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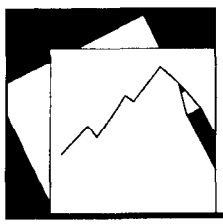

IMF Working Paper

Fiscal Policy in Nigeria: Any Role For Rules?

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Fiscal Policy in Nigeria: Any Role for Rules?

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Authorized for distribution by Michael Keen

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Abstract

Fiscal policy in oil-producing countries can be profoundly affected by oil revenue uncertainty and volatility. Policy formulation should factor in the exhaustibility of the natural resources and aim at reducing oil revenue volatility passed on to the economy. Past fiscal policy in Nigeria has not been successful in this regard, since both revenue and expenditure have been highly volatile, to a large extent reflecting oil price developments. The paper discusses the role an appropriately designed fiscal rule, nested within the long-run sustainable use of oil revenue, could have in providing a more stable framework for fiscal policy formulation. It also highlights practical implementation and transitional issues.

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I. INTRODUCTION

Like other countries dependent on mineral extraction, Nigeria faces two challenges when formulating fiscal policy: in the long run, the need to ensure that the fiscal stance is compatible with the sustainable use of oil and gas resources (a depletable asset), and, in the short-to-medium-run, the need to prevent the revenue volatility from spilling over into the budget. Fiscal rules could play a role in guiding the sustainable use of oil and gas resources, taking into account the exhaustibility of resources and intergenerational equity objectives while aiming at stabilizing expenditure programs at levels consistent with the long-run target for the sustainable fiscal stance.

Experience in Nigeria illustrates the difficulties of implementing fiscal policy in an environment with highly volatile revenue flows. Over the years, there have been a strong deficit bias and procyclicality in fiscal policy, driven largely by oil price developments. The current revenue-sharing arrangement, whereby about half of oil revenue is allocated to state and local governments, has facilitated an expansion of expenditure programs at the subnational level, a tendency that has further constrained the ability of the federal government to stabilize overall expenditure. As a result, fiscal volatility has been transmitted to the rest of the economy, with negative implications for, in particular, the real exchange rate and growth performance.[2]

Despite the substantial oil resources that have been spent during the last thirty years, there is little to show in terms of economic development and poverty alleviation.[3] This reflects the key challenge to fiscal management from the inefficient use of public resources. The overriding concern now must be to break this pattern; however, this will remain a challenge since, as it has been pertinently put, "the fundamental drivers of the process—the politics of patronage, support of a large bureaucracy, and keeping a diverse and often fractious polity together—remain the same" (Eifert, Gelb, and Tallroth, 2002, p. 21). An effectively implemented fiscal rule, in principle, could play a role in overcoming these constraints on fiscal policy formulation by providing a framework for a more stable and predictable budget. This has been given more prominence with the recent announcement by President Obasanjo of the intention to introduce a fiscal rule with the 2003 budget. Nevertheless, a quantitative fiscal rule will not change the impact of government activities on the economy unless measures are taken to combat corruption and to strengthen transparency and accountability of fiscal operations.

Drawing on the literature on fiscal rules and the sustainable use of nonrenewable resources, the paper illustrates the role fiscal rules could play in Nigeria by strengthening the framework

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[2] For a discussion of the growth impact of volatility on the Nigerian economy, see World Bank (forthcoming).

[3] Oil revenue amounted to more than $300 billion during 1970–2001, whereas per capita GDP declined from $264 to $254 over the same period (figures in constant 1995 U.S. dollars).

for fiscal policy formulation. The paper provides a simple analytical framework that merges long-run fiscal sustainability concerns with the short-to-medium-run objective of reducing the impact of oil volatility on the budget. It also highlights transitional and implementation issues for any fiscal rule to operate efficiently.

The remainder of the paper is organized as follows: Section II provides a very brief overview of past fiscal policy in Nigeria and compares this with the experience in Indonesia and Venezuela. Section III discusses in general terms the role fiscal rules can play in guiding fiscal policy formulation. Section IV derives various measures of the sustainable long-run fiscal stance for Nigeria using the permanent-income approach, while Section V investigates two specific fiscal rules, nested within the estimates for the long-run fiscal stance, aimed at reducing the impact of oil volatility on budget formulation and execution. Section VI addresses briefly the role of various complementary reforms, and some concluding remarks are provided in Section VII.

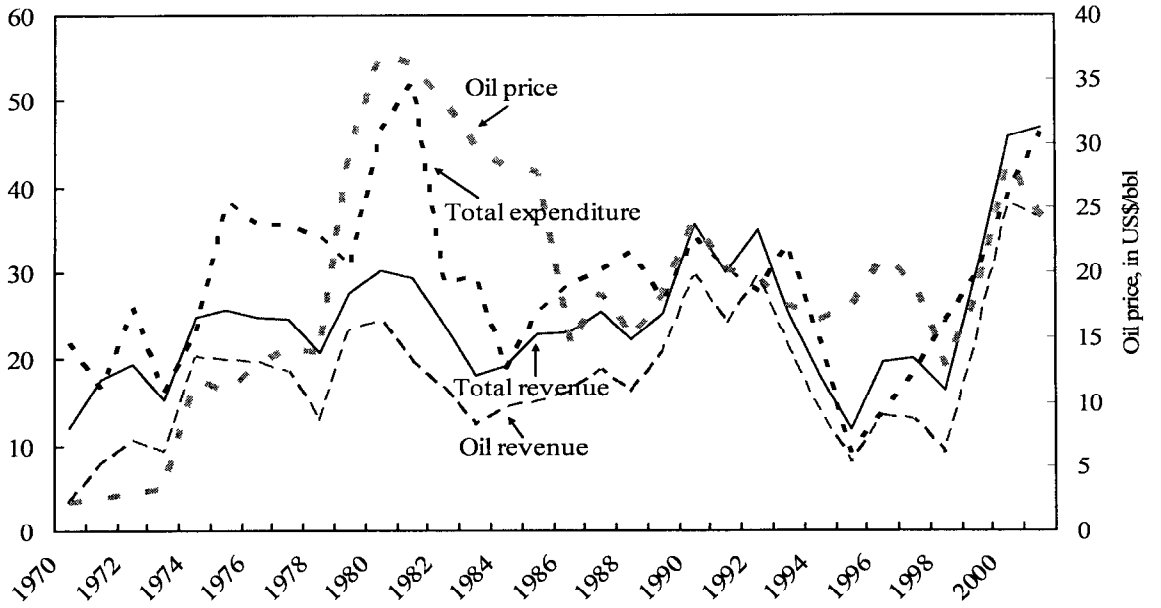
II. Past Fiscal Policy in Nigeria

With about 75 percent of revenue from oil and gas, fiscal policy in Nigeria has been heavily influenced by oil-driven volatility impacting both revenue and expenditure. Since 1970, both revenue and expenditure have been very volatile while increasing over time. In periods with high oil prices, such as in 1979–82, 1991–92 and more recently in 2000–02, revenue and expenditure have increased sharply (Figure 1). This has typically been followed by the scaling back of expenditure as oil prices subsequently decline, though at times with a lag. The implications of such boom-bust fiscal policies include the transmission of oil-volatility to the rest of the economy as well as disruptions to the stable provision of government services. This has added to the failure over the years of public spending neither facilitating the diversification and growth of the non-oil sector nor reducing poverty.

