Republic of Kazakhstan

Country Economic Memorandum

Getting Competitive, Staying Competitive:
The Challenge of Managing Kazakhstan's Oil Boom*

Background Paper No. 7:
Improving the Investment Strategy for the National Fund of the Republic of Kazakhstan

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Executive Summary

In this paper we study the investment strategy of a stabilization fund from a different perspective: instead of stabilizing the revenues of the portfolio, we stabilize the revenues of the commodity income plus the portfolio. This change in perspective produces very different investment strategies than the ones usually implemented in practice.

We study the case of Kazakhstan and analyze the changes in the portfolio that this different objective would imply. On the onset, it is important to recognize that this is a limited exercise in the sense that only few assets are considered. Therefore, to implement the strategy in full a more detailed study – which requires computational capabilities that are beyond the possibilities I have – is required.

Kazakhstan has two funds, one for savings and one for stabilization. The savings fund should be managed as a typical "growth" fund and therefore investment should be mostly using a diversified strategy. The stabilization fund, on the other hand, requires investments that are liquid and provide some stabilization, or insurance.

The conclusions from the exercise are as follows:

1. When the investment strategy is concentrated entirely in fixed income these are the three main conclusions:
    a. I have shown that just investing in safe assets produces a sizeable stabilization of the flows. In other words, ANY saving in fixed income provides some useful stabilization.
    b. However, to achieve large reductions in consumption volatility the amount of savings required ion are extremely large. Possibly, they are politically unfeasible.
    c. The investment strategy is not one of full diversification, but one in which EU holdings are extremely large, and where US fixed incomes are in general shorted.
2. When investment in stocks as well as fixed incomes are allowed the results are as follows:
    a. Total investments are smaller than in pure fixed incomes. Implying that stocks are a better hedge against oil price movements than fixed incomes.
    b. The portfolio is concentrated in Japan's stock market, and EU fixed incomes.

I believe that stabilization funds should work as "cushions" to oil price chances. In this view, these results are not surprising. The Japanese stock market is the most sensitive one to oil price fluctuations, and the

European real exchange rate - and therefore their bonds – are the most sensitive ones to oil fluctuations. Hence, in the end the portfolio that is trying to maximize its negative correlation with oil revenues holds these two assets primarily – again, just to maximize the stabilization properties.

Recommendations:

1. Changing the investment strategy to one in which the revenues of the stabilization fund are negatively correlated with oil prices seems to be a sensible strategy. To implement it, a thorough portfolio analysis has to be performed in which
    a. The set of assets included in the optimization has to be carefully decided by the authorities in Kazakhstan.
    b. A portfolio investment is determined including the projected prices of oil, and the future productions.
2. Some of these changes are hard to implement because the institutions that is performing the stabilization – typically the Central Bank – is not receiving the revenues. Therefore, institutional changes have to be devised in order to allow the losses in ones institution to be compensated by the profits in the other. The usual way to do so is to assume that the stabilization fund is the one that collects both the income from investments and the oil revenues. But these institutional changes have to be consistent with the realities of the budget.

I. Introduction

There exists a large literature studying the properties of stabilization funds for commodity-exporting countries. Most of this literature concentrates on some aspects of the stabilization fund: is it needed or not? what should be its optimal size? how to make the rule for savings consistent with the dynamics of the federal budget? should it have or not an upper bound in resources saved, should the external debt be repaid? etc. A relatively new literature studies how the political economy imposes important constraints on the design of the fund's rule.[1] This paper addresses a very different question: how the resources in the fund should be invested? To discuss this issue this paper studies the case of the Kazakhstan's stabilization fund.

The objective of the paper is to provide a set of practical recommendations on how to invest the funds in the NFRK fund to maximize their stabilization properties. The NFRK has both saving and stabilization objectives. Saving funds are interpreted as intergenerational stabilization funds, while stabilization funds are intragenerational stabilization funds. The first one is devoted to keep income stable across generations in anticipation – in this case – of lower oil production several decades ahead. The objective of the second one is to stabilize the income within the same generation – compensating bad years with savings performed during good years. For the purpose of this paper, I will concentrate entirely on the stabilization aspect – which in my view is the more difficult one.

The main message of the paper is to illustrate the difference in investment strategies when the resources saved are devoted to stabilization policy than when they are supposed to be savings for future generations – such as retirement, or intergenerational funds. The first type of funds are known as "stabilization" funds, while the second type are known as "growth" funds. In general, "growth" funds try to maximize return minimizing its risk; and therefore, these are balanced portfolios that diversify away all the non-

1 For a review on the theoretical literature see Arrau and Claessens (1991), Basch and Engel (1993) Claessens and Duncan (1993), Claessens and Varangis (1991, 1994), Corden (1984), Engle and Meller (1993), Gardner (1989), Grisanti (1995, 1996), Hausmann (1990), Hausmann, Powell, and Rigobon(1990), Kletzer, Newbery, and Wright (1990), Lessard (1989), McKinnon (1967), Morales, Espejo, and Chávez (1993), Newberry and Stiglitz (1985), Priovolos and Duncan (1991), Rigobon (2004), Schwartz (1982), Valdés (1993), and Wright and Newbery (1989) for an exhaustive review of the literature. For a critical view of the design of the law to achieve identification see Rigobon (2004) and the references therein.

systematic risk. On the other hand, a “stabilization” fund is one in which we want to maximize its (negative) correlation with the commodity price. The idea then is not one of minimizing the risk of the portfolio, but one of minimizing the risk of the portfolio that includes the income generated by the commodity. These two strategies produce dramatically different results in the investment strategies.

Most stabilization and savings funds that exist follow a pure diversified strategy.[2] This is understandable for several reasons, although the most important one, is that the agency or institution that determines the investment strategy and is in charge of managing the funds is almost never the same institution that collects the revenues from commodity revenues. For example, in most countries the Central Bank is the one that manages the fund, while the taxes collected from commodity activities go to the Ministry of Finance. This means that a stabilization strategy, one that minimizes the variance of the oil revenues plus the returns on the fund will imply transfers between the Central Bank and the Ministry of Finance that will be hard, and in some cases impossible, to implement.

I discuss in this paper how the investment strategies for Kazakhstan can change when the “stabilization” objective is used. I will assume that the optimal strategy could be implemented and leave the details of implementation to those that understand the institutional arrangements of Kazakhstan much bet6ter than me.

The paper is organized as follows: Section II provides a short rationale for why stabilization funds are used. Additionally, it discusses the issues involved in the designs of the rules. Section III studies the macro aspects of Kazakhstan and how the volatility of oil revenues has affected the economy. Section IV summarizes the two proposed strategies. Section V concludes.

II. General Considerations

The primary objective of stabilization funds is to smooth the tax revenue that a volatile commodity, or sector, generates. The standard problem is one in which a government collects a sizeable proportion of the taxes from a single source that is highly volatile, and requires a mechanism to reduce such fluctuations.

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[2] For example, one of the most successful oil stabilization funds, Norway, is managed almost as if it were entirely a saving fund. In other words, the saving strategy is to invest in each stock market index according to their market capitalization. This is a standard diversification strategy that will tend to reduce the risk of the portfolio.

Oil producing countries are perhaps the most dramatic examples of this problem, although stabilization funds exists for a large variety of commodities and sectors.

The most immediate question in this set up is why countries should care about this source of volatility. If the private sector internalizes the uncertainty, and hedges against it, then there should be no intervention by the government at all. However, it is this second assumption the one that is consistently violated: the private sector is unable to internalize the uncertainty, or it is unwilling to buy the hedge that is socially optimal. The problem arises when either the sector belongs to the government – as in most oil producing countries – or when a sizeable proportion of the taxation comes from such sector and expenditures of the government are distortionary. In fact, almost all government expenditures are distortionary, and therefore, this explains why the private sector cannot fully internalize the costs of the volatility generated by a commodity sector. In this environment, government intervention can improve upon the market outcome, and this rationalizes why most countries that face important source of volatility implement some form of insurance.

There exists several alternatives to reduce the uncertainty faced by governments, and clearly, the best one is the use of financial markets. Governments can sell the production in the futures market to eliminate part of the uncertainty. However, most emerging markets that are commodity exporters are in general relatively large in comparison to the futures market, or the futures markets are not long enough to provide sensible stabilization for the cycle of the fiscal revenues.

For example, in the case of oil, it is well known that the cycles have half-lives of three to four years, which implies that increases in prices remain high and above half of the initial shock for three to four years. A meaningful stabilization, therefore, requires selling oil production at least more than six to eight years ahead. In the case of the oil market, although the three to six month futures and options market is liquid, the futures market dries out after a year or two. In this sense, a country like Kazakhstan would be too big for the futures market five years ahead. This implies that the insurance required by Kazakhstan would be too large relative to the insurance provided by the market if it were to trade its production five years ahead.[3]

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[3] There are good reasons why these markets do not exist. The short run futures market is mainly the response of the market to provide insurance for all the oil in inventory. The number of countries, firms, and market participants demanding and supplying insurance in a three month window is larger, while the ones demanding insurance for production 5 years ahead is a limited number of countries.

Therefore, the use of futures markets is not plausible to provide enough stabilization for an oil producing country, and other alternatives have to be found. The second best alternative is to have debt indexed to the commodity prices. The idea is that the interest payments or the principal of the sovereign debt are linked to the price of oil. So, in good times the burden of the debt goes up – exactly at a time in which the country can afford it – and in bad times the burden of the debt is reduced – exactly at a time in which the country needs it. Unfortunately, contingent debts have had a terrible history. There is a sizeable problem of liquidity and credibility that has not allowed the market to foster even for countries that have no control on the contingency.

For example, the most interesting case of financial market imperfection in this sense is the hurricane debt. The small islands in the Caribbean suffer every year from a hurricane season, but not all islands are hit the same year in the same form. They were interested in issuing debt linked to the probability of a hurricane hitting the islands with the objective of hedging this risk. Obviously, there is no moral hazard in this case. No policy can attract or divert a hurricane. So, this debt should have been easy to issue, and the market should have been able to provide it. But that was not the case. The debt was extremely costly, and the countries were unable to issue the contingent debt.

