries to see whether there are common factors underlying their economies growth, just as was the case for Central and Eastern Europe countries. Such a study could serve as a basis for recommendations coordinated policies in the Region of Central Asia.

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Appendix 0

Selected Economic Indicators (IFS, IMF)

Concepts	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Gross Domestic Product, Real, Index 2005=100	58,83	54,01	54,28	55,20	54,15	55,61	61,06	69,30	76,10	83,17	91,16	100,00	110,70	120,55	124,53	126,02	134,22	142,94
Gross Domestic Product, Real, Percent.	-12,60	-8,20	0,50	1,70	-1,90	2,70	9,80	13,50	9,80	9,30	9,60	9,70	10,70	8,90	3,30	1,20	7,00	6,50
Private Final Consumption Expend.(Percent of GDP)	0,73	0,69	0,70	0,73	0,77	0,72	0,62	0,60	0,58	0,56	0,54	0,49	0,46	0,46	0,43	0,49	0,47	0,44
Public Final Consumption Expend. (Percent of GDP)	0,10	0,13	0,14	0,13	0,11	0,12	0,12	0,14	0,12	0,12	0,12	0,11	0,10	0,11	0,10	0,12	0,11	0,11
Corp., Househ., and NPISH, Gross Fixed Capital Formation(Percent of GDP)	0,24	0,22	0,18	0,17	0,16	0,16	0,17	0,24	0,26	0,24	0,25	0,28	0,30	0,31	0,26	0,29	0,25	0,21
Exports of Goods and Services (Percent of GDP)	0,35	0,38	0,37	0,36	0,32	0,42	0,57	0,47	0,50	0,50	0,52	0,53	0,51	0,50	0,56	0,43	0,46	0,51
Imports of Goods and Services (Percent of GDP)	0,44	0,42	0,38	0,39	0,37	0,40	0,49	0,48	0,50	0,44	0,44	0,44	0,40	0,43	0,37	0,35	0,30	0,28
Trade Balance (Percent of GDP)	-0,09	-0,04	-0,01	-0,03	-0,05	0,02	0,08	-0,01	0,00	0,06	0,09	0,09	0,11	0,07	0,20	0,08	0,15	0,22
Consumer Prices, All items (Percent Change over Corresp. Period of Previous Year)	1877,37	176,16	39,18	17,41	7,15	8,30	13,18	8,35	5,84	6,44	6,88	7,58	8,59	10,77	17,15	7,31	7,12	8,35
Total Population (millions)	16,12	15,93	15,71	15,48	15,26	15,08	14,96	14,90	14,90	14,96	15,05	15,17	15,31	15,48	15,66	15,84	16,03	16,21
Wage Rates (index 2005=100)	5,08	14,09	20,14	25,14	28,50	34,92	42,31	50,93	59,82	68,08	83,38	100,00	120,45	154,34	179,31	198,77	228,31	264,57
Unemployment Rate (Percent. Rate)	7,50	11,00	13,00	13,00	13,10	13,50	12,80	10,40	9,30	8,80	8,40	8,10	7,78	7,25	6,63	6,55	5,78	5,40
Interest Rates, Government Securities, Treasury Bills (Percent. Per year)	214,34	48,98	28,91	15,15	23,59	15,63	6,59	5,28	5,20	5,86	3,28	3,28	3,28	7,01	7,00	7,00	7,00	7,00
Official Reserve Assets (US $)	888,01	1206,06	1384,84	1782,66	1547,57	1565,57	1678,00	2078,13	2636,58	4326,69	8572,82	6180,30	17864,81	15900,43	17996,15	20844,08	25339,40	25315,71
National Currency per U.S. Dollar, period average (National Currency per US Dollar)	35,54	60,95	67,30	75,44	78,30	119,52	142,13	146,74	153,28	149,58	136,04	132,88	126,09	122,55	120,30	147,50	147,36	146,62
Var change		71,50	10,42	12,09	3,80	52,64	18,92	3,24	4,46	-2,42	-9,05	-2,32	-5,11	-2,80	-1,84	22,61	-0,10	-0,50
Current Account (Excludes Exceptional Financing), Net, (US $)		-213,10	-751,00	-799,30	-1224,90	-171,00	366,31	-1389,52	-1024,34	-272,63	335,43	-1055,84	-1998,56	-8321,92	6325,52	-4113,98	2408,52	14110,04

Appendix 1

Table 1 : Variables

C	Private consumption	$y = Y / PPI$	Real GDP
$c = C / P$	Real consumption	FDI	Foreign direct investment
P	Producer Price index	$fdi = (FDI / GDP)$	FDI(% GDP)
i	Nominal short term interest rate	K	Capital stock
$r = i - \Delta P^{c}$	Real interest rate	EXP	Exports
Y	*Gross domestic product*	$x = EXP / PPI$	Real exports
ΔP^{c}	Consumer price index	IMP	Imports
W	Nominal wages	m	Real imports
$w = W / P^{c}$	Real wages	y^{*}	USA GDP
INV	Gross fixed capital formation	$BRENT$	Oil prices
$I = INV / P$	Real investment	s	Nominal exchange rate vs US$
GOV	Government expenditures	$PROD = Y / L$	Labor productivity
$STOCK$	Inventories stock	E	Employment
L	Labor force	SOC	Social expenditures
$gov = GOV / GDP$	Gov.expenditures (%GDP)	$stock = STOCK / GDP$	Stock of inventories (%GDP)

$G = GOV / PPI$	Gov .Expenditures (real)	$depsoc = DEPSOC / PPI$	Social expenditures (real)

Source : Kazakh national accounts (Ministry of trade and economic development of the Republic of Kazakhstan, National Bank, Agency of the Republic of Kazakhstan on statistics) and the IMF database source.