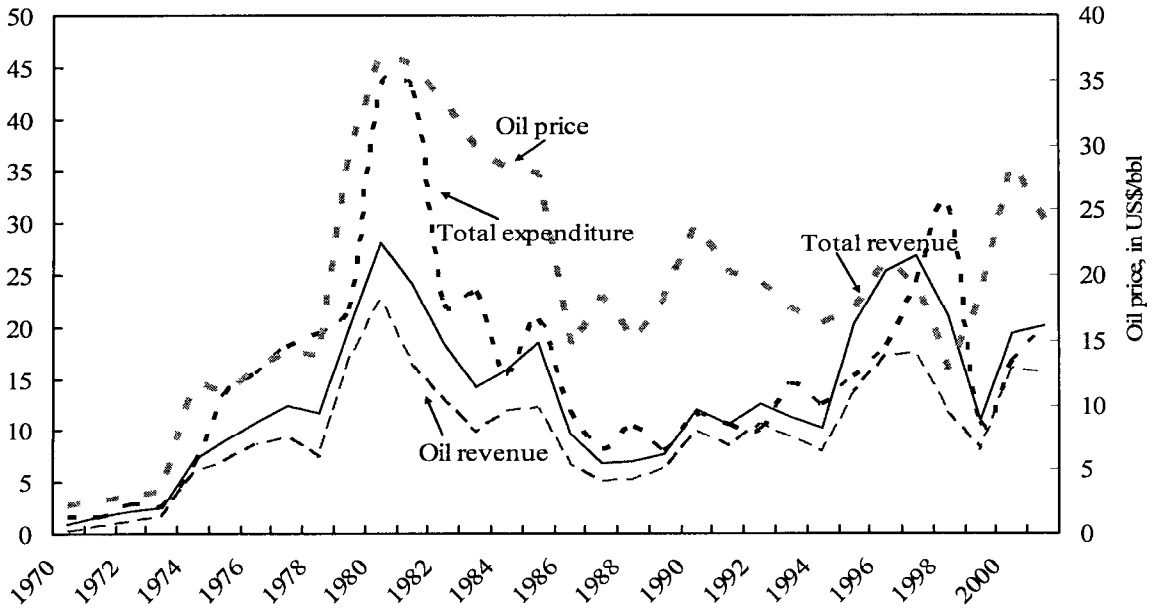
Many other oil-producing developing countries have had a similar oil-driven fiscal policy over this period. Figure 2 shows that both oil revenue and expenditure in Venezuela had very similar boom-bust characteristics as in Nigeria, to a large extent driven by oil price developments. In contrast, Indonesia has been much more successful in insulating its economy against oil-related volatility, primarily by achieving a broader diversification of the economy. In Indonesia, the share of oil-revenue in total revenue has gradually declined without the expenditure volatility experienced in Nigeria and Venezuela. This is also apparent from the overall balance: Indonesia has had much more modest deficits, whereas Nigeria and Venezuela have had very large swings in the overall deficit, mostly driven by oil price developments.

Figure 1. Nigeria: Fiscal Trends, 1970-2001

(i) Fiscal trends, in percent of GDP



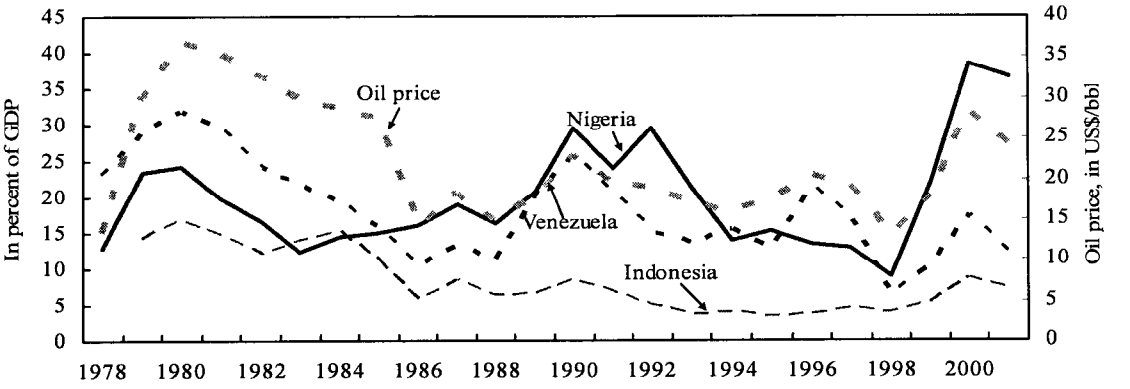
(ii) Fiscal trends, in billions of US dollars



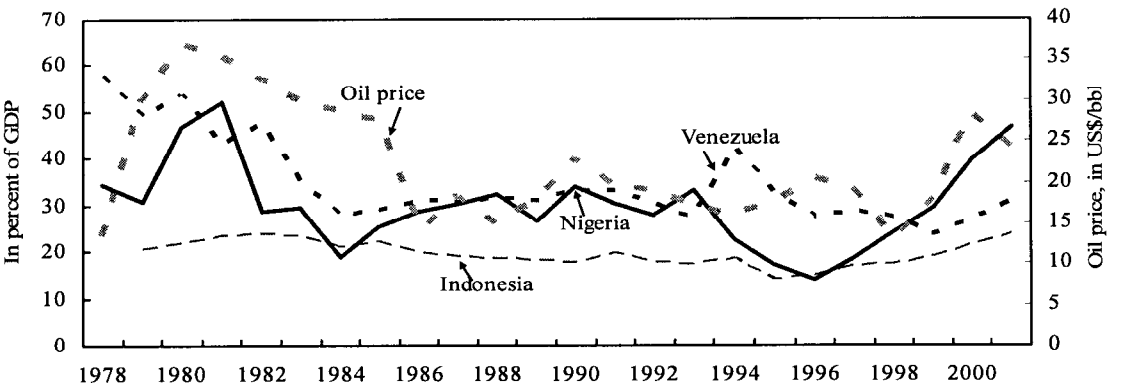
Source: Selected IMF Staff Country Reports, IMF.
Note: US$/bbl denotes U.S. dollars per barrel.