As the case of a hurricane linked debt illustrates, commodity or contingent debt for emerging markets is either extremely costly to issue, or the market is unwilling to offer the insurance. Hence, the alternative most countries find feasible is the one of self-insurance. Countries can self-insurance in two forms (mostly); one is by saving – which is a stabilization fund – and the second one is by smoothing expenditures – which is an expenditure rule.

Regarding stabilization funds, most of the theoretical literature has concentrated on three main issues: first, on the necessity of a stabilization fund, as oppose to the use of futures markets or saving rules; second, on the particular rules such funds should follow; and third, on the constraints that the political economy imposes in the functioning of the stabilization fund. Surprisingly, one of the aspects that has received very little attention is the investment strategy of the resource accumulated in the fund.

The reason is that it is usually assumed that the responsibility is delegated to the central bank because the resources should be managed in the same way reserves are. However, this explanation – which is almost part of the common wisdom – can be easily proven wrong. In the following section, I argue that how the resources are saved might enhance the stabilization properties of a stabilization fund.

III.Oil prices and international markets

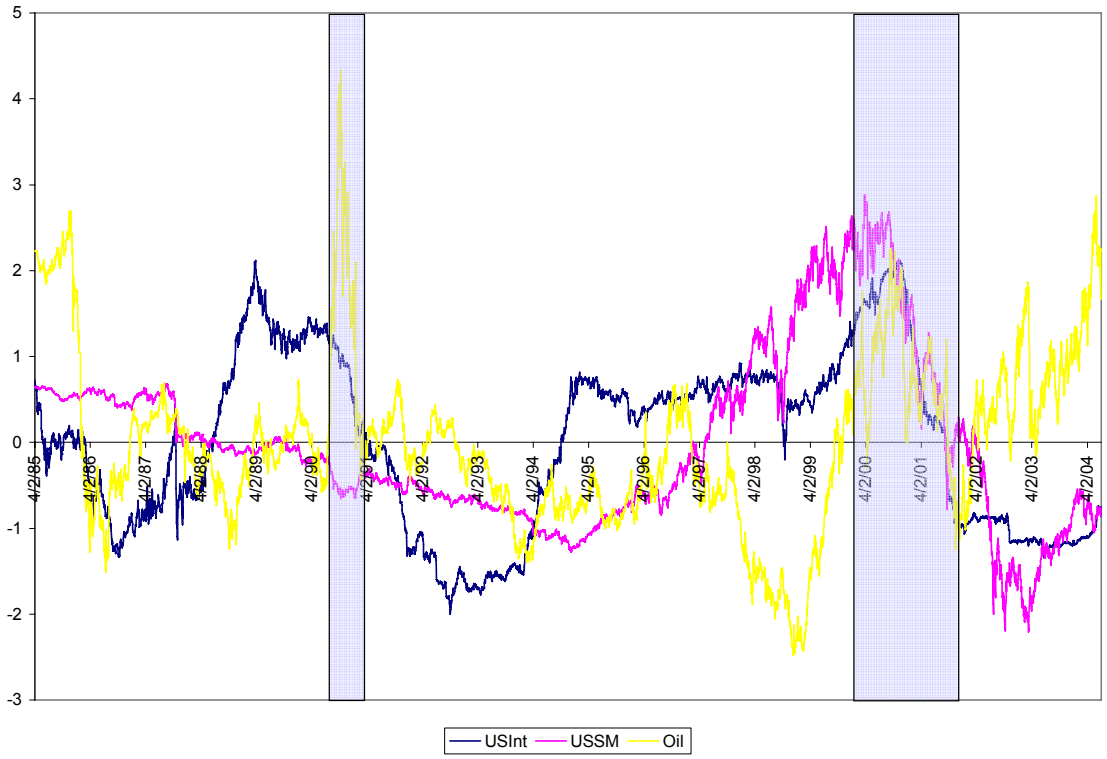
To understand how the resources of a fund are invested it is instructive to start by asking, why oil futures markets provide good insurance for oil. For example, if we are going to produce 2 million barrels tomorrow, and we would like to stabilize its income, we would sell in the futures market the production. Lets say the price today is 40, and the future for tomorrow is 41, which indeed coincides with our expectations about the price tomorrow. Today we sell 2 million barrels at a price of 41 to be delivered tomorrow. Assume, that a day passes and there is a debacle in the oil price – it has dropped to 20 dollars. Well, this implies that the production has to be sold a 20 (which implies a sizeable reduction given our expectations of 41). But notice that even though there is a loss in the spot market, there is a profit in the futures market, we have a contract that allow us to sell oil at 41, but the spot market is 20.

The crucial aspect in this story is that the futures market is perfectly NEGATIVELY correlated with the oil price. And this is the reason why it provides a tremendous insurance. Everything bad that happens in the spot market will be good news for the futures market, and vice-versa, everything that is good news in the spot market are bad news for the futures market.

The purpose of this section is to argue that there exist other financial variables that have similar properties as the futures market. They are not perfectly correlated as the futures market, which means that they do not provide perfect insurance, but they provide some. Indeed, there is almost a continuum of variables to choose from, but in this section I would like to concentrate on only on the two most important and liquid variables in the US: the US stock market, and the US short term interest rate.

Figure 1 shows the daily US stock market, short term interest rates, and the price of oil from 1986 until today. Each variable is measured in logs, and has been demeaned and detrended to make the exposition clearer. The blue line corresponds to the interest rate, the purple line is the stock market (in this case S&P500), and the yellow line is the oil price. The two shaded regions indicate the periods in which oil prices increased way ahead of their trend – excluding the recent period that is just under way.

Figure 1: Daily US stock market and short interest rate.



Notice that when oil prices increase, consistently the interest rates that are higherl, and the stock market that was above rend falls. In other words, oil price increases in general produce a recession in the short run in the US, and inflation in the future.

This analysis can be performed more formally using regression analysis and the message would be exactly the same. Furthermore, the example of the US stock markets and interest rates are just a small set of those asset prices that could be used to hedge oil price fluctuations. Other variables have been proposed – for example the implied volatility of S&P500 options (VIX) is very correlated with commodity prices. However, this is a market that is not extremely liquid, and therefore, too small for an oil producing country.

Furthermore, most of the analysis in this paper is one in which we assume that the country will buy and hold the asset in order to achieve insurance. This is clearly a limited strategy. It could be possible – for example – to short an asset. For instance, the price of Exxon is clearly positively correlated with the oil price. So, an alternative insurance is to short Exxon. Again, this might be possible for a small producer,

but 2 million barrels a day, and a price of 35 represents an extremely large position, even for a company of Exxon's caliber.

Finally, it is important to realize that investing in foreign assets is better than investing in domestic assets because the real exchange rate fluctuations will provide an automatic stabilizer. In the standard open-macro literature (Dornbusch (1980), Salter (1964) and Swan (1964)) it is well known that an increase in the price of exports generates a windfall that requires an appreciation of the real exchange rate to return to equilibrium. This is the standard transfer problem highlighted in the "dependent economy" model with tradables and non-tradables. This means that in good times, the real exchange rate appreciates, while in bad times the real exchange rate depreciates. In this sense, holding dollars will provide some stabilization for the domestic "real" variables.

Mainly for considerations of liquidity, in this paper I will entirely concentrate on stock market indexes and bond prices of developed economies as the only alternatives for investment. A more detail analysis of all the possible alternatives is both beyond the scope, and possible beyond the willingness of a central bank to undergo the strategy.

IV. Investment Strategy for Kazakhstan

In this section, I discuss the possible strategies for investment for Kazakhstan. First, I discuss the country characteristics and what should be the objectives of the stabilization. Then, I proceed to two alternatives of investment and compare them to the actual strategies.

It is important to highlight that for this exercise I will use a very limited number of assets – I include at most five stock market indexes and five sovereign bonds. This is enough to make the point that a stabilization objective produces a portfolio that is tremendously different from a diversified objective. To study specifically how exactly the Central Bank should perform its investments a more exhaustive study is required – one that should include several stock market indexes in the world, as well as other fixed incomes.[4]

[4] This problem is beyond the computational capabilities my computers have. Finding the optimal portfolio with 10 assets takes a couple of hours, but an optimal portfolio including 100 assets will take months.

A. Country characteristics

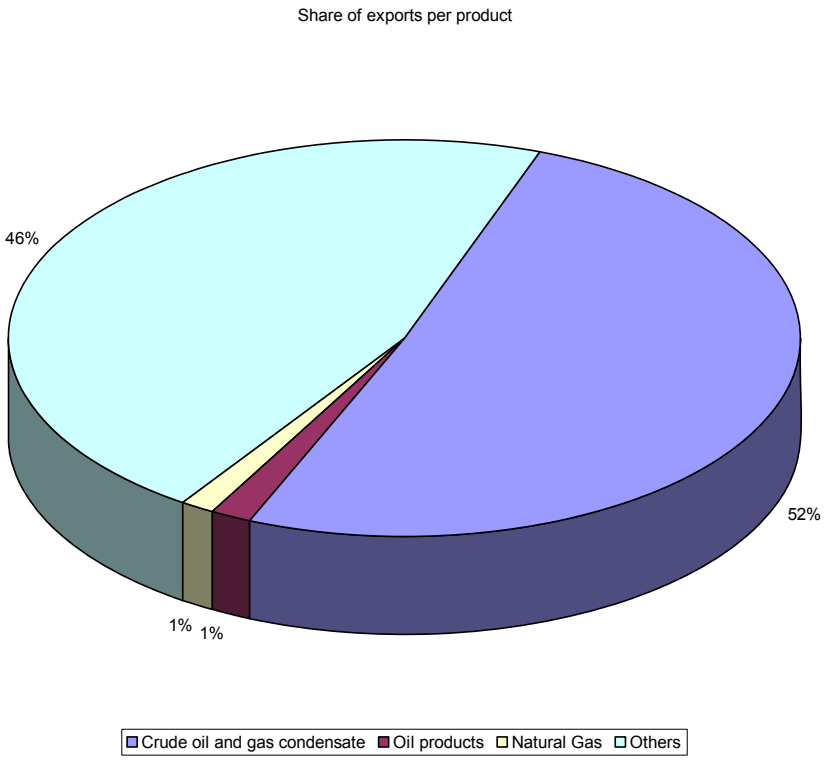
1. Real Variables and the Aggregate Demand

Kazakhstan is an important oil producer that has its exports tremendously concentrated in oil and oil related products – as most small commodity producers.