Appendix 2 – Results of simulations

Figure 2.1 - A 10% Permanent increase in foreign direct investments

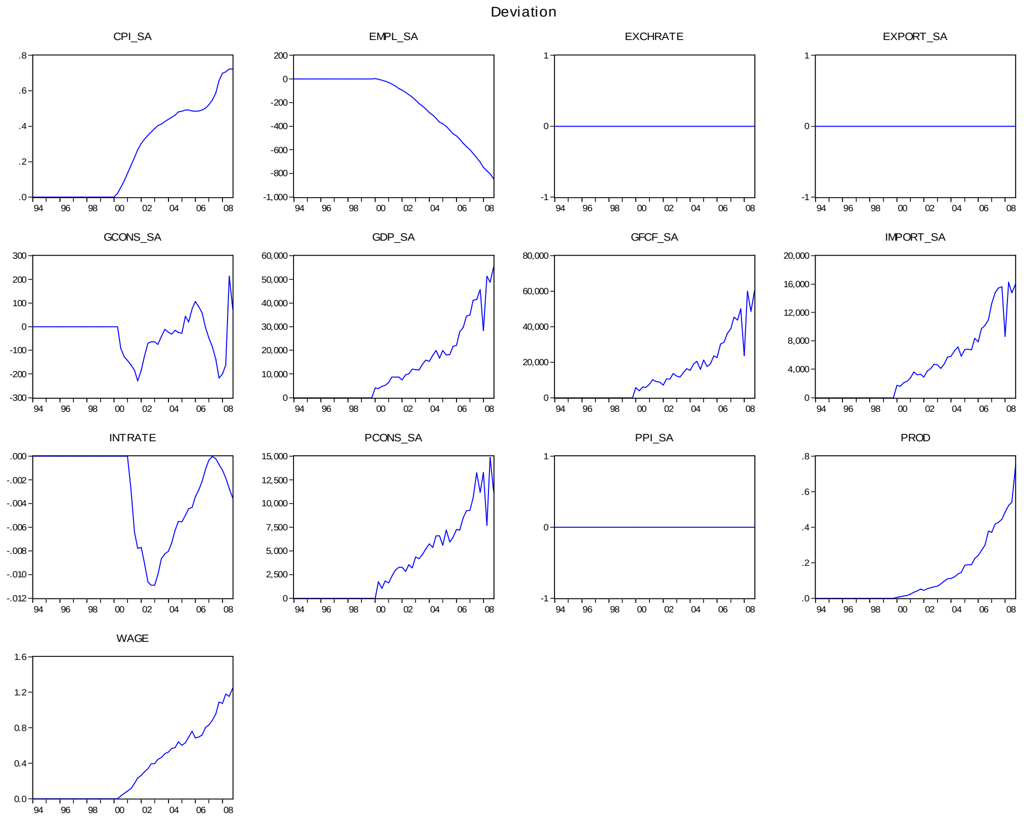


Figure 2.2 - A 10$ Permanent increase in the crude oil price

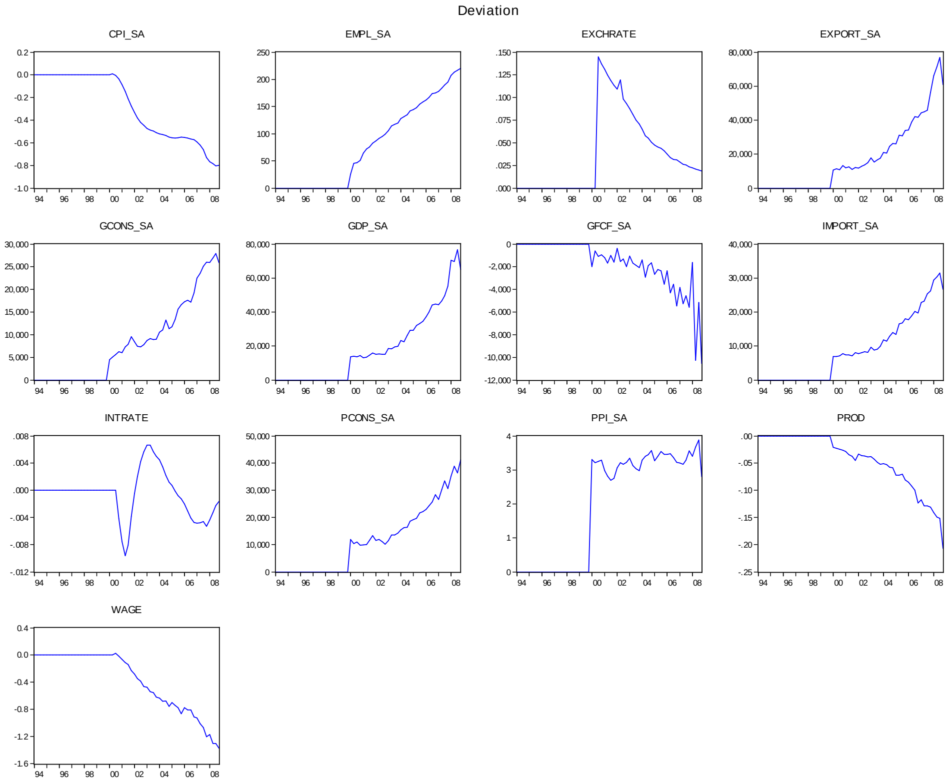


Figure 2.3 - A 10% Permanent Increase in US GDP

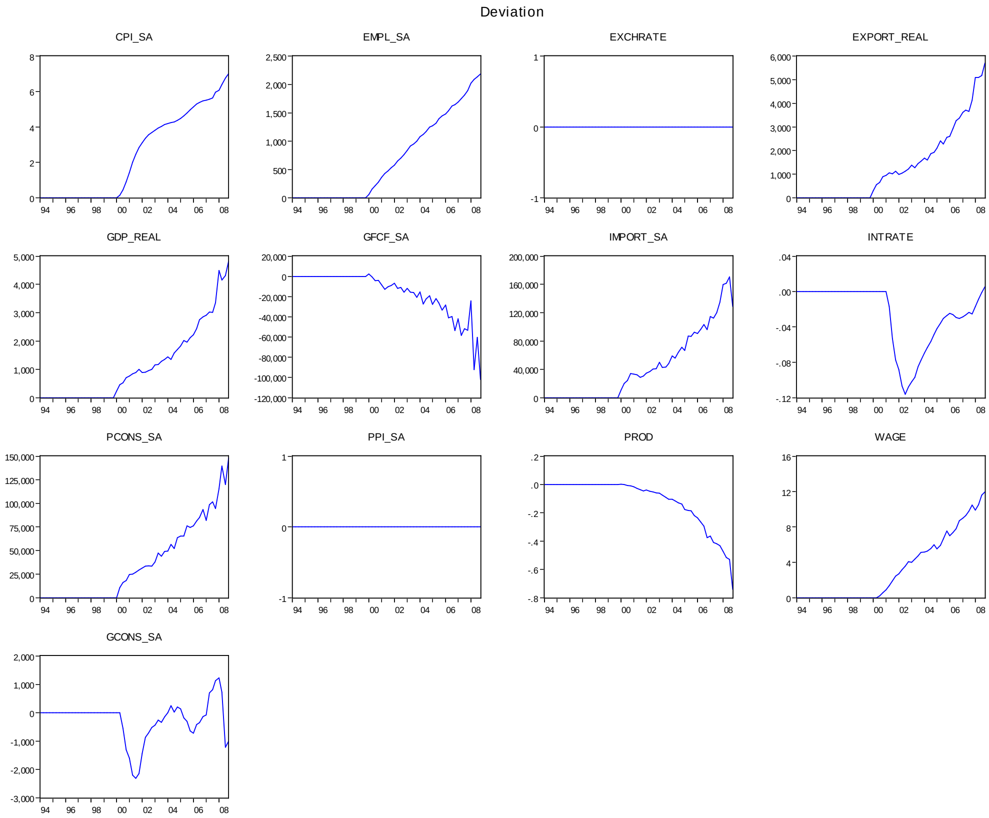


Figure 2.4 - A 1 point Increase in interest rate

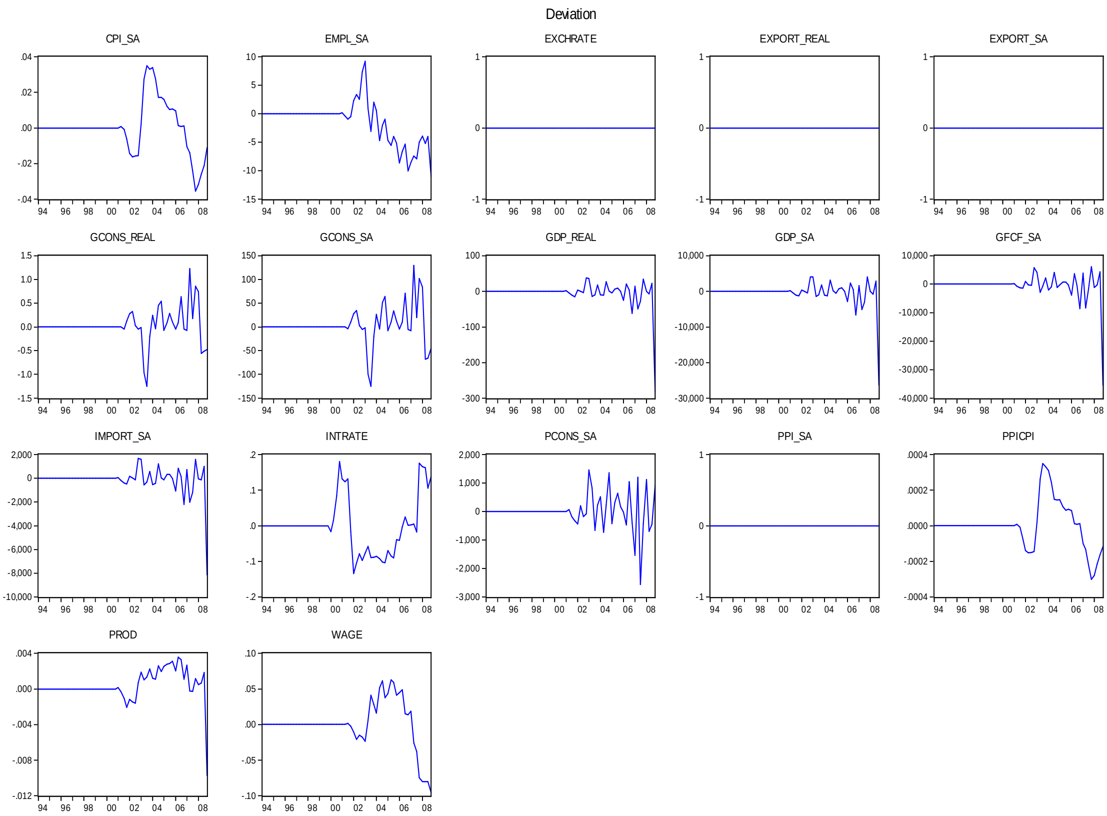