Figure 2. Nigeria, Indonesia and Venezuela: Fiscal Trends, 1978-2001

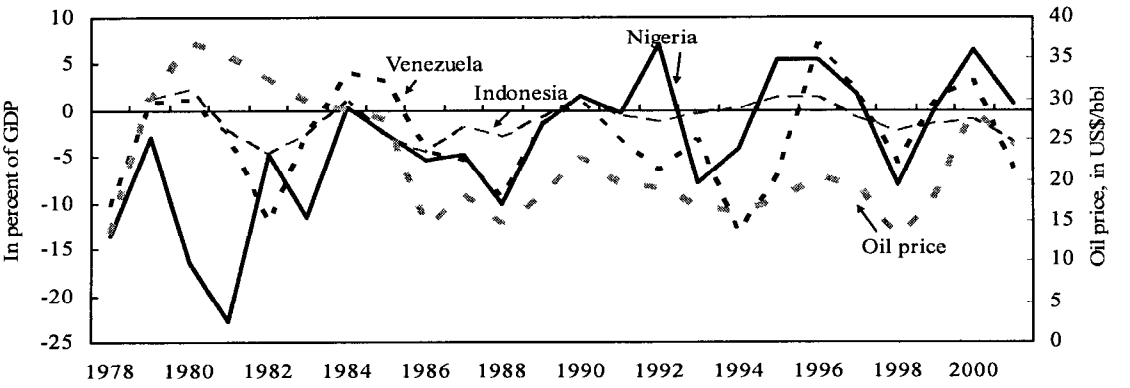
(i) Oil Revenue



(ii) Total Expenditure



(iii) Overall Balance



Source: Selected IMF Staff Country Reports, IMF.
Note: US$/bbl denotes U.S. dollars per barrel.

III. The Role of Fiscal Rules

There has been a growing interest in recent years, both in the academic literature and in policy circles, in the role explicit rules may play in strengthening the conduct of fiscal policy.[4] The key idea is that in countries with a weak reputation for fiscal prudence the introduction of fiscal rules, effectively binding the government to a certain preannounced fiscal conduct, may provide a more credible policy framework that over time will contribute to stability and growth. Hence, there would seem to be a strong case for Nigeria benefiting from the introduction of fiscal rules by allowing policymakers to send a credible signal about their intent to implement prudent fiscal policies in a break from the past. Naturally, fiscal rules will only play a positive role if they are backed by firm political will and complemented by other administrative reforms strengthening the budget process and improving the quality of spending.

The political economy literature suggests that the main rationale for fiscal rules is to constrain the policymaker in order to reduce or eliminate a tendency toward generating budget deficits (Drazen, 2002).[5] Rules can take the form of either legal restrictions or more implicit codes or norms. The key requirement for the effectiveness of a rule is that there are penalties or costs of deviating from it. If so, explicit rules enhance the credibility of a preannounced fiscal policy if they raise the costs and lower the benefits to policymakers from deviating from this. Effective fiscal rules can then be used by policymakers as a signaling device to make commitment to a certain fiscal policy credible. They may also increase the public awareness of deviations from fiscally responsible behavior (the negative spotlight effect). As fiscal rules may encourage creative accounting for policymakers to be seen to meet the targets, however, the design and transparency of a rule is paramount.[6] Moreover, fiscal rules are likely only to be effective if procedural rules for the budget process, and their implementation, are also strengthened.

Fiscal rules can take many forms but typically impose limits on the budget balance (either the overall or current balance), on expenditure (e.g., primary expenditure or the wage bill), or on public debt. For oil-producing countries, a specific objective of a relevant policy rule should be to decouple expenditure from the fluctuations in oil revenue while ensuring that the fiscal stance is compatible with the sustainable use of oil resources (see Box 1 for examples of

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[4] See Kopits (2001) and Kopits and Symansky (1998) for a comprehensive discussion of the issues.

[5] The political economy literature has identified an expenditure and deficit bias in the political process for several reasons: the presence of fiscal illusion in the electorate; budget maximizing bureaucratic behavior; a free rider problem introducing a conflict of interest in who should contribute to deficit reduction; and the opportunistic use of fiscal policy in the electoral cycle (as summarized in Drazen (2002) and further explored in Drazen (2000)).

[6] Some ways for policymakers to circumvent fiscal rules are through overoptimistic budget projections, strategic use of off-budget transactions, by using an inflated baseline, or at times from the difficulty of measuring precisely fiscal variables (Drazen, 2002).

fiscal rules). A fiscal rule targeting a certain overall or primary fiscal balance without taking into account oil revenue volatility will not prevent procyclical fiscal policies (e.g., if the expenditure path is being determined by oil revenue swings). Instead, a rule targeting a certain non-oil fiscal deficit or balancing the budget at a cautious oil reference price will be more successful in insulating the budget against oil market vagaries.

Box 1. Examples of Fiscal Policy Rules

Many countries apply rules when determining fiscal policy. Best known perhaps is the Stability and Growth Pact in the European Union setting limits on the overall balance and debt. Brazil also has rules restricting the primary balance and debt, whereas Argentina and Peru have applied limits to the overall balance and primary expenditure. New Zealand has rules for the operating balance as well as debt limits.

Among oil producing countries some also have fiscal rules, although often these apply only to the operation of an oil fund. A case where the oil fund is well integrated within the budget framework is that of Norway, where the petroleum fund (essentially a government account) was partly set up to support the achievement of intertemporal policy objectives. Net oil revenue is deposited into the fund and finances the non-oil deficit through a revenue transfer.

Some countries have rules for stabilization purposes, though these are not always well integrated within the budget. Kazakhstan deposits revenue in excess of the budget reference price in a mineral fund; revenue shortfalls are compensated by transfers from the fund. Oman also deposits oil revenue in excess of a reference price into a fund, but in any given year the government may withdraw funding up to the amount of the budget deficit. Venezuela has had a mixed experience with its stabilization fund. The initial rules established that oil revenue above the threshold price should be deposited in the fund, though this has not always been done without recourse to other financing. Kuwait has a fund for savings purposes into which 10 percent of total government revenue is deposited, irrespective of oil or budgetary developments.

Sources: Davis and others (2001), Kopits and Symansky (1998), and Kopits (2001).

For countries with federal structures, an added complexity is whether, and if so, how to apply fiscal rules at the subnational level. In principle, the answer is clear: rules at the federal level only are not likely to be fully credible without subnational rules too. Given the current revenue-sharing arrangement in Nigeria, this is a key issue that will have an impact on the effectiveness of any fiscal rule. The approach taken here is to investigate how a rule could be extended to the subnational level within the current federal arrangement. However, the credibility of any policy rule is likely to be enhanced if it can be supported by fiscal federalism reforms.

Country experience also suggests that the effectiveness of the policy framework is dependent on achieving a sufficient degree of transparency and accountability, with credibility being influenced by the design of the policy rule (e.g., whether it is formal or informal, legislatively binding, and what sanctions and enforcement mechanisms are applicable). More than anything else, the critical determinant for the success of any rule is the political support and commitment that can be garnered. This may be particularly challenging in Nigeria's political environment with its strong currents of suspicion and tension between the executive and the legislative, as well as between the federal and subnational levels of governments. Related to this is the challenge of how to convince an electorate, impatient to benefit from the "democracy dividend," that there may be reasons to save some oil revenue during oil booms and instead to focus on strengthening the composition, quality and targeting of expenditure.