In this section we study how GDP, consumption, government expenditures, and investment react to oil price movements.

We start, first, by looking at the export composition. In Figure 2, the share of exports concentrated in oil and oil exports can be seen. Roughly, in any given year, more than half of the exports are the outcome of oil related activities.

Figure 2: Composition of exports: oil versus non-oil

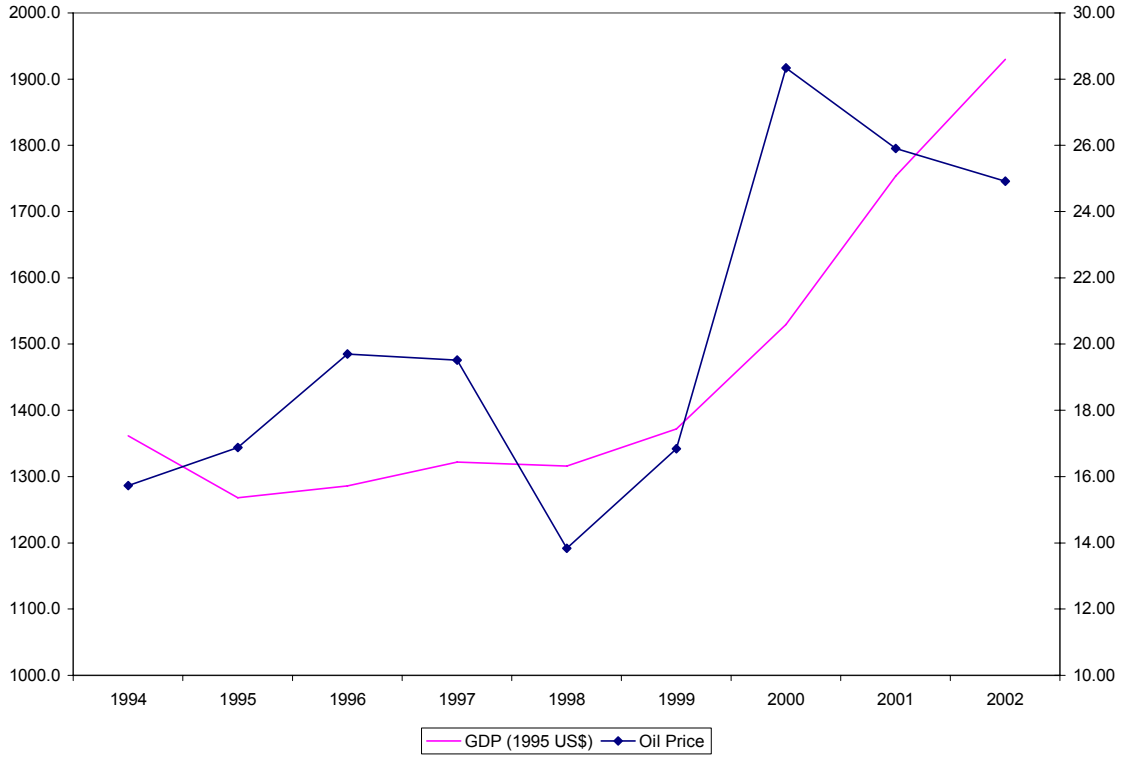


This high degree of concentration of exports affects the economy in several dimensions: first, oil is a sizeable proportion of the GDP and therefore, oil price fluctuations are likely to influence output. Second, because oil price increases will create a real exchange rate appreciation, and an increase in real wages, we should observe a tight relationship between consumption and the price of oil. Third, oil revenues are also an important part of the fiscal accounts, and we study the correlation between oil prices and government consumption. Finally, we study the behavior of investment and the real exchange rate.

Unfortunately, the time series for Kazakhstan are not long enough to perform a proper econometric modeling of the relationships. Therefore, instead of presenting regression analysis we concentrate mainly in correlations. This is a disadvantage, but with the information available, this is the best that can be done. For most of the series available, we have at most 10 years of reliable data and time series analysis will be unsuitable.

In Figure 3, the GDP per-capita in dollars from 1994 until 2002 together with the oil price are depicted together. The continuous line is the GDP and it is measured in the left hand side, while the darker line identified with the diamond is the average yearly oil price (WTI) and it is measured in the right hand side axis.

Figure 3: GDP and the Oil Price



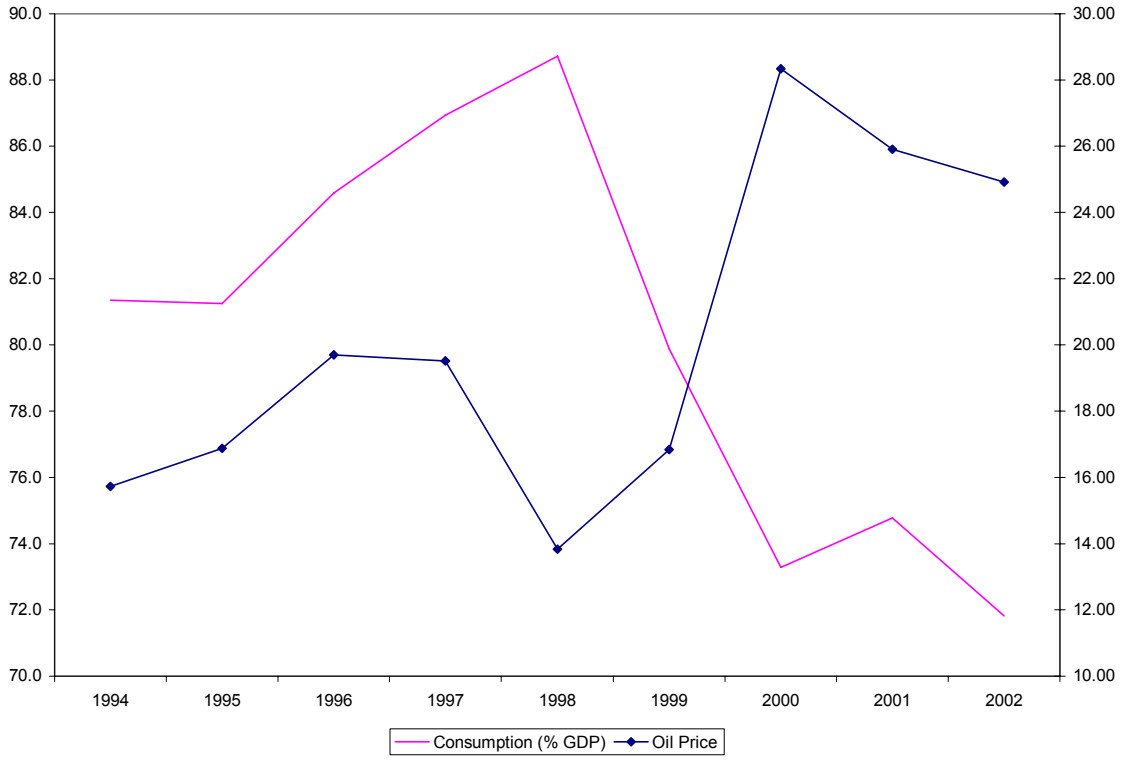
Notice that there is a strong correlation between the two variables. Indeed, changes in output and changes in oil price are correlated in almost 25 percent (see Table 1).

In the same way, GDP is highly correlated with oil prices, consumption is also tightly associated with oil exports. One important question is if consumption is more or less correlated with oil prices than output. In other words, when oil prices go up we expect output and consumption to rise as well, but the question is if the change in output is larger relative to the change in consumption.

To address this question, in Figure 4, we present the share of consumption (Consumption per-capita divided by GDP per-capita) and oil prices. Before discussing the figure it is important to realize that if consumption and GDP both react in the same way to oil prices, the share of consumption on GDP is unaffected by the oil price changes. In other words, by looking at the share of consumption over GDP we can determine if consumption is more or less responsive to oil prices than GDP. In fact, if the share increases when oil prices rise, then we can conclude that consumption is more responsive than output. On the other hand, if the share of consumption is negatively correlated with oil prices, then we can say that

consumption is smoother than GDP. This is an important property because stabilization funds should stabilize consumption patterns rather than GDP.

Figure 4: Consumption and the Oil Price



As before, the consumption share is measured in the left axis, and it is the light continuous line, while the oil price is the darker line, identified with the diamond, and is measured in the right hand side axis.

Notice that the consumption share for Kazakhstan fluctuates between 72 to 89 percent: a 17 point swing. By all means, this represents a tremendous fluctuation in aggregate consumption. Now, interestingly, it is clear that the share is negatively correlated with the price of oil. Obviously, in this graph, this conclusion is mainly driven by one event. However, even in changes, the correlation between oil and consumption share is –61.6 percent.

The fact that consumption is less correlated with oil prices than output is extremely important from the stabilization point of view. As was mentioned above, an stabilization fund should have as an objective the stabilization of consumption, not the stabilization of output. For example, if the private sector can

perfectly hedge oil volatility then their consumption would be constant and there is no role for a stabilization fund. In Kazakhstan it is clear that some smoothing is taking place given that consumption share is negatively correlated with the oil price.