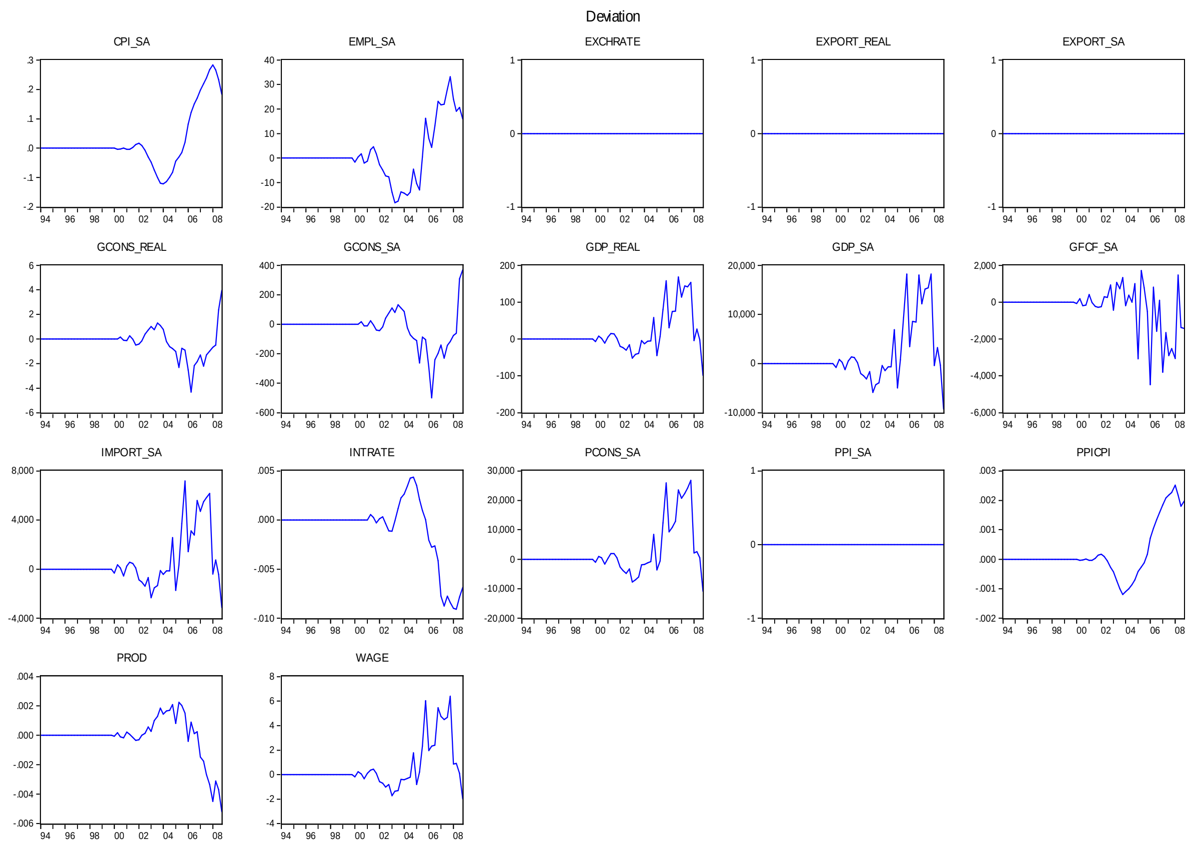


Figure 2.5 - A 30% Increase in wages



Appendix 3 – Stability tests outcomes

3.1 – Real Consumption equation

Figure 3.1.1 – Evolution of the coefficients over the time

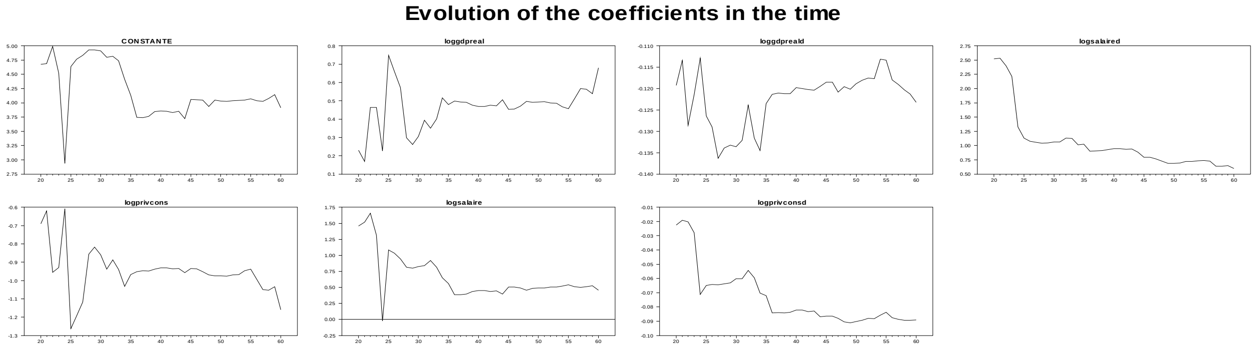


Figure 3.1.2 – CUSUM and CUSUM squared test’s results

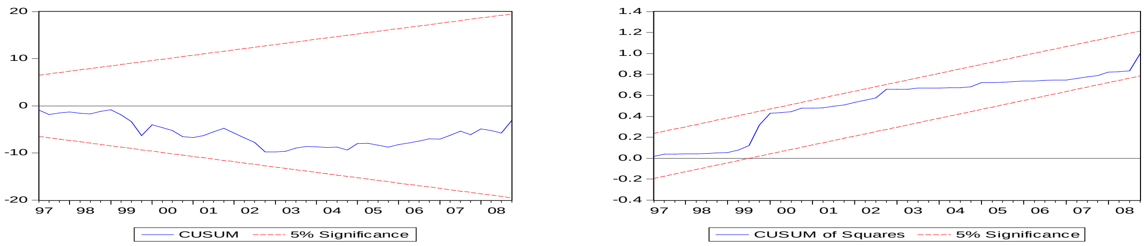
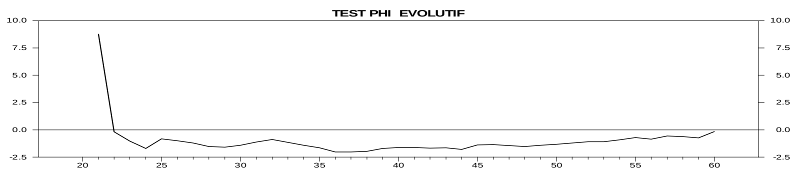