IV. Long-Run Fiscal Sustainability

In an economy dependent on nonrenewable, depletable resources (such as oil and gas), an indicative target for the fiscal stance in the long run should be compatible with the sustainable use of the resources. One approach to assess the long-run sustainability of fiscal policy is to adapt the permanent-income hypothesis to the circumstances of an oil-producing country.[7] Considering oil in the ground a physical asset, this implies that, as extraction proceeds, part of the oil revenue is saved and converted into financial assets in order to maintain wealth constant to finance future consumption after the natural resources have been depleted. The long-run target for government consumption should therefore be consistent with the objective of preserving the total stock of government wealth (oil and financial). In most instances, this will require targeting relatively prudent non-oil primary deficits in order to save some current oil revenue and convert this into financial assets.[8]

The two possible targets that will be looked at more closely are as follows: (i) keeping the total stock of wealth constant in real terms; and (ii) keeping real wealth constant in per capita terms. Figure 3 illustrates that whereas these targets have different implications for real wealth accumulation, both imply a shift in the composition of wealth from oil in the ground to financial assets. The assumptions underpinning the long-run simulations are discussed in Appendix II.

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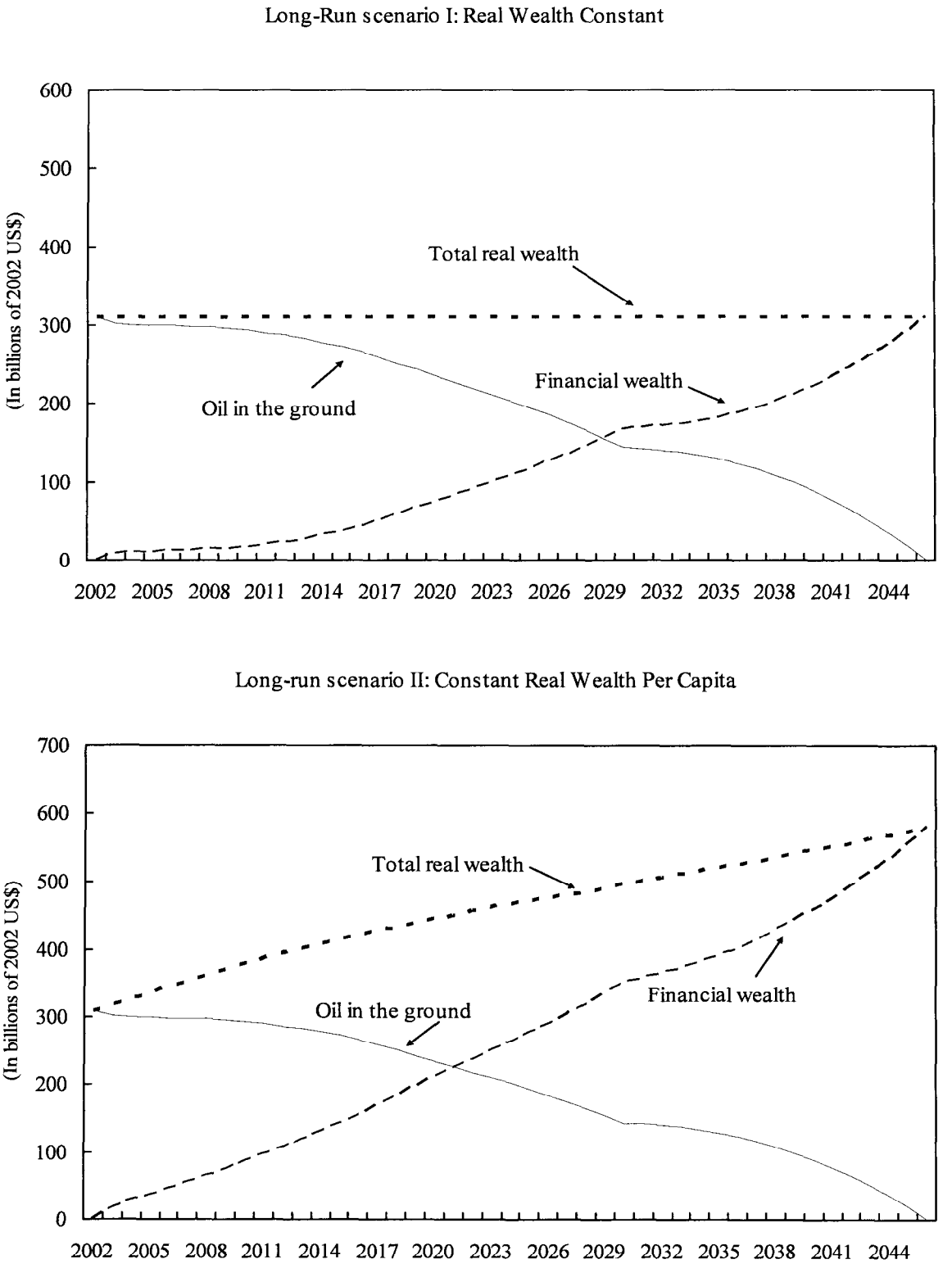
[7] For a comprehensive discussion of fiscal policy in oil-producing countries, see Barnett and Ossowski (2002), highlighting the importance of focusing on the non-oil primary balance. For recent applications of the permanent income hypothesis, see Liuksila, Garcia, and Bassett (1994), Chalk (1998), Alier and Kaufman (1999), and in particular Davoodi (2002); and for a more general discussion, Engel and Valdes (2000). A more stringent "bird-in-the-hand" fiscal rule is advocated in Bjerkholt (2003).

[8] The focus is on the primary non-oil balance excluding oil-related interest payments. As oil wealth is converted into financial assets, the non-oil balance will improve as interest receipts increase even though the underlying fiscal stance has not changed. Appendix I provides a brief discussion of different fiscal balances.

Figure 3. Nigeria: Composition of Total Real Wealth



Source: IMF staff simulations.

A. Long-Run Target I: Constant Real Wealth

Under the first target, a sustainable fiscal policy requires that government consumption financed out of oil revenue be consistent with maintaining the stock of oil-derived government wealth constant in real terms over the long run. The stock of oil wealth, *ow*, is equal to the net present value of the projected revenue flow (after production cost) from oil in the ground. The stock at the end of period *t* of oil in the ground is given by the sum of all future oil revenue up to time *T* when the reserves are fully depleted, where *r* is oil revenue in constant prices extracted in each period and *i* is the real interest rate.

$$ow_t = \sum_{s=1}^{T} \frac{r_{t+s}}{(1+i)^s} \tag{1.1}$$

By adjusting how much oil revenue is spent, the government can ensure that total wealth—the value of the oil in the ground and the financial assets accumulated from saved oil revenue—stay constant in real terms. At time *t* the total real wealth of the government is equal to the oil wealth (from (1.1)) plus the stock of net financial assets, *fw*.

$$tw_t = ow_t + fw_t \tag{1.2}$$

The target is to keep total wealth constant over the long run as oil is extracted. To see what this implies, note first that (1.1) gives the path of oil wealth as the difference between the stock of oil in the ground at the end of the previous period and the oil revenue extracted during the period.[9]

$$ow_t = ow_{t-1}(1+i_t) - r_t \tag{1.3}$$

From (1.3) the decline in oil wealth between periods *t* and *t-1* is given as the difference between the implied return on the oil wealth at the end of period *t-1* and the oil extracted during period *t*.

$$ow_t - ow_{t-1} = i_t ow_{t-1} - r_t \tag{1.4}$$

As the oil wealth gradually declines over time, the financial wealth must increase in parallel to keep total real wealth of the government defined by (1.2) constant. This will require that some oil revenue is saved and converted into financial assets. The stock of net financial assets will increase over time, with a constant real wealth target and declining oil wealth, in line with the following equation:

$$fw_t = tw_t - ow_t, \quad where\ tw_t = tw_{t-1}\ for\ all\ t \tag{1.5}$$

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[9] From (1.1), $ow_{t-1} = \sum_{s=1}^{T} \frac{r_{t-1+s}}{(1+i)^s}$.