Furthermore, from the practical point of view, this distinction implies, or suggests, how much insurance should be bought. Considering that setting aside resources in the form of a stabilization fund is costly for a nation, then the smaller the volatility that has to be stabilized the smaller the insurance that has to be bought. Evidently, with the release of more data in the future this relationship has to be reevaluated to determine how much insurance should be provided. For the moment, these results, and those from Table 1 suggest that consumption is just a third of the volatility of output.

In fact, two of the most important components of the aggregate demand are government consumption and investment. Figure 5 shows the path of government consumption share against oil, and Figure 6 depicts investment share.

The pattern depicted in these two figures is very interesting. Notice that both shares are extremely pro-cyclical. In the case of government consumption (Figure 5), the share fluctuates from 10 to 13 percent of GDP and its relationship with oil prices is almost one to one. Indeed, the correlation on the changes is 38 percent – which is larger than the correlation implied by GDP.

As an aside, it is important to remember that these variables are share, and hence positive correlations mean that the variables are “more” pro-cyclical with respect to oil price changes, than GDP by it self. In other words, if we were to have government consumption moving exactly as output, then the share of government consumption and output would be constant and its correlation with oil would have been zero. If government consumption reacts more to oil prices than output, then the share becomes pro-cyclical and the correlation between the share and the oil price is positive, as it is the case in Figure 5.

Figure 5: Government Consumption and the Oil Price

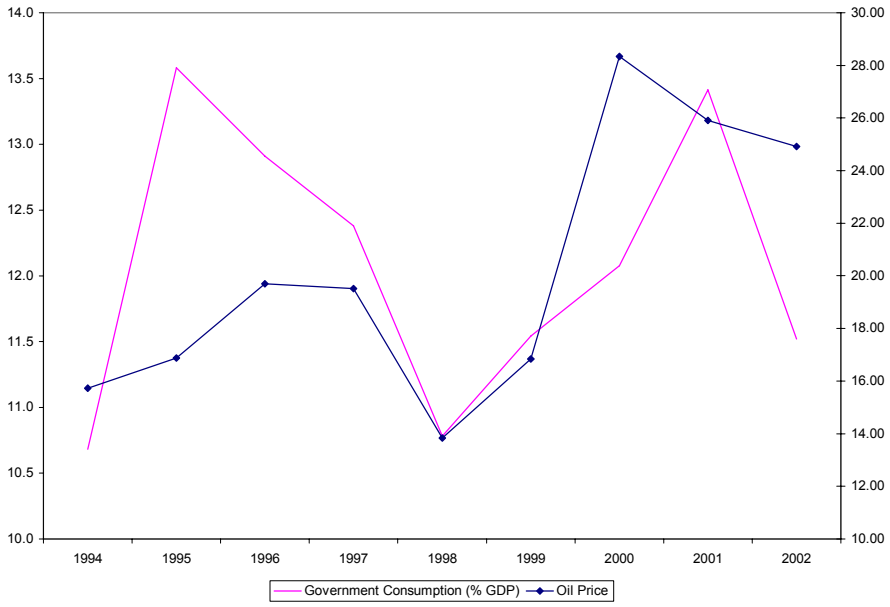
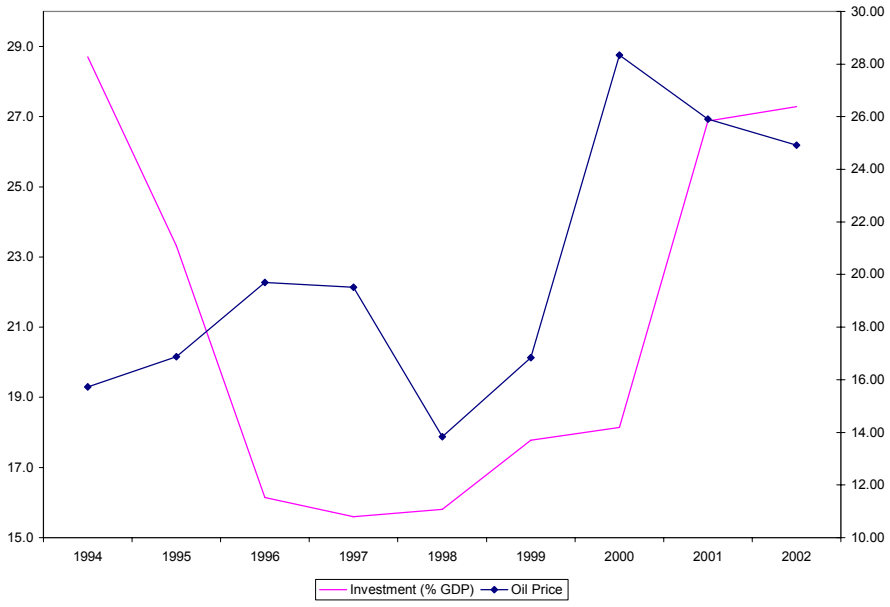


Figure 6: Investment and the Oil Price



In Figure 6, we present the same analysis for the case of investment. In this case, investment is measured as the capital formation from the national accounts. In the case of investment, if the first two years are excluded from the analysis, we also have a positive correlation between the share of investment and oil

prices. Again, signaling that the investment component of the aggregate demand is more responsive to oil prices than output by itself.

In summary, what we have learned from this exercise is that output and the components of the aggregate demand are highly responsive to oil prices. However, consumption, which is the ultimate goal for the stabilization, is far less responsive than the other components of the aggregate demand (government consumption and capital formation), and output.

2. Real Exchange Rate

The second area of study is the real exchange rate. As was argued before, the standard macroeconomic literature suggests that oil price increases must be accompanied by a real exchange rate appreciation. The reason is that oil price increases rise the wealth of the country and consumer, with this extra wealth, decide to increase aggregate demand. The increase in aggregate demand has several effects. In terms of the current account, exports are going to go down and imports up just by the change in the demand – even without a change in the relative prices. But the increase in the domestic demand implies an increase in the demand of non-tradables, and therefore, an increase in the demand for labor. This, in turn, increases pressures on wages, hence, an increase in real wages and a real exchange rate appreciation. Finally, this appreciation hurts the current account even further.

In Figure 7 we present the real exchange rate of Kazakhstan and the oil price. The real exchange rate was set to one in 1994, and changes were computed as the ratio between the exchange rate depreciation and the inflation differential between Kazakhstan and the US. So, this is the bilateral exchange rate Kazakhstan –US. As can be seen, these variables are tightly associated. Given the construction of the real exchange rate, an increase represents an appreciation of the real exchange rate, while a decline represents a depreciation.

Notice that whenever oil prices increase, there is a real exchange rate appreciation – except for the first two years in the sample – either contemporaneously or with a lag. Indeed, the correlation of the log changes of these two variables is positive and equal to 16 percent in the full sample, but it is 42 percent if the first two years are excluded from the analysis.

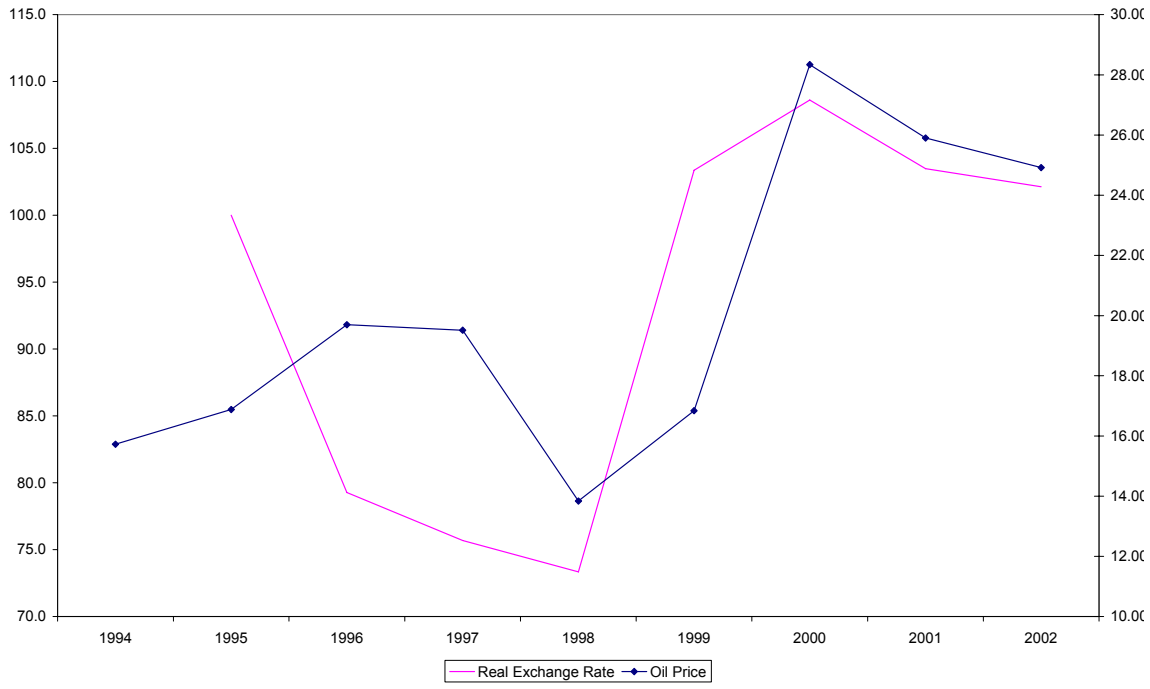


Figure 7: Real Exchange Rate and the Oil Price

In Table 1 we present the simple correlations on the log changes of the variables of interest. These are the results for the full-sample. We computed the log difference of all the variables and report the simple correlation.

Table 1: Average Correlation of Selected Marco Variables and the Oil Price.