Figure 3.1.3 – Harvey and Collier Phi-test



3.2 – Investment rate equation

Figure 3.2.1 – Evolution of the coefficients over time

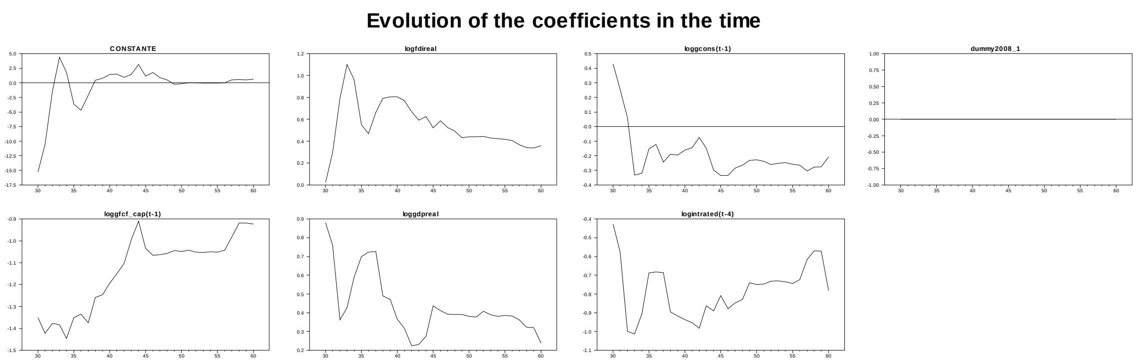


Figure 3.2.2 – CUSUM and CUSUM squared test's results

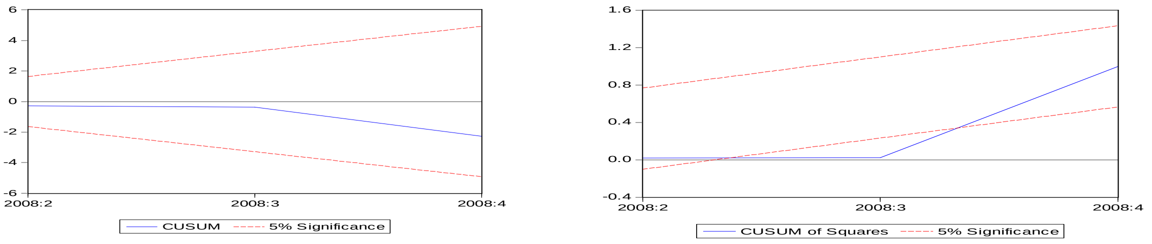
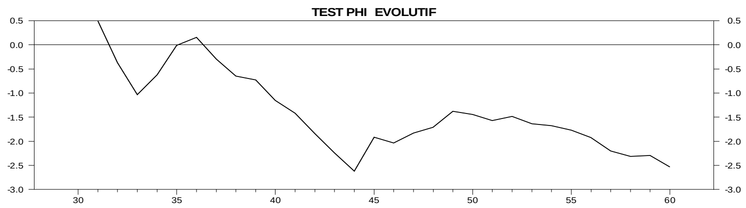


Figure 3.2.3 – Harvey and Collier Phi-test



3.3 – Real Exports equation

Figure 3.3.1 – Evolution of the coefficients over time

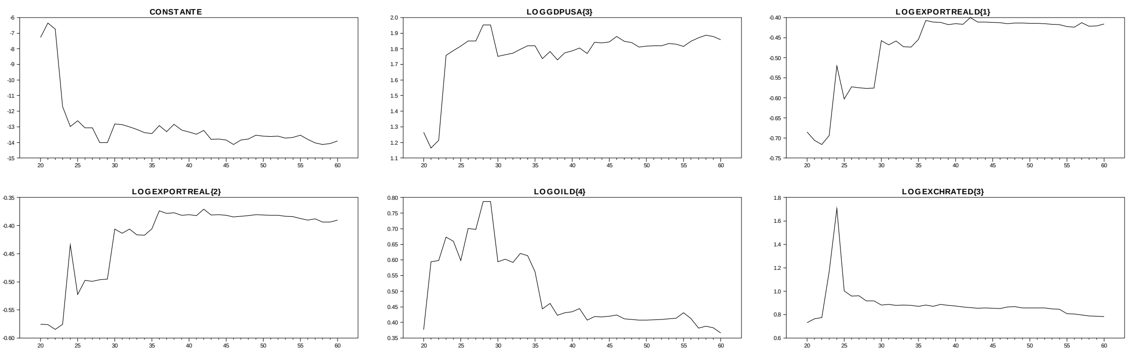


Figure 3.3.2 – CUSUM and CUSUM squared test's results

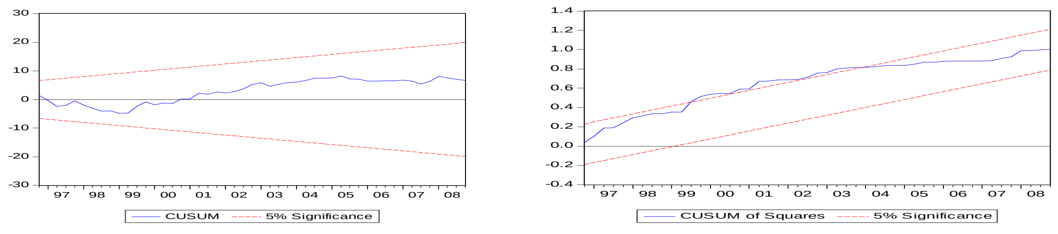
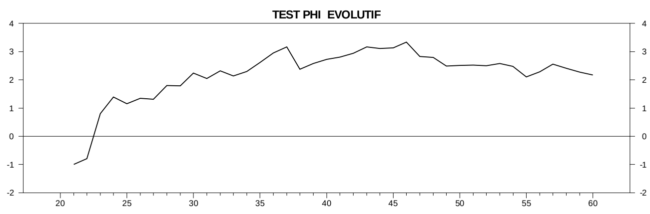