Hence, $ow_t = \sum_{s=1}^{T} \frac{r_{t+s}}{(1+i)^s} = \sum_{s=1}^{T} \frac{r_{t-1+s}}{(1+i)^{s-1}} - r_t = \sum_{s=1}^{T} \frac{r_{t-1+s}}{(1+i)^s}(1+i) - r_t = ow_{t-1}(1+i) - r_t$

Assuming no uncertainty, in period t the required savings out of oil revenue can then be calculated as the difference between the targeted financial wealth by the end of the period and the stock of net financial assets by the end of the previous period.

$$s_t = \frac{fw_t}{1+i_t} - fw_{t-1} \tag{1.6}$$

The required savings will be less than the change in the stock of net financial assets as the interest earned during the period will be added to the financial assets. Hence from (1.6), the change in net financial assets between periods t and $t-1$ is given by the savings during the period plus the interest earned on the net financial assets (including interest earned on the savings).

$$fw_t - fw_{t-1} = s_t\left(1+i_t\right) + i_t fw_{t-1} \tag{1.7}$$

Since the total wealth is kept constant over time under the first target, from (1.5) the increase in the stock of net financial assets must equal the decline in oil wealth.

$$fw_t - fw_{t-1} = ow_{t-1} - ow_t, \quad for\ tw_t = tw_{t-1} \tag{1.8}$$

By inserting (1.4) and (1.7) into (1.8) and rearranging, we can derive an expression that shows that the difference between oil revenue and savings should equal the interest earned on the stock of net financial assets and oil wealth (at the end of the previous period) plus the interest earned on savings during the period.

$$r_t - s_t = i_t\left(ow_{t-1} + fw_{t-1} + s_t\right) = c_t \tag{1.9}$$

This gives a rule for the use of oil revenue, r, for each period providing how much the government can spend, c, and how much will have to be saved, s, to keep total wealth constant. Consumption financed out of oil revenue should equal the real return on the total stock of financial and oil wealth (including interest on savings). As financial wealth is accumulated and oil deposits are depleted, the government will increasingly finance its expenditure by drawing on the return from past savings of oil revenue.

As we assume that the government will finance its non-oil deficit only from oil revenue (current and past savings), the non-oil primary deficit, d, will equal the amount of oil revenue spent, c, where t is non-oil revenue and e is non-oil primary expenditure.[10]

$$d_t = t_t - e_t = c_t \tag{1.10}$$

Equations (1.10) and (1.9) provide a fiscal rule for the non-oil primary deficit ensuring that the government saves enough oil revenue, and accumulates financial assets, to maintain real wealth constant. Over time, however, the targeted savings will turn negative and the

[10] The interest earned from (1.9) is on a net-basis (interest received minus interest paid) as it is calculated on net financial assets. Hence this provides a spending rule for primary expenditure excluding interest payments.

government will increasingly finance expenditure by drawing on oil revenue saved in the past.

This little model can be used to derive simple simulations for the long-run sustainable fiscal stance in Nigeria. The first step is to project the expected oil and gas revenue over the long run. As the projections are very sensitive to the price, production and interest assumptions, this introduces substantial uncertainty to the forecasts (hence these can only be regarded as indicative). In addition, since the simulations assume an increase in gas production, the estimate of natural resource wealth will depend on how the gas resources are taxed. Currently, as an incentive to develop the gas sector, a much lighter tax burden is placed on gas operations than on oil extraction. However, for the long-run simulations, it is assumed that the gas sector will be taxed equivalently to the oil sector.[11] Under these assumptions, the first column in Table 1 shows the projected annual average oil and gas net revenue per capita (excluding extraction cost) at US$73 in the base-case scenario (in constant 2002 prices).[12]

The next step is to calculate the maximum consumption out of annual revenue or, conversely, the targeted savings rate for oil revenue that is compatible with keeping constant total wealth. In the base case scenario, 18 percent of per capita oil revenue is saved to keep real wealth constant. Having derived the maximum consumption of oil revenue that is compatible with the long-run fiscal target, this can be presented in terms of a non-oil primary deficit target of 20 percent of non-oil GDP in the base case scenario. The results are very sensitive to the assumed price and production forecasts; however, under reasonable assumptions, an average non-oil primary deficit target between 15–25 percent of non-oil GDP would preserve the stock of oil-derived wealth in real terms.[13]

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[11] This does not appear to be an unreasonable assumption, as the current fiscal incentives are intended to develop the gas sector and, therefore, would likely be phased out as this objective is achieved. Nevertheless, a more refined simulation would probably assume a slightly lower tax burden on the gas sector relative to the oil sector. For a general introduction to the taxation of mineral extraction, see Baunsgaard (2001).

[12] The sensitivity of the simulations is tested under different price and production scenario with average oil revenue per capita between US$55–US$92 (in constant 2002 prices).

[13] The simulated high price scenario allows for more consumption, increasing the average non-oil primary deficit to 24.5 percent of non-oil GDP. Conversely, the low price scenario has a lower average non-oil primary deficit target of 14.6 percent of non-oil GDP. With higher production, the savings profile changes with an average non-oil primary deficit at 22 percent of non-oil GDP (this scenario is not shown in Table 1).

Table 1. Nigeria: Long Run Fiscal Sustainability Simulations, Annual Averages, 2002–45

	Constant Real Wealth	Constant Wealth per Capita
Base case		
Oil revenue (net) per capita (in constant US$)	73.0	73.0
Oil consumption per capita (in constant US$)	60.0	54.6
Savings rate (in percent of per capita oil revenue)	17.8	25.2
Non-oil primary fiscal deficit (in percent of non-oil GDP)	19.5	16.3
Annual change in real wealth (in percent)	0.0	1.4
Annual change in real per capita wealth (in percent)	-1.4	0.0
High-price case		
Oil revenue (net) per capita (in constant US$)	91.6	91.6
Oil consumption per capita (in constant US$)	75.2	68.5
Savings rate (in percent of per capita oil revenue)	17.8	25.2
Non-oil primary fiscal deficit (in percent of non-oil GDP)	24.5	20.5
Low-price case		
Oil revenue (net) per capita (in constant US$)	54.5	54.5
Oil consumption per capita (in constant US$)	44.8	40.8
Savings rate (in percent of per capita oil revenue)	17.7	25.1
Non-oil primary fiscal deficit (in percent of non-oil GDP)	14.6	12.2

Source: IMF staff estimates.