Correlations of the changes	
GDP (1995 US$)	22.8%
Consumption (% GDP)	-61.6%
Exports (% GDP)	75.8%
Imports (% GDP)	54.5%
Government Consumption (% GDP)	37.3%
Investment (% GDP)	-19.2%
Savings (% GDP)	55.7%
Trade in Goods (% GDP)	79.7%
Real Exchange Rate	16.1%

Most of these variables have already being analyzed in the previous discussion and therefore the table is here just to report those results.

The previous analysis has indicated that there are two aspects of the cycle that oil prices generate that require our attention: one is related to real variables such as output and consumption, but the second one is related to the real exchange rate correlation. We showed that the bilateral rate is indeed correlated with the oil price – as should have been expected – the question is, then, what about the multilateral rate.

In order to determine what is the relevant multilateral rate, we evaluate the composition of imports and exports of Kazakhstan. In Figure 8 we present the average composition of imports, and in Figure 9 we show the average composition of exports. In Table 2 and Table 3 we present the shares per countries from 2000 to 2003.

Figure 8: Composition of Imports

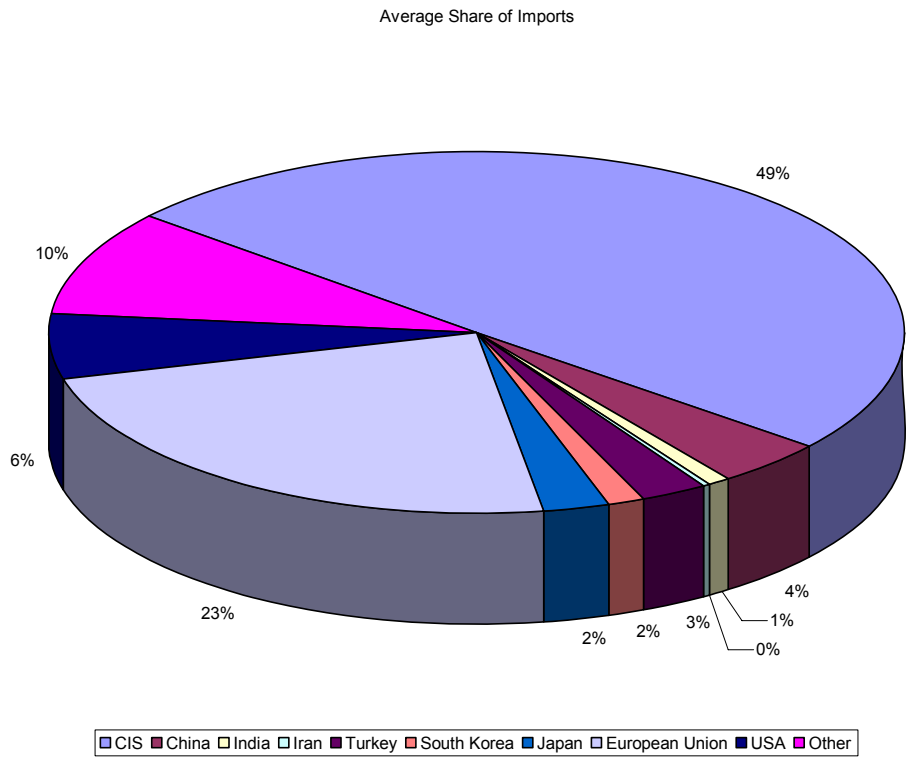


Table 2: Share of Imports per country between 2000-2003.

Composition of imports (In percent of total)				
TOTAL	100.0	100.0	100.0	100.0
CIS	54.6	52.0	46.7	47.1
Azerbaijan	0.2	0.2	0.2	0.2
Armenia	0.0	0.0	0.0	0.0
Belarus	0.8	0.7	0.8	1.1
Georgia	0.1	0.1	0.0	0.1
Kyrgyz Republic	0.6	0.5	0.5	0.6
Moldova	0.1	0.1	0.1	0.1
Russia	48.7	45.4	39.1	39.3
Tajikistan	0.1	0.0	0.0	0.1
Turkmenistan	0.9	1.2	1.1	0.6
Ukraine	1.6	2.4	3.3	3.9
Uzbekistan	1.4	1.3	1.3	1.1
China	3.0	2.7	4.7	6.0
India	0.8	0.8	0.8	0.9
Iran	0.3	0.2	0.2	0.2
Turkey	2.8	2.1	2.6	2.6
South Korea	1.6	1.7	1.7	1.3
Japan	2.1	2.2	2.5	2.4
European Union	20.1	23.7	23.6	24.7
USA	5.5	5.4	7.0	5.6
Other	9.2	9.4	10.2	9.2

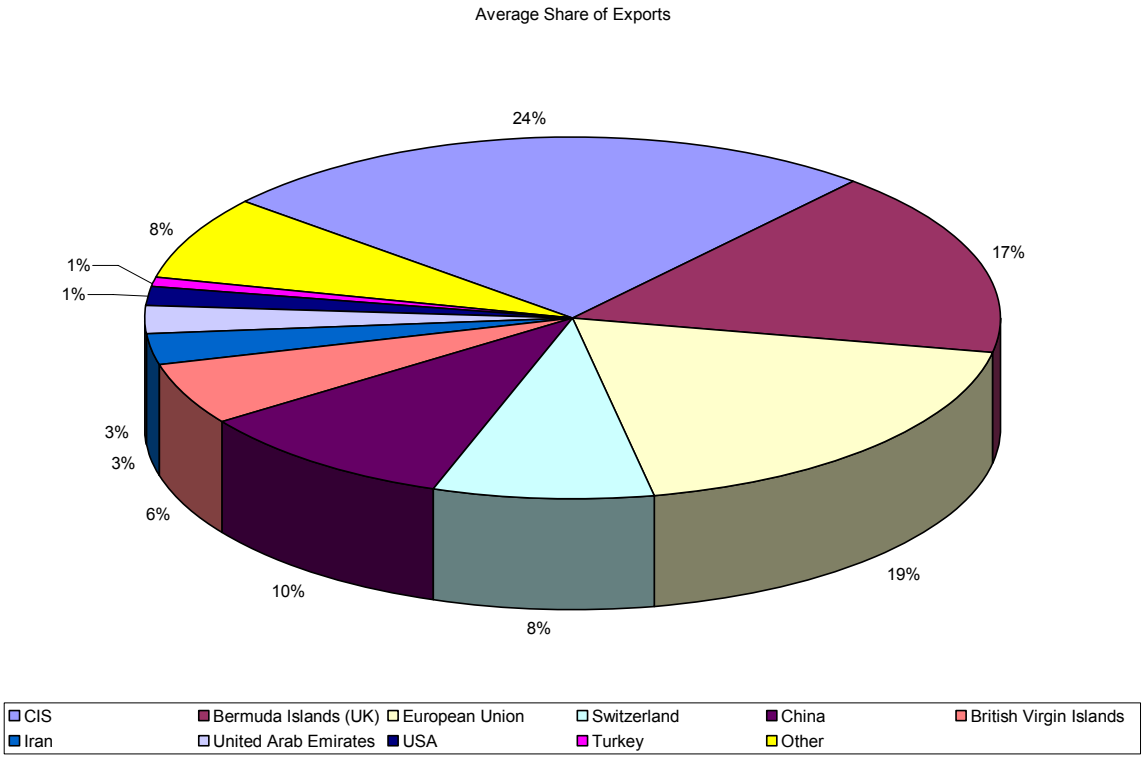
Source: Statistical Agency of the Republic of Kazakhstan.

Concentrating, first, in the imports side, notice that the most important source of exposure are: CIS, European Union, China, Japan, USA, and Turkey. In fact, roughly we could say that half of the imports are from countries in the CIS, one quarter from EU, and five percent from USA. These numbers reflect 80 percent of the exposure of the imports. In the CIS, the most important country is Russia.

Notice that most of the import exposure is with Russia – also an oil exporter – which means that in principle the real exchange rate between Kazakhstan and Russia should be relatively stable: both appreciate against the dollar during an oil boom, and both depreciate against the dollar during a fall in prices. This fact is important because it implies that holding any assets in the CIS countries implies that their stabilization properties are smaller than holding the exact same assets in Europe or the US.

The next step is to compare the exporting side, the actual exposure, then is how different the imports and exports are. Figure 9 and Table 3 present the results.

Figure 9: Composition of Exports



Notice that in this case, approximately, 30 percent of the exports are going to Europe (16 to the EU and 14 to Switzerland), 25 percent go to CIS countries, 20 to Bermuda (although these exports are denominated in Dollars and are really to European firms that are registered in Bermuda), and 13 to China. This is interesting because as can be seen trade with the US is minimal. The bilateral real exchange rate between US and Kazakhstan should, in principle, not be part of the stabilizing objective – at least from the trading point of view. It is possible to argue that Bermuda fluctuates as the US and therefore, that 20 percent should be assigned to the US (as we will do here), but this is an indirect mechanism and not a direct one.

Nevertheless, even if the real exchange rate with the US dollar is not one that should be part of the stabilization objective, that does not mean that assets in the US would be bad providers of insurance. Not al all. On the contrary, those assets offer a very good insurance, and because they do not for part of the real exchange rate that we are interested in stabilizing, these positions are better hedgers, in principle. We come back to this discussion later.

Table 3: Share of Exports per country between 2000-2003.

Composition of Exports (In percent of total)				
TOTAL	100.0	100.0	100.0	100.0
CIS	26.2	30.4	22.9	22.9
Russia	19.5	20.2	15.7	15.2
Ukraine	2.9	5.7	3.0	3.2
Kyrgyz Republic	0.6	1.0	1.1	1.2
Uzbekistan	1.5	1.7	1.1	1.0
Azerbaijan	0.5	0.8	1.2	0.9
Tajikistan	0.6	0.7	0.5	0.6
Turkmenistan	0.1	0.2	0.2	0.3
Moldova	0.0	0.0	0.0	0.3
Belarus	0.2	0.1	0.1	0.1
Georgia	0.1	0.0	0.1	0.1
Armenia	0.0	0.0	0.0	0.0
Bermuda Islands (UK)	14.9	14.1	20.7	17.0
European Union	22.7	23.3	16.0	15.4
Switzerland	5.3	4.7	8.1	13.0
China	7.3	7.6	10.5	12.8
British Virgin Islands	11.6	5.1	1.7	4.7
Iran	2.2	2.4	3.2	3.2
United Arab Emirates	0.1	3.8	4.9	1.7
USA	2.3	1.8	1.2	0.8
Turkey	0.7	0.9	1.0	0.8
Other	6.6	5.8	9.8	7.9

Source: Statistical Agency of the Republic of Kazakhstan.