Figure 3.3.3 – Harvey and Collier Phi-test



3.4 – Real Imports equation

Figure 3.4.1 – Evolution of the coefficients over the time

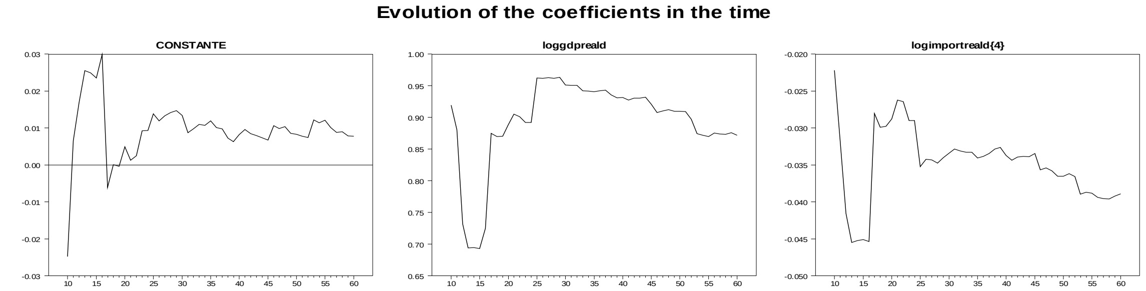


Figure 3.4.2 – CUSUM and CUSUM squared test’s results

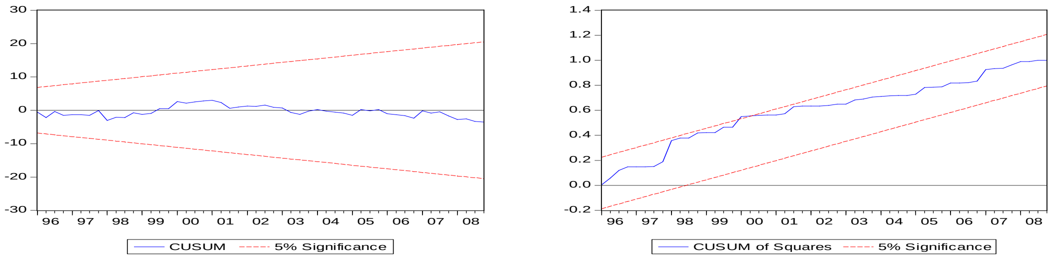
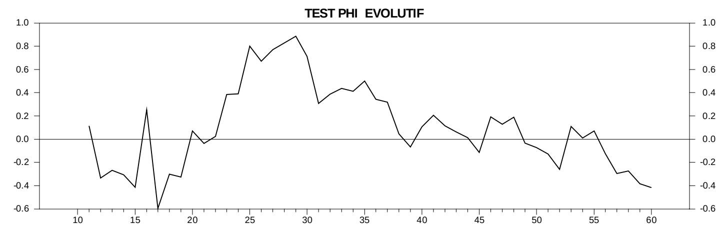


Figure 3.4.3 – Harvey and Collier Phi-test



3.5 – Changes in inventories equation

Figure 3.5.1 – Evolution of the coefficients

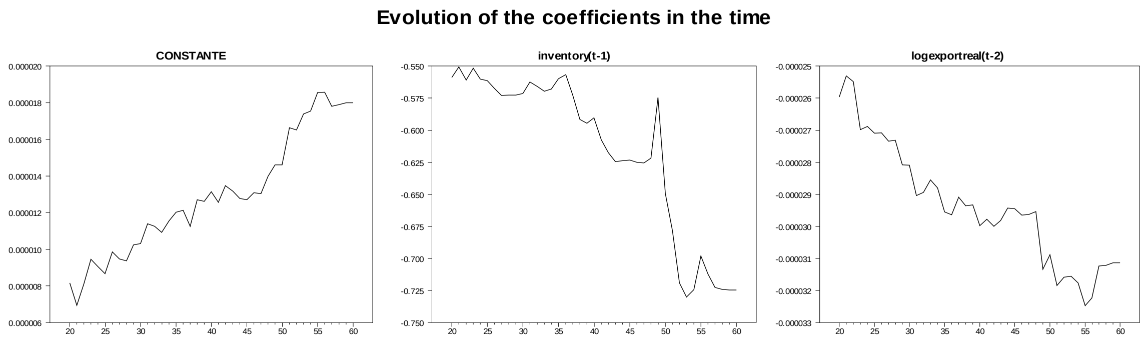


Figure 3.5.2 – CUSUM and CUSUM squared test's results

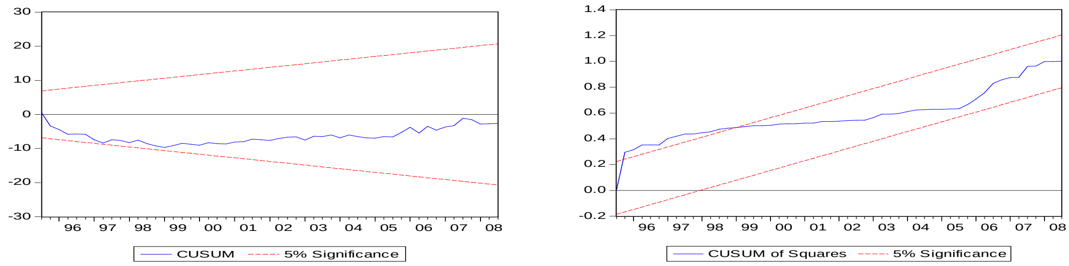
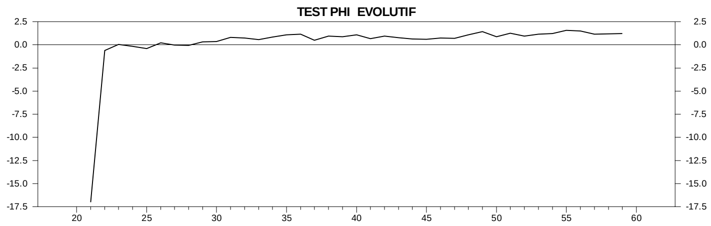


Figure 3.5.3 – Harvey and Collier Phi-test



3.6 – Real Government expenditures equation

Figure 3.6.1 – Evolution of the coefficients over the time

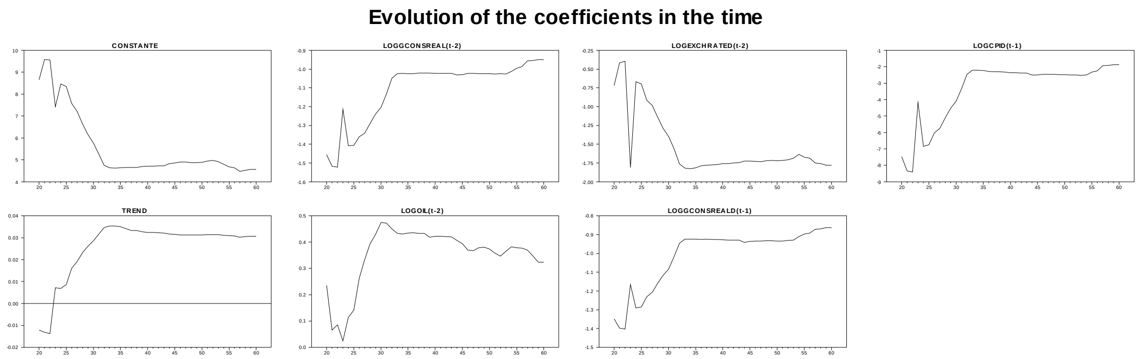


Figure 3.6.2 – CUSUM and CUSUM squared test's results

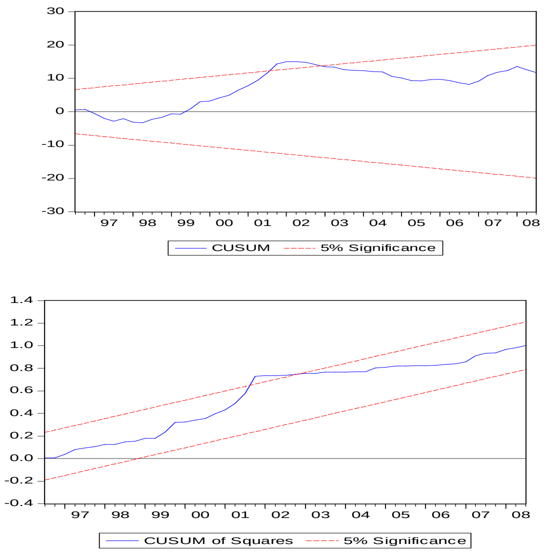
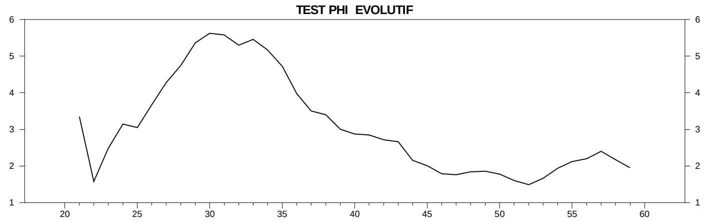