B. Long-Run Target II: Constant Real Wealth Per Capita

The real wealth target can be criticized for ignoring the intergenerational distribution of oil wealth.[14] While this criticism has some merit, arguably in a country with large developmental needs, and presuming that the oil wealth would be spent productively, the benefits from oil could be spread over time if oil-funded spending were to improve the physical and human capital stock. Nonetheless, the intergenerational concerns can be addressed explicitly by targeting constant real wealth in per capita terms. This target can be easily accommodated within the simple model framework above by amending the target in (1.5) for real wealth by requiring this to increase each period with population growth, n, in line with

$$tw_t = tw_{t-1}(1+n_t) \tag{1.11}$$

This implies that the targeted total wealth increases in each period by the product of the population growth rate and the total stock of wealth.

$$tw_t - tw_{t-1} = n_t tw_{t-1} = n_t(fw_{t-1} + ow_{t-1}) \tag{1.12}$$

In turn, this increases the target for financial wealth, which no longer is only given by the decline in oil wealth, but must now also include a component offsetting the increasing population to keep real wealth constant in per capita terms.

$$fw_t - fw_{t-1} = ow_{t-1} - ow_t + n_t(fw_{t-1} + ow_{t-1}) \tag{1.13}$$

Inserting (1.4) and (1.7) provides a rule for the use of oil revenue that will keep total wealth constant in per capita term. The resulting rule in (1.14) implies that the non-oil primary deficit should equal the return on total wealth adjusted for the population growth rate plus the interest earned on savings during the period.

$$c_t = r_t - s_t = (i_t - n_t)(ow_{t-1} + fw_{t-1}) + i_t s_t \tag{1.14}$$

With a growing population, keeping total wealth constant in per capita terms will require higher savings of oil revenue. The second column in Table 1 shows the higher average savings rate at 25 percent of per capita oil revenue resulting in a lower non-oil primary deficit at 16 percent of non-oil GDP in the base case scenario. The sensitivity of the results can again be tested by simulating these under different production and price assumptions. Relative to the constant real wealth target, under all scenarios savings will be higher and the range for the non-oil primary deficit is correspondingly lower between 12–21 percent of non-oil GDP.

[14] As the population is expected to increase over the projection period, the stock of wealth in per capita terms will gradually be eroded.

V. Fiscal Rules: Short-to-Medium-Run Stability

Any fiscal rule should be broadly in line with the long-run target for fiscal sustainability, arguably even with an additional precautionary element given the uncertainty affecting the long-run simulations. However, the more immediate objective is to reduce the spillover on the budget from the volatility of oil revenue. This is most clearly related to price swings but will also reflect uncertainty about oil and gas reserves as well as extraction costs, among others. By smoothing fluctuations in the expenditure program caused by revenue volatility, a fiscal rule could reduce the procyclicality of the budget. If expenditure is broadly stabilized, the budget will be countercyclical (or at least neutral) in the face of oil revenue swings, thus reducing the volatility that is transmitted to the rest of the economy from the fiscal sector (see Box 2).

Box 2. Fiscal Links, Volatility, and the Rule

The fiscal sector in Nigeria has been the main mechanism for transmitting oil volatility to the rest of the economy. With a procyclical budget, as expenditure tends to be correlated with oil revenue, the fiscal sector has provided no cushion against oil-related volatility. One theoretical explanation of this can be found in Talvi and Végh (2000), who adapt a standard optimal fiscal policy model to include a political distortion element making it difficult for policymakers due to political pressure (e.g., arising from a common pool problem) to run large budget surpluses during revenue booms, rather than spending the surplus. This results in an optimal procyclical fiscal policy where positive shocks to the tax base lead to a policy response of decreasing tax rates and raising spending.

The impact of this can be illustrated in a simplified example. If government expenditure increases with higher oil revenue, the non-oil balance will deteriorate in response to a positive oil price shock. The higher domestic demand pressure will tend to increase inflation, and cause the real exchange rate to appreciate (if not offset by a more depreciated nominal exchange rate), which is likely to put upward pressure on the interest rate. Higher interest rates and the more appreciated real exchange rate will reduce investment and real growth in the non-oil economy. If the increase in government expenditure is only scaled back with a lag as oil revenue subsequently declines, the domestic financing needs of the budget will increase, placing further pressure on inflation and interest rates. A volatile fiscal policy will also increase uncertainty about the macroeconomic impact of the budget, which could add a risk premium to the interest rate resulting in a further deterioration of the investment climate in the non-oil sector.

A fiscal rule attempts to break this cycle. By following a more stable expenditure path, the budget becomes counter-cyclical in the face of oil price swings. If the oil price increases, the non-oil deficit will remain unchanged relative to non-oil GDP and will go down relative to total GDP (as total GDP in nominal terms has increased with the value of oil). If the oil price falls, the non-oil deficit will still be unchanged relative to non-oil GDP, whereas it will increase relative to total GDP. The counter-cyclical budget under a fiscal rule will therefore provide a cushion against the transmission of oil price volatility to the rest of the economy.

A. Fiscal Rules

Two specific rules will be considered here: (i) a permanent price rule targeting a balanced budget at a reference oil price of US$20 per barrel; and (ii) a non-oil primary deficit rule targeting a 20 percent primary non-oil deficit relative to non-oil GDP. Under the first rule, the budget will be formulated and executed based on the reference oil price (at which oil price the budget would be balanced). Should the actual price turn out to be higher, the excess revenue proceeds will be saved. Under the second rule, given the projected non-oil revenue (in Nigeria around 10 percent of GDP), targeting a constant non-oil primary deficit will tie down the expenditure path.

The fiscal rules are aimed at stabilizing the impact of oil revenue volatility, particularly price-related, on the expenditure path.[15] Underlying this, there is an implicit assumption that non-oil revenue will remain broadly stable relative to GDP. This may not be the case, neither in the short run nor in the medium run. For example, diversifying the economy may enhance non-oil revenue collections increasing the available resources that can be spent while being in compliance with the rules. Likewise, negative shocks to the economy may affect non-oil revenue shrinking the budgetary resource envelope. In principle, both rules could be further refined to allow for some automatic fiscal response to shocks affecting the non-oil economy. This may also be important as the non-oil economy is likely to be directly affected by oil shocks, not only indirectly through the fiscal sector. Nevertheless, the magnitude of shocks affecting non-oil revenue is likely to be of second-order importance relative to the direct impact of oil revenue shocks. Hence, there are first-order benefits from isolating the budget from the direct oil volatility impact, and there are advantages from keeping the rule simple.