In summary, if we look at the net position of Kazakhstan in terms of their trading partners the following countries stand out as the most important: CIS (20%), China (10%), European Union (9%), Switzerland (14%), and USA (15%) – where we have interpreted the exposure to Bermuda as exposure to the US dollar. These shares are important because they reflect, in principle, which currencies will appreciate or not against Kazakhstan.[5] From this set of countries, we have already argue that the bilateral real exchange rate with the CIS should be relatively stable – regarding oil price fluctuations – and therefore they will offer poor hedging.

In summary, the composition of currencies that are worth stabilizing – regarding the multilateral real exchange rate – is approximately the following: The three most important countries excluding CIS are USA, China, and European Union. It is important to remember that even though these are the countries to

[5] A similar issue arises in the case of Switzerland, where the exports could be interpreted as part of EU. In the applied section of the paper we will allow the portfolio to interpret this share of exports as either entirely to Switzerland, or as part of the EU.

which the exports are taking place, almost all of the exports are denominated in US Dollars. In the computation of the optimal investment strategy we will take into consideration these aspects.[6]

B. Investment Strategy: only bonds and currencies

The first strategy analyzed in this paper is the safest one. We have several criteria that are used to formulate the strategy:

1. We assume that only liquid fixed income instruments are used.
2. We assume that the fixed income instruments included in the portfolio will be issued by the respective governments considered in the analysis; so, they have the highest possible rating. No corporate debt is considered.
3. We also force us to concentrate entirely in currencies that are liquid internationally. So, investing in Indian Rupee's is not considered a possibility – this indeed will eliminate Chineese Renminbi as a possibility too.
4. The shares of investment take into account the average exposure of exports, but also the stochastic properties of the underlying fixed income assets in the respective countries.
5. For simplicity we assume that only four assets are included.
6. We only assume buy and hold strategies, and there is no shorting of any currency of asset price.
7. We assume that the objective is to stabilize consumption – and not total GDP.

Given these assumptions, we have to construct portfolios that maximize the negative exposure with respect to oil price changes using a maximum of four bonds. Some of these assumptions require further discussion.

In principle, this is supposed to be a safe strategy, which means that no shorting, and no trade in illiquid assets is considered. Furthermore, all assets have to be of the highest possible rating. These conditions, in the end, imply that no investment in emerging markets is possible, and that no investment in stocks, or shorting of currencies is considered. Clearly, this imposes tremendous restrictions on the ability of the strategy to stabilize oil fluctuations, but it is important to understand that this strategy is going to be implemented either by a central bank or a ministry of finance. Both are in the business of stabilizing the economy, but neither is in the business of absorbing too much risk. Therefore, this safe strategy has the

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[6] In fact, in the end, it will be almost as if all exports are going to the US.

purpose to offer “some” insurance, but also to be consistent with the usual constraints – and normal practices – of both central banks and ministries of finance regarding exposure to financial risk.

These restrictions are reflected in the assumptions 1, 2, 3 and 6. Assumption 4 indicates that we will use the most recent 4 years of data to construct the strategy, but is crucial that if conditions change that the shares are recomputed. I cannot imagine that dramatic changes are going to occur, but this is an important part of the strategy. Assumption 5 is used to simplify the analysis. It would be extremely hard to consider bond and stock markets of all the countries that Kazakhstan trades with, and therefore, only the relevant part of imports and exports is considered. In fact, the countries included in the analysis imply almost 90 percent of the imports and more than 80 percent of the exports.

The fist step is to have an idea of which countries should be included in the analysis. In the previous section we talked about the most important countries to which Kazakhstan has trade exposure: CIS, USA, EU, China, Switzerland, Japan, UK, and Turkey. From these countries, we have already argued that holding currency from CIS will provide a bad hedging. The reason is that the real exchange rate of those countries is likely to be positively correlated with Kazakhstan’s real exchange rate.

Additionally, the liquidity requirement implies that the Chinese and Turkish currencies and instruments are not to be included in the analysis. This means that we are left with four countries (USA, EU, Switzerland, and Japan) the four assets that we limit the analysis too. In the analysis below we will evaluate – as a robustness check – what is the implication of including the UK in the analysis. Furthermore, we will also study the implications of assuming that Switzerland exports are part of the EU.

What is the objective of the analysis? As is indicated by assumption 7, the objective is to stabilize consumption, and hence, the only part of the oil price that is required to be stabilized is the effect it has on consumption. If the data were longer, then the analysis will first estimate the effect of oil on consumption using a time series model, and take the results of that regression and stabilize the variance explained by oil. Given that the data is so short, we instead, are going to assume that consumption changes are just a linear function of (or simply proportional to) oil price changes – i.e. assume that the coefficient is constant.

The simple regression shows that, on average a one dollar increase in oil prices, increases consumption per-capita by roughly 10 dollars, or in other words, a 0.8 percent consumption expansion. Given that the

standard deviation of oil prices is 6 dollars a year this means that the stabilization fund has to stabilize (any given year) a little bit less than 5 percent of the consumption per-capita.

In other words, if oil prices go up by 5 dollars in a year, then consumption will increase by 4 percent, and the stabilization fund should generate a loss of exactly that magnitude to offer full insurance and offset the oil shock. This implies that in this exercise we will determine both, the optimal size of the funds saved, and how they should be invested. We start, as the assumptions indicate by forcing the assets to have only buy and hold positions. Using monthly data stating from 1999, and taking into account that a one dollar increase in the oil price pushes consumption up is roughly 10 dollars per-capita.

In the sample, given the oil price volatility and the pass through, the standard deviation would have been of 271 dollars. Imposing that the we can invest only in positive amounts in fixed income assets in the US, Euro Area, Japan, and Switzerland, we find that the variance is reduced to 10.6 dollars when the positions per-capita are as follows:

	Currency
US	175
Euro	35333

Two points are worth highlighting: First, these are extremely large positions in per-capita terms. They imply that 35 thousand euros per person have to be invested in Euro-zone fixed income. This is an extremely large position and clearly unfeasible. This represents 25 times the consumption per-capita. These levels of savings are unrealistic. However, it is important to highlight that this result is common in most stabilization funds. The reason is very simple, if we would be interested in achieving maximum stabilization out of fixed income assets, we not only need the correlation to be the correct one, but we also need that the return on the fixed income to be of the same order of magnitude than the shock. One standard deviation oil shock, produces a fluctuation of consumption of 5 percent. Therefore, a bond holding has to be large enough such that its interest rate fluctuating by 25 basis points whenever oil prices increase by 5 dollars would produce a capital loss equal to 5 percent of GDP. A back of the envelope calculation implies that if we define H to be the holdings in the fixed income, then the holdings in per-capita terms have to satisfy: $H*0.0025 = 0.05$, this implies H to be equal to 20. And this is 20 times GDP, not consumption.

Finally, notice that the covariance between the currencies buy some more hedging and therefore there is some investment in different fixed income, but in the end the hedging provided by two developed markets

is more than enough. Observe that even though we are allowing the portfolio to hold positive amounts on all four fixed incomes, in the end the minimum variance is achieved with just two. This is an important fact of the optimal portfolio because in general most stabilization funds seek a diversified portfolio strategy. That objective implies that investment in the end should be closely related to the market capitalization of the countries involved in the portfolio. Therefore, US, EU, Switzerland, and Japan should receive a large share. However, this is not the case when the objective of the portfolio is one of stabilizing the income flow to the country, as opposed to stabilize the return of the portfolio.

Another important feature of the optimization is that the levels of investment involved in the maximization are extremely large. In practice, most countries that are involved in the production of commodities that have decided to implement a stabilization fund go through the first years of this process achieving some savings that involve a tremendous effort to their governments and their societies. In the end, the resources are not enough – and these numbers show that the will never be enough in practice – achieving only limited stabilization with high costs.

We can relax some of the assumptions in this exercise and allow for short positions in currencies and fixed income. In this case, the optimal portfolio is

Currency

Dollar	162958	58.2%
Yen	-1146	-0.4%
Swiss Franc	-207879	-74.2%
Euro	326062	116.5%

The Standard deviation of consumption now is only 7 dollars – which implies a tremendous stabilization just of investing in fixed income assets in 4 developed countries. Again, notice the extremely large positions imply to achieve the desired stabilization. Furthermore, even though we are allowing the shorting of some fixed incomes the net positions – or in other words, the savings per-capita – are an order of magnitude above the previous one. Notice that the gross positions are an order of magnitude larger than in the previous case. Indeed, there is still a very long position in Euro's, and the Dollar positions are almost counterbalanced by the Swiss Franc shorts.

One final comment regarding the quantities implied by the optimal portfolio: whenever I perform this exercises I always ask how much volatility is a country willing to accept? In this two simple exercises the standard deviation falls from 11 dollars a month to 7. This is a sizeable reduction, but this reduction requires an increase in the net position of resources saved in the fund by 8 times – from an already

extraordinarily large position. Most countries will answer, that they are not that interested in buying so much insurance – in this case, it is too expensive in terms of savings.