Figure 3.6.3 – Harvey and Collier Phi-test



3.7 – Employment equation

Figure 3.7.1 – Evolution of the coefficients over the time

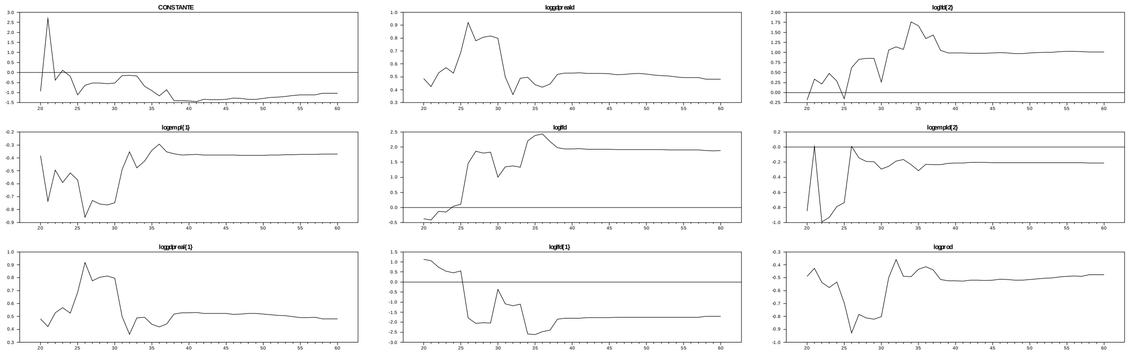


Figure 3.7.2 – CUSUM and CUSUM squared test's results

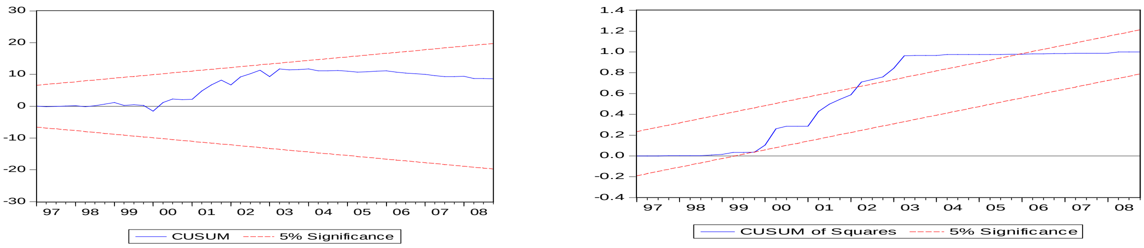
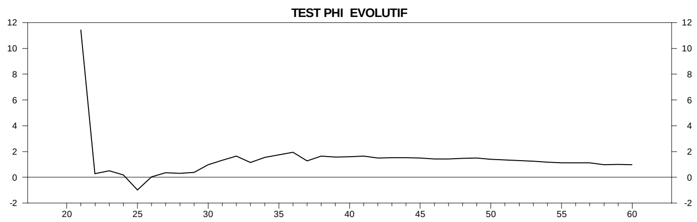


Figure 3.7.3 – Harvey and Collier Phi-test



3.8 – Productivity equation

Figure 3.8.1 – Evolution of the coefficients over the time

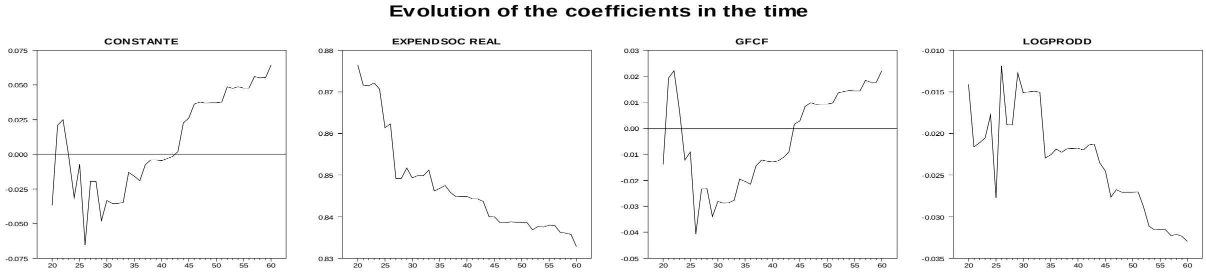


Figure 3.8.2 – CUSUM and CUSUM squared test's results

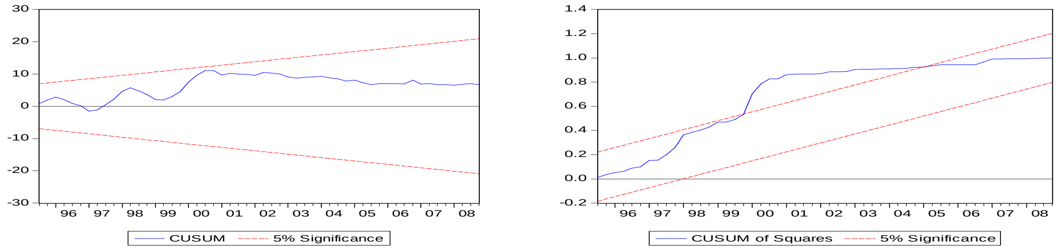
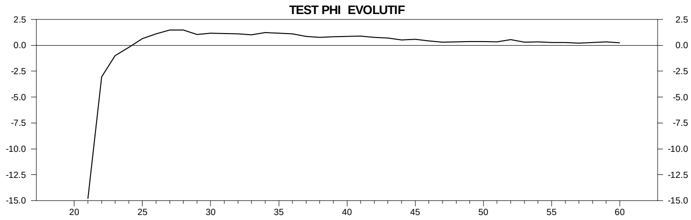