The two fiscal rules can be presented more formally. First, the price-based rule will require that the overall budget is balanced at the notional oil revenue stream, r^{ref} ,calculated using the (constant) oil reference price. This leads to the following fiscal rule, for simplicity ignoring interest payments, where as before t is non-oil revenue and e is primary expenditure.

$$r^{ref} + t - e = 0 \tag{1.15}$$

The difference between the actual oil revenue and the notional oil revenue calculated at the budget reference price will determine the extent to which financial assets are increased (oil revenue saved) or drawn down to finance the budget.

$$r - r^{ref} = \Delta fw \tag{1.16}$$

Second, the non-oil primary deficit rule will target a constant deficit, the latter defined as:

$$\overline{d} = t - e \tag{1.17}$$

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[15] A seminal contribution to the mineral tax literature (Garnaut and Clunies-Ross, 1983), while discussing ways to deal with mineral resource instability, suggested targeting a stable path of public expenditure. If the main instability is from fluctuations in mineral revenue, this is (approximately) equivalent to the proposed fiscal rule.

As the non-oil revenue is likely to be relatively stable, this will broadly stabilize the expenditure path. The non-oil deficit will be financed through a combination of current oil revenue and financial assets (from oil revenue saved in the past).

$$\bar{d} = \Delta fw - r \tag{1.18}$$

With a constant non-oil deficit, $\bar{d}$, if oil revenue is larger than the negative of the non-oil deficit, $r > -\bar{d}$, the stock of financial assets will increase. If $r < -\bar{d}$, the stock of financial assets will decrease.

The specific target for the non-oil primary deficit is nested within the simulations of a sustainable long-run fiscal stance in Section IV, which indicated that a non-oil primary deficit of 15–25 percent of non-oil GDP would be compatible with keeping real wealth constant under various price and production assumptions. The justification for the price-based target is slightly different. Looking backward, the long-run average price has been about US$20 per barrel, which at first glance would provide some intuition for maintaining this as the forward-looking price target as well.[16] However, as oil prices are affected by persistent shocks, the usefulness of using past oil prices for projecting future oil prices can be questioned. Nevertheless, the permanent price rule is quite effective in stabilizing the non-oil primary deficit under various price scenarios (hence tending towards the arguably conceptually stronger non-oil primary deficit rule), and has advantages in terms of its simplicity. Moreover, the Nigerian authorities are familiar with this particular type of rule and have recently announced their intention to implement a rule with the 2003 budget, although the modalities for this are yet to be worked out.[17]

Both rules would allow Nigeria to carry out an expenditure program unaffected by oil price volatility. The impact of oil revenue swings would show up in changes to the overall fiscal balance, but only as a change in the financing composition.[18] Nonprice related sources of volatility, however, would affect the rules differently. The constant non-oil primary deficit rule will effectively decouple the budget from all sources of oil revenue volatility, including changes to production, extraction costs, the taxation regime, and the impact on oil revenue from exchange rate movements. In contrast, the permanent price rule will only insulate the budget from oil price swings, although this is likely to be a very prominent source of volatility. Should a large nonprice related shock occur, this can be accommodated by reparameterizing the price-based fiscal price rule (e.g., a large increase in oil production may require tightening the price rule by lowering the budget reference price to achieve a fiscal stance equivalent to the preshock target).

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[16] The average price per barrel of crude was US$19 over the 1970–2001 period; US$22 during 1980–2001, and US$20 during 1990–2001.

[17] In presenting the 2003 budget to the National Assembly, President Obasanjo stated that the government in 2003 will seek to establish a fiscal rule that stabilizes the levels of both capital and recurrent expenditure.

[18] Conceptually, one can consider oil revenue as financing the non-oil deficit. Indeed, under any of the fiscal rules, oil revenue (current and what has been saved in the past) would be the only source of financing.

B. Implementation and Transitional Issues

Any policy rule will require strong political support from both the executive and the legislature, as well as from subnational governments. The absence of this is likely already to constrain the government. In principle, the Ministry of Finance is already guided by a price rule when preparing the budget. In practice, this rule has not been adhered to as (i) the budget is not balanced at the targeted price; and (ii) when executing the budget, the excess revenue (the difference between the budget reference price and the actual price) is not consistently saved in line with the movement in the oil price differential.[19] Without strong political commitment, no fiscal rule can be successfully implemented, regardless of how well it is designed.

There are challenging transitional concerns when introducing a fiscal rule. To implement either rule requires a substantial initial adjustment given the current expansionary fiscal stance. Since this is unlikely in the short run, a gradual transition period will be required. A critical issue will be how this gradual adjustment can be achieved without undermining the credibility of the rule. A transitional rules-based arrangement may be more credible than relying on the discretionary tightening of the fiscal stance to meet a medium-term target. For example, one way to reduce the element of discretion would be to reach in the medium-term a permanent price rule through a preannounced target path for the gradual reduction in the non-oil primary deficit.

Initially, it may only be possible to implement the policy rule in an asymmetric manner. The idea of saving excess revenue proceeds during periods of high oil prices is to build up a buffer to tap into as oil prices fall. However, without a sufficient buildup of financial assets as a precautionary liquidity cushion, it might not be feasible to finance the non-oil deficit if prices drop below the reference price, as this would require excessive recourse to domestic financing (given the limited access to external credit). Arguably, this could call for a large upfront fiscal adjustment, so as to achieve a quick accumulation of financial assets, rather than a gradual shift toward the targeted fiscal stance. However, the swift scaling back of expenditure programs is likely to be politically more difficult. The best a credit-constrained country can do then is to target a gradual reduction in the non-oil primary balance, eventually building up a precautionary cushion of financial assets.

One issue that is likely to cause some discussion is the treatment of capital expenditure. Barnett and Ossowski (2002) provide two ways to think about capital expenditure in the context of a fiscal rule: (i) as productive investment generating a financial return; and (ii) as a consumer durable generating social welfare. In the first case, by including capital assets in the government's net worth, the government faces a portfolio choice between converting oil assets into financial or physical assets. If a capital project has a higher return (in the form of

[19] For example, in 2002 the budget deficit was partially financed by drawing down government deposits, including the excess proceeds account, even though oil prices were at a level well above the reference price in the budget.

increased future tax revenue) than the financial asset, it would be justifiable to convert oil or financial assets into physical assets. However, this decision would be separate from any fiscal rule. It is probably rare, though, for government investment to generate sufficiently high financial returns to meet this requirement. In the second case, capital spending is seen—in a perhaps more familiar manner—as generating a flow of social benefits. If the capital stock is at a suboptimal level, this could provide a rationale for initially higher deficits until the capital stock reaches its desired level.

In Nigeria a case could be made that the public sector capital stock is below the level required to provide sufficient social benefits for a growing population. This would certainly provide a strong rationale for changing the composition of expenditure toward capital projects with a high social return, particularly rehabilitation and maintenance. It may also be politically difficult for the government to accumulate financial assets unless existing economic and social development needs are met. However, exempting capital expenditure from the binds of a fiscal rule is likely to lead to attempts to reclassify other spending as capital expenditure. Creative accounting, therefore, could be used to circumvent the fiscal rule. Arguably, it would therefore not be advisable to treat capital expenditure outside any fiscal rule, but rather to complement the rule with efforts to improve the resource allocation in the budget.