Therefore, in my next exercise, I force the optimization never to have more than a thousand dollars per-capita holding in any of the assets (in absolute terms). The answer is the following:

Currency		
Dollar	1000	30.6%
Yen	272	8.3%
Swiss Franc	1000	30.6%
Euro	1000	30.6%

Notice that in this case, in contrast with the previous exercise, all the positions are positive, and three of them are binding. What it is even more surprising about this exercise is the stabilization that is achieved by this portfolio. As a reminder, the variance with no savings is 271, the variance without constraints is 7, the variance with only positive holdings was 10.6, and the variance in this constrained case is 11.5! This result, at least to me, is quite striking. This shows that just the fact that the country is saving is enough to achieve a sizeable stabilization.

The next exercise is to restrict the holdings even further: no more than 100 each. The result here is as it should be expected – all the countries have exactly an investment of 100; what it is surprising from this exercise is that the standard deviation is 24.6!

The final two exercises are ones in which instead of restricting the holding in each of the assets we restrict the TOTAL holding to be either 1000 or 100. The results of this optimization are as follows: When the total holdings are restricted to be 1000, the holdings in each asset are

Currency	Exposure
Dollar	-29908
Yen	311
Swiss Franc	-3299
Euro	33896

Which implies extremely large gross positions – both long and short – but the total adding up to 1000. This strategy indeed achieved a very good stabilization: 11.28 is the standard deviation. Notice that, indeed, this stabilization is better than the one in which we restrict each holding to have a cap.

When the total portfolio is restricted to be less than 100 dollars per-capita in total the portfolio is as follows:

Currency	Exposure
Dollar	-30530
Yen	316
Swiss Franc	-2639
Euro	32954

Notice that this portfolio is almost identical to the previous one. It has a very large position in Euros, a short position in dollars and some in the other currencies. As before, this portfolio, with very little invested actually achieves the same stabilization as the other one: 11.3 standard deviation. By all means, these are remarkable reductions in the overall consumption volatility.

The results presented so far assume these four countries in the optimization. When we allow for the UK or assume that Switzerland exports are entirely to the EU very little changes. Indeed, the message is almost always the same: extremely large positions in fixed income in EU, shorting the US, and then minor positions elsewhere.

In summary, (the results are summarized in Table 4) the full unconstrained problem implies a total per-capita saving of 280 thousands which is 200 times the yearly per-capita consumption of Kazakhstan – but achieving a standard deviation of only 7 dollars which is 0.5 percent of consumption. This volatility is similar to the variance of consumption in developed economies.

The constrained one with only positive holdings implies a much smaller total saving – only 35 thousand per-capita, which is 26 times per-capita consumption. Still it is an extremely large effort. The standard deviation is 10.6 which represents a tiny 0.77 percent of consumption.

Table 4: Stabilization Fund Properties

	Total Saving	StdDev	S/C	StdDev/C
Full	280.0	7.1	202.01	0.51%
Positive	35.5	10.6	25.62	0.77%
<1000	3.3	11.6	2.36	0.83%
<100	0.4	24.6	0.29	1.77%
sum<1000	1.0	11.3	0.72	0.81%
sum<100	0.1	11.3	0.07	0.82%

The portfolio in which we force all holdings to be much smaller than one per-capital consumption a year implies a total saving of 3.3 – which still is a large proportion of the total consumption 2.3 times – but it achieves a remarkable stabilization. The standard deviation is 11.6. Finally, the extremely restrictive portfolio implies savings of only 400 dollars per-capita, which is less than 30 percent of the consumption to be stabilized and that it still represents a small volatility of consumption: 1.77 percent. The last two exercises impose the constraint not in each holding but in the overall assets – these are therefore riskier positions, and in fact achieve a tremendous amount of stabilization. The coefficient of variation of consumption is only 0.8 percent.

In all these simulations, the unconstrained portfolio implies a large holding in Euros – and some in dollars. When the model is constrained to have a maximum investment in every bond, then savings in almost all currencies is equalized. Interestingly, if instead of constraining each holding we assume that the total holdings are constrained (the last two exercises) the optimal portfolio prefers to hold euros and short dollars to achieve stabilization.

In summary, this exercise shows that, first, almost any saving produces a tremendous reduction: from 271 to 25 in the most restrictive way. Second, it shows that diversification is only important when the savings in each of the assets is restricted – otherwise, the Euro is the place where most of the savings should be allocated. Finally, as I mentioned above, the inclusion or not of the Pound changes almost nothing the conclusions and results here derived. The stabilization benefit of including the pound was imperceptible in my simulations, and in the end, made no difference at all. It is possible that the inclusion of the Euro, the Dollar, and the Yen, makes the Pound redundant – but this is a conjecture not a proof. The same took place when Switzerland was dropped from the simulation.

We can compare these results with the current allocation in the overall stabilization fund in Kazakhstan. Remember there are two funds, and in the case of Kazakhstan they differentiate between currency holdings and bond holdings. We do not do this is our exercise and therefore we aggregate all these holdings across types and the two funds. From the stabilization point of view it is irrelevant where the money is saved.

In Figure 10, we present the holdings per country, where the Euro Area has been aggregated in one single item. Notice that it is clear that most of the holdings is distributed along two countries – USA and Euro Area. Indeed, in the restricted positive holdings model this is exactly what the optimization was implying. Now, in the optimization we required a ration 200:1 between Euros and US dollars; so, that could be

improved from the actual behavior. But, in general terms, this seems appropriate. Nevertheless, these holdings look exactly the opposite to what a total constrained portfolio would imply – because the short in dollars, and long in euros are not big enough.

It is important to indicate that even though the savings in the fund are way smaller than the ones implied by the model, their ratios correspond to the constrained case where the central bank is forced to hold mostly positive positions and short very little.

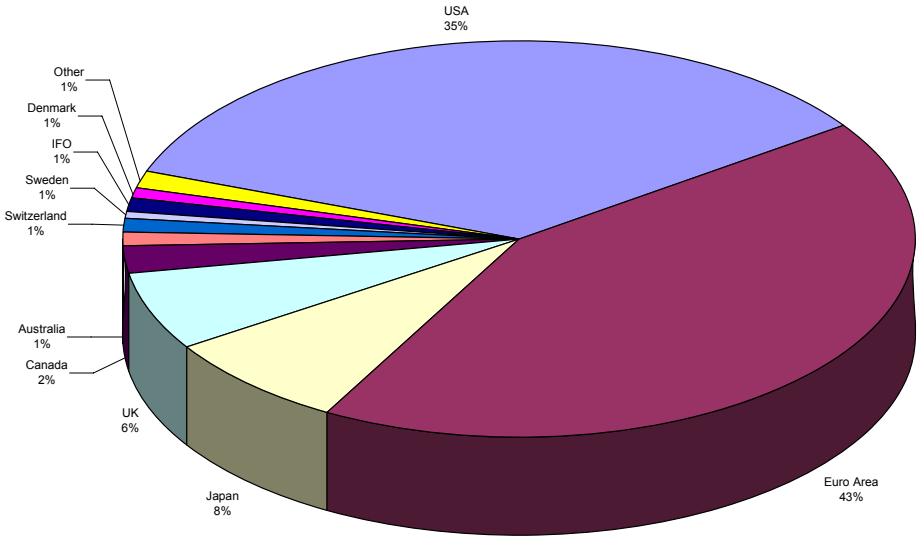


Figure 10: Savings in Currency and Bond Holdings per country.

My final comments in this respect is that although the optimization implies a much larger share of Euros than the one that it is actually implemented, it is possible that the portfolio that I have solved is driven by some of the dynamics of the US-Euro dollar exchange rate of recent years due to the recession in the US, and not necessarily due to the normal stochastic properties of the Dollar and its response to oil price shocks. Nevertheless, it is comforting that the overall message that comes from the optimization model is in some sense is similar to the one performed by the authorities.

C. Investment Strategy: including stocks.

A more aggressive strategy is one in which we invest in stocks and bonds. Again, we follow the same criteria as before.

1. We assume that only liquid fixed income and stock market indexes.
2. No corporate debt is considered and only stock market indexes – not individual stocks
3. Liquidity is crucial (as before)
4. The shares of investment take into account the average exposure of exports, but also the stochastic properties of the underlying fixed income assets in the respective countries.
5. For simplicity we assume that only four bonds and four stock market indexes are included.
6. We only assume buy and hold strategies, and there is no shorting of any currency of asset price.
7. We assume that the objective is to stabilize consumption – and not total GDP.

We replicate the same exercises as before, here we only present the summary statistics. The exercise in which the holdings per asset are constraints produced very similar outcomes as before and it is not extremely informative. In order to shorten the discussion we concentrate only in four exercises.

In Table 5, the results of the simulations are shown. The first row indicates the total investment measured relative to total consumption. The second row indicates the stabilization achieved measured in percentage points of the consumption level. These are equivalent to the last column in the previous sub-section. The next rows indicate from the total invested what is the portfolio shares in bonds and stocks for each country.

The first column is the data without saving. This is the benchmark of comparison. As can be seen, the raw data implies a consumption volatility with a standard deviation equal to 8.4 percent. This means that on average every year consumption growth changes in about 8.4 percent and that 95 percent of the fluctuations will imply consumptions going up or down by 17 percent! As was mentioned before, this is an extremely volatile environment by all means.

The second column is the unconstrained portfolio. Here we allow the total investment to be any, and have no limits on the investments. The first point worth noticing is that the total investment is 7 times the yearly consumption per-capita, and this investment implies a coefficient of variation of only 0.3 percent.

0.3 percent is roughly the standard deviation of consumption growth in developed economies – so, this level of variation is certainly acceptable. Observe that the total investment, although it continues to be very large, is much smaller than the one required when only bonds were used. The main reason is that here stock markets are much better hedgers than bonds alone; and therefore, with a much smaller net position we achieve even more stabilization. We consider that 7 times per-capita consumption is still unreasonably high. This implies that the stabilization fund will have 5 times the country's GDP, and clearly this level of saving is politically unfeasible. However, this number is an order of magnitud smaller than the ones obtained in the previous section.