Figure 3.8.3 – Harvey and Collier Phi-test



4.9 – Real Wages equation

Figure 3.9.1 – Evolution of the coefficients over the time

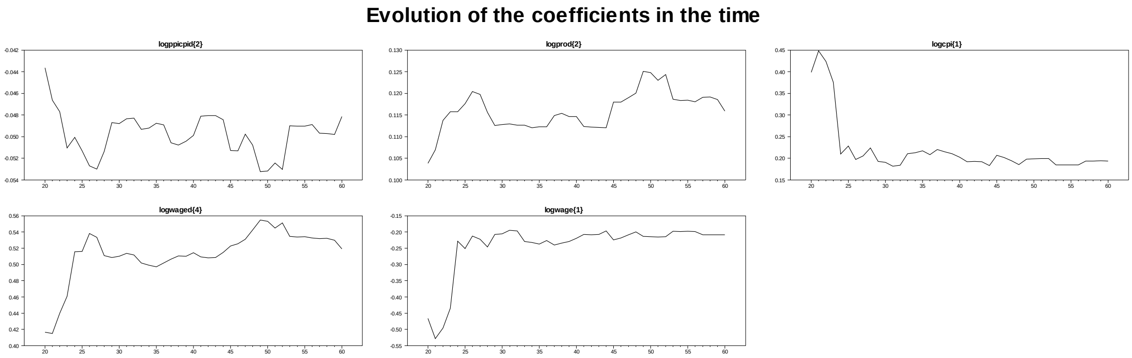
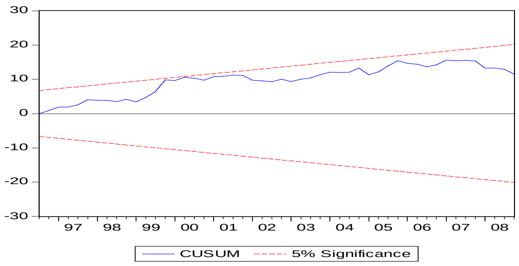


Figure 3.9.2 – CUSUM and CUSUM squared test's results



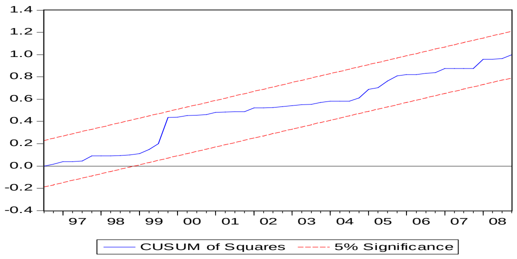
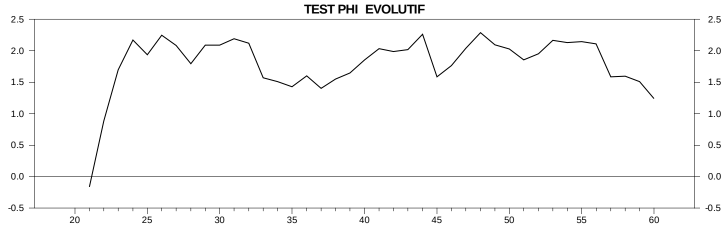


Figure 3.9.3 – Harvey and Collier Phi-test



3.10 – Consumer Prices equation

Figure 3.10.1 – Evolution of the coefficients over the time

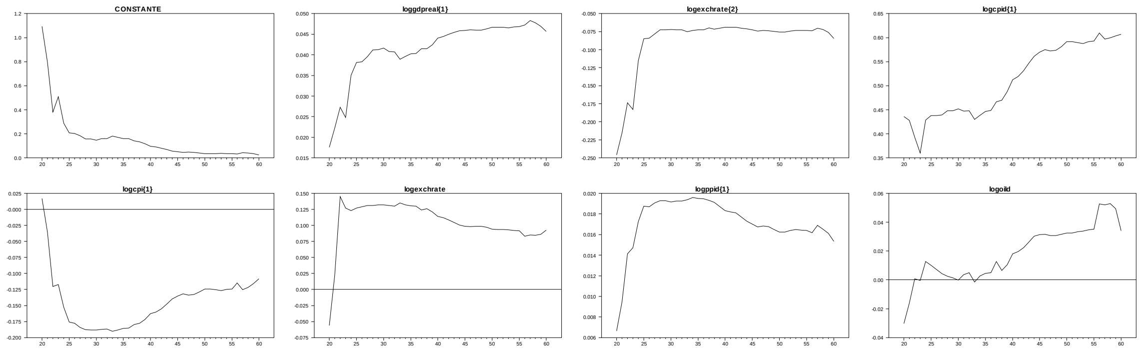
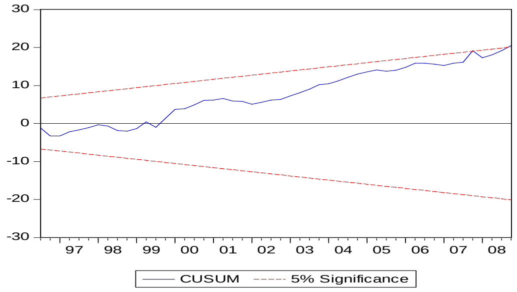


Figure 3.10.2 – CUSUM and CUSUM squared test's results



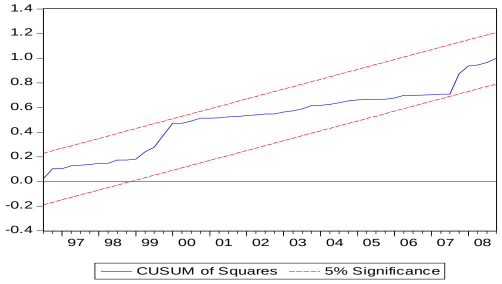
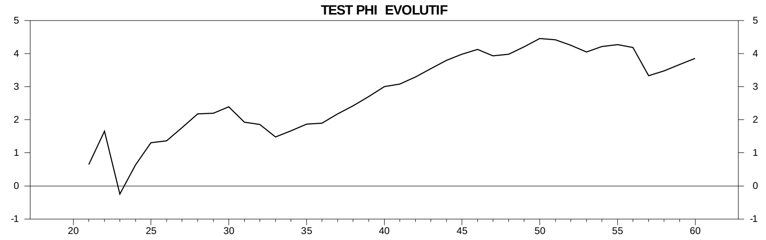