Implementing a fiscal rule is likely to prove less effective unless the fiscal adjustment required is shared between the federal and subnational governments. This will require a mechanism through which the subnational governments can save their share of excess revenue when prices are high, and draw on these when prices are low. One possibility suggested in the draft Fiscal Responsibility Bill, which was recently prepared by a federal government working group, is to set up separate subaccounts corresponding to each level or unit of government where excess revenue proceeds can be saved. To convince state and local governments that their savings will not be lost in the federal system, it will be important to establish a credible fiduciary setup. However, it will be equally important to ensure that the subnational governments will not be able to prematurely tap into their saved funds in contravention of the fiscal rule. This is likely to require that the administration of the savings accounts be undertaken by an independent, but accountable, institution.

A decision will also have to be made on where to keep the oil savings. One might think that oil savings should be invested domestically to boost the local economy. However, there are convincing arguments why it is better to save oil revenue abroad. From a stabilization point of view, the government will draw on the savings account to finance the budget when faced with a temporary oil revenue decline. This is likely to result in large fluctuations in the balance of the savings account. If this was kept domestically, the volatility would therefore be transmitted to the financial sector. There is also a need to invest in sufficiently liquid assets that may not be readily available domestically. Moreover, keeping the oil savings abroad will automatically sterilize the monetary impact of the oil savings.

C. Simulations

To illustrate the impact of a policy rule, a number of simple simulations have been carried out. These present different medium-term scenarios comparing a baseline projection (a no-rule case) assuming that expenditure will be fully driven by revenue developments—in other words that the full resource envelope will be spent every year—with two alternative cases in which a fiscal policy rule would be fully adhered to starting in 2003.[20] The main purpose is to illustrate the performance of the two fiscal rules under oil volatility, particularly price-related, rather than forecast future revenue with any attempt at precision. This is simulated by constructing a hypothetical oil price path replicating oil price movements over the past 14 years, albeit starting at the actual level of oil prices in 2002.[21] Similarly as for the long-run simulations, the base case scenario is compared to various price and production scenarios. A description of the simulations and the detailed results can be found in Appendix III.

The results from the simulations of the fiscal rules are presented in a summarized form in Figure 4 for the base case price scenario. In the no-rule case there is substantial expenditure volatility driven by revenue movements, which leads to a highly fluctuating non-oil primary balance. In contrast, applying any of the fiscal rules result in much more stable expenditure paths, and as parameterized at a lower aggregate level as well. This is reflected in the stable non-oil primary balances over the medium term under the two fiscal rules. However, the overall balance is highly fluctuating when following a rule as the financing composition of the non-oil primary deficit changes between current oil revenue and past revenue saved. Without a rule the overall budget will be broadly balanced as all revenue is spent each year, illustrating the shortcomings of assessing the fiscal stance in oil-producing countries solely based on the overall balance.

In the high-price scenario (see the tables in Appendix III for details), all the windfall gains will be spent in the no-rule case resulting in a higher expenditure path, whereas under either of the policy rules, the expenditure paths will be unchanged (in nominal terms). The higher expenditure will substantially worsen the non-oil primary deficit in the no-rule case, whereas this is unchanged under the two policy-rule cases. Looking at the overall balance, under both fiscal rules a larger surplus will be maintained over the simulation period as excess oil revenue is saved. In contrast, under the no-rule case, despite the high oil prices, no substantial fiscal surpluses will be generated (as it is assumed that the full resource envelope is spent every year).

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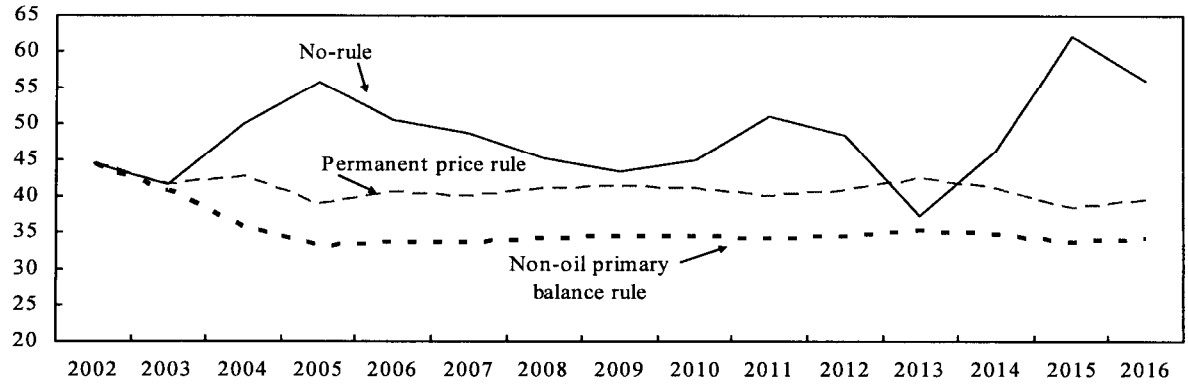
[20] The rules will be simulated under three different price scenarios (the base case price projection in addition to a high and a low price scenario) and an alternative low production scenario.

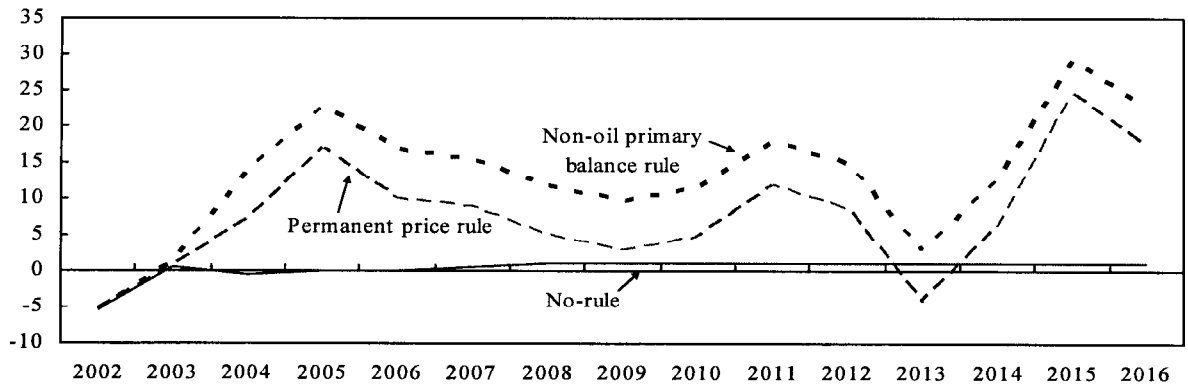
[21] While this does not pretend to be a credible medium-term oil projection, it does conveniently capture the extent of oil price volatility that is also likely to affect the Nigerian economy in the future.

Figure 4. Nigeria: Fiscal Policy Rules, Base