Table 5: Results from the optimization allowing for stock markets

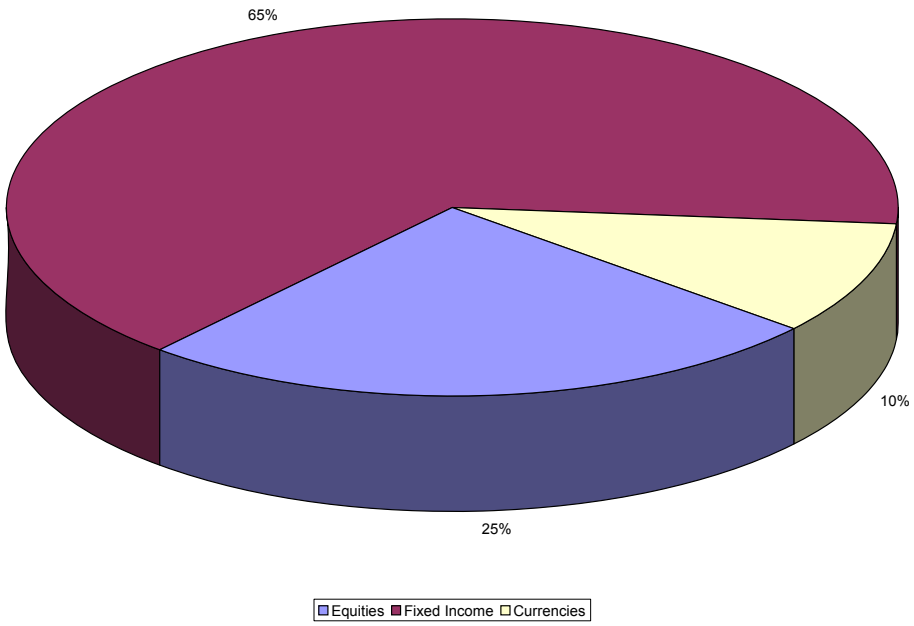
		None	Unconstrained	sum<1	sum<0.1
Total Investment		0	6.75	1.00	0.10
Coefficient of Variation		8.4%	0.3%	0.9%	0.9%
Bonds	Dollar		-44%	-387%	-4020%
	Yen		188%	1275%	12764%
	Swiss Franc		-208%	-2042%	-21413%
	Euro		154%	1436%	14983%
StockMarkets	US		-57%	-452%	-4632%
	Japan		74%	432%	4223%
	Switzerland		8%	-147%	-1793%
	Euro		-15%	-15%	-12%

The second aspect worth highlighting is the bond composition. Notice that there is a large long position in euros (as it was before), and a short of the dollar (again as what we found in the last exercises above). The only change from before now is that there are more aggressive positions in Yen and Swiss Franc's and the main reason is that now the optimal portfolio is holding the domestic stock market in these countries; and therefore, there is a currency exposure that wasn't there before.

Finally, notice that the net position in stock markets is almost zero. From the total investment 57 is shorten in the US, 74 percent long in Japan, 8 long in Switzerland, and 15 is shorten in Euro's. Adding up all the positions we have that the net exposure is only 10 percent – or in other words, only 67 percent of the per-capita consumption is the net position in stocks. In other words, this portfolio implies that 90 percent of the portfolio should be invested in fixed income and currencies, and only 10 percent in stocks.

In fact, the actual portfolio distribution by type is shown in Figure 11. As can be seen, the market value implies that approximately 25 percent of the savings are invested in stock market indexes.

Figure 11: Actual investment by type (for the savings portfolio only).



It is important to highlight that in practice the stabilization and savings fund in Kazakhstan only take long positions in fixed income and stocks, and only short currencies. In Figure 11 we present the net positions and compare them with the net positions implied by the unconstrained model. Indeed, these are similar.

The fourth point worth highlighting from Table 5 is the very long position in the Japanese stock market: 74 percent of the portfolio is there, while only 8 is in the swiss market, and 15 in the Euro Zone. The main reason is that among the developed markets the Japanese stock market is perhaps the most responsive to oil prices – and therefore the best hedger.

This is perhaps in contrast with actual investment in the fund. The actual investment looks closer to a diversified portfolio, the weights are probably close to the market capitalizations. But it is important to remember that the objective of the savings is not to minimize the risk of the portfolio – on the contrary, the objective is to maximize the negative correlation between the portfolio and the oil price.

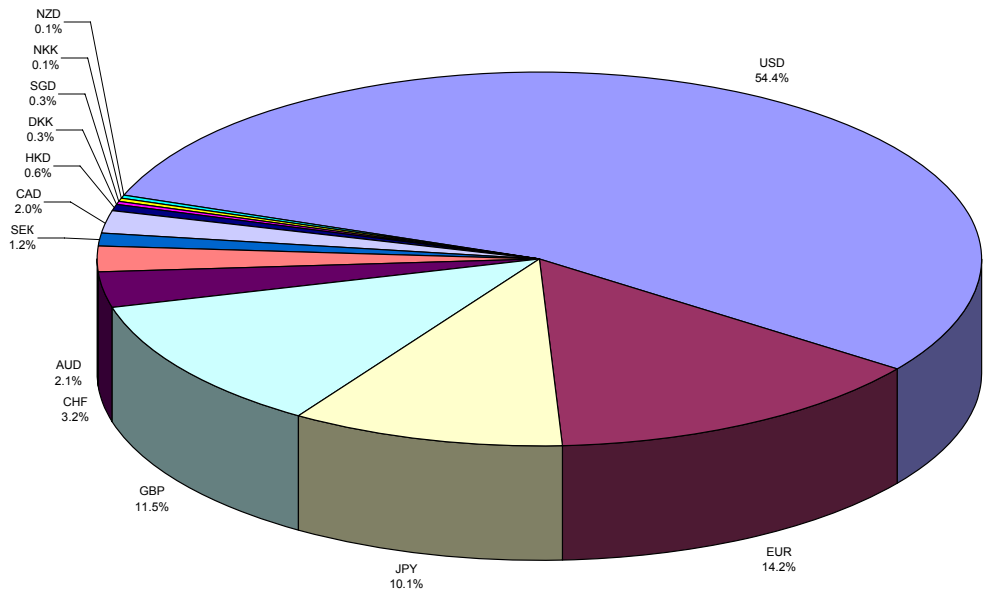


Figure 12: Actual investment in stock market indexes by country.

In this sense, this is perhaps the most important change the actual behavior of the fund has to amend.

The second and third columns in the table show the restrictive portfolios and as can be seen, even though the net positions are small, the gross positions are extremely large. However, almost the same patterns in terms of ratio between bonds and stocks, and stocks among countries are similar as the unconstrained portfolio.

In summary, there are several conclusions worth emphasizing: First, when the portfolio in the stabilization fund is allowed to invest in stock market indexes, the overall net saving required to achieve a sizeable stabilization is an order of magnitude smaller than when the savings are exclusively invested in fixed income. This makes sense because stock markets are more responsive to oil price movements than bond prices, and therefore, they are better hedgers.

Second, in most portfolio simulations – and in all the robustness checks I ran – the ratio between fixed income and stocks is roughly 90/10 and a minimum of 72/28. So, in most of my simulations the total invested in stocks is relatively small.

Third, almost invariably there are always long positions in Euros (bonds in Europe). And very large positions indeed. In fact, in almost all my simulations, with or without restrictions, most of the times the net positions in Euro's is 3:1 the positions in dollars.

Fourth, also, almost invariably, the positions in the Japanese stock market are much larger than any other stock market. Again, the main reason is that the Nikkei is far more responsive to the oil price than the other stock markets.

V. Final Remarks

What have we learned from this exercise? It is very different to design an investment strategy for a stabilization fund, than to design an investment strategy for a "growth" portfolio. The objective of the second one is mainly to increase the return on the savings minimizing overall risk, while the objective of the former one is to minimize the portfolio risk including the income from the commodity revenues and its effect in the countries welfare.

This distinction is rarely recognized in practice, and most stabilization funds in general are managed as "growth" funds. If we believe that one of the roles of a stabilization fund is to be a "cushion" to the commodity price fluctuations, then the investment strategy is not one of minimizing risk, but to maximize the negative correlation with the commodity price. And because the commodity price is risky, that means that the investment strategy of the fund will be risky as well.

In this exercise I have shown that just investing in safe assets produces a sizeable stabilization of the flows. Obviously, the disadvantage of this strategy is that the amount of savings required to achieve such stabilization are extremely large. Possibly, they are politically unfeasible. In that section, I showed that the investment is not one of a balanced portfolio in fixed incomes, but one that is heavily exposed to Euros. Again, this is the difference between the objectives. In the second exercise where I allow investment in stock markets, I found that investment in Eurobonds and in the Japanese stock markets is where most of the weight is located.

In views of the different objectives in which I believe stabilization funds should be based, these results are not surprising. The Japanese stock market is the most sensitive one to oil price fluctuations, and the

European real exchange rate - and therefore their bonds – are the most sensitive ones to oil fluctuations. Hence, in the end the portfolio holds these two assets to maximize the stabilization properties.

Finally, the paper has also argues that the source of income that has to be stabilized is the consumption volatility due to oil prices, and not oil revenues by themselves. Some of the smoothing is done in the private sector and hence, government intervention is not required. Furthermore, because insurance is costly, it is better to concentrate only in that volatility that the private sector is not hedging – rather than on the whole variance.

My recommendation to a country like Kazakhstan is to do a little bit of everything. Having a balance portfolio for the savings of the country is a “safe” strategy, but not one that achieves stability. In the other hand, I understand completely that suddenly changing all the portfolio and investing it is Japan’s stock market might be implausible and too risky for the finance authorities to bear. Hence, my suggestion is to deviate from the current investment strategy slowly and in small steps toward a portfolio that is more negatively correlated with the oil price, than the one that currently is in place. This can be done slowly and experimenting how much risk the ministry of finance and the central bank are willing to support. In the end, the fund has to comply not only with economic efficiency, but with political willingness and comfort.

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