Figure 3.10.3 – Harvey and Collier Phi-test



3.11 – Producer prices equation

Figure 3.11.1 – Evolution of the coefficients over the time

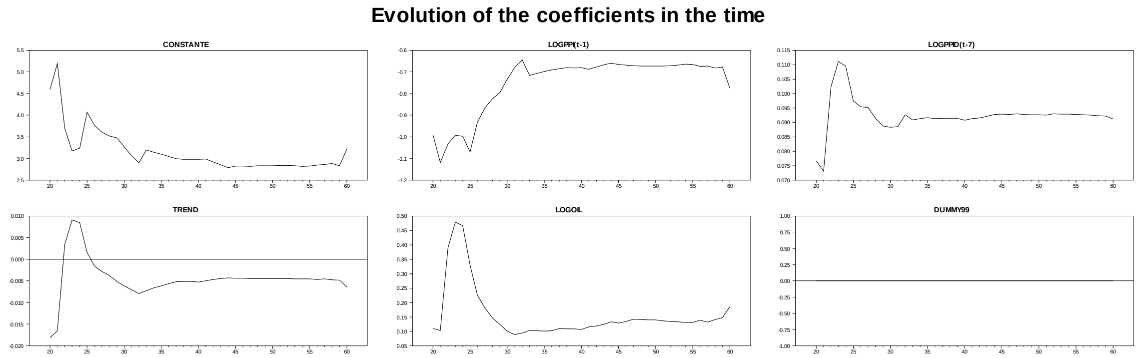


Figure 3.11.2 – CUSUM and CUSUM squared test's results

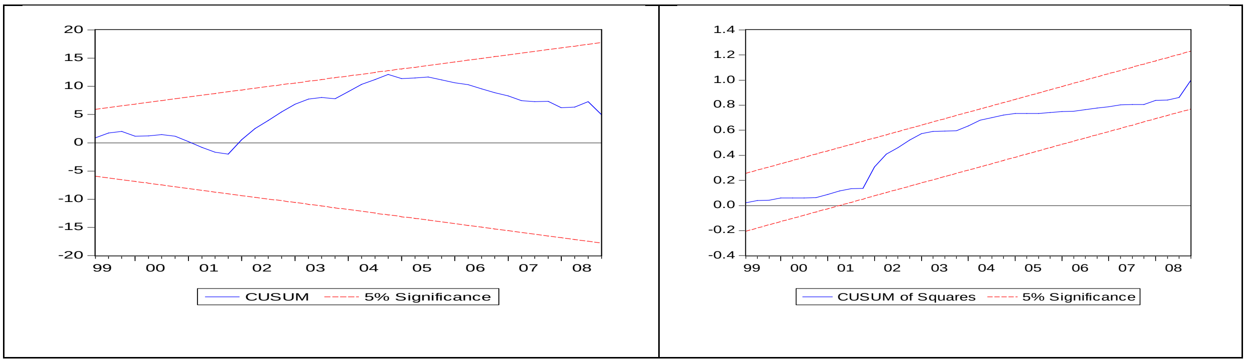
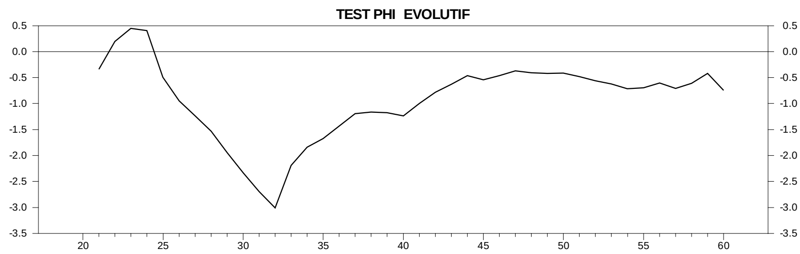


Figure 3.11.3 – Harvey and Collier Phi-test



3.12 – Interest rate equation

Figure 3.12.1 – Evolution of the coefficients over the time

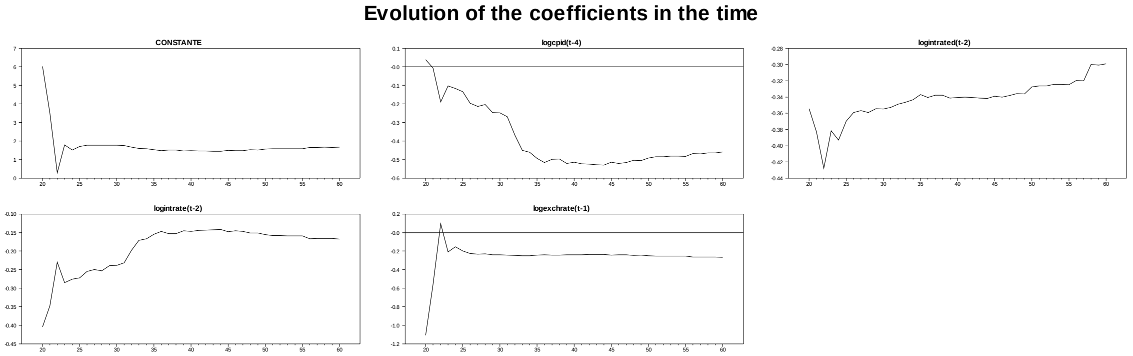


Figure 3.12.2 – CUSUM and CUSUM squared test's results

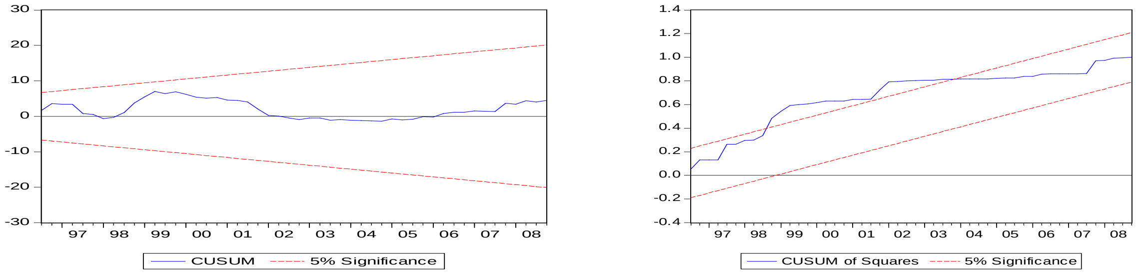
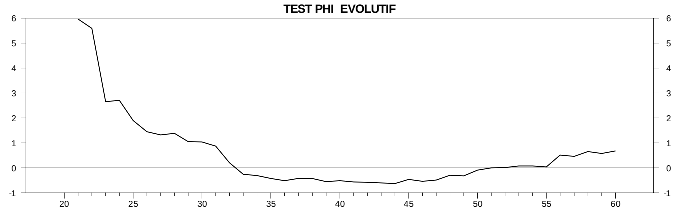


Figure 3.12.3 – Harvey and Collier Phi-test



3.13 – Nominal exchange rate equation

Figure 3.13.1 – Evolution of the coefficients in the time

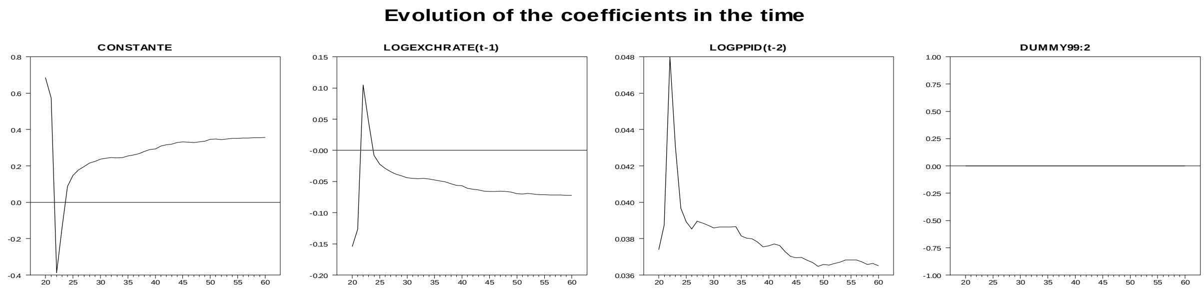


Figure 3.13.2 – CUSUM and CUSUM squared test's results

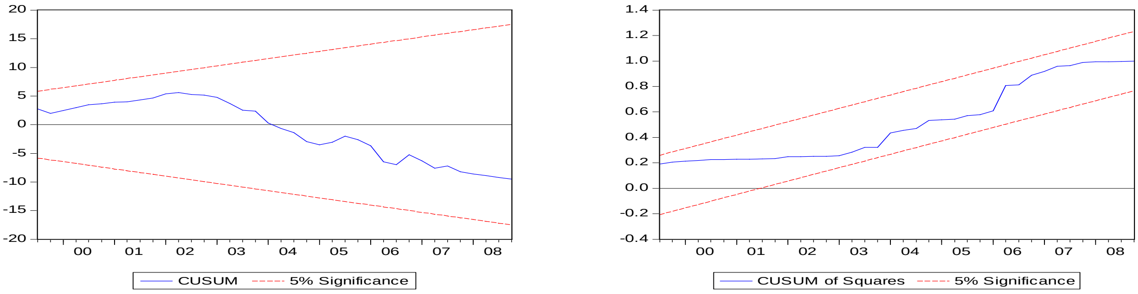


Figure 3.13.3 – Harvey and Collier Phi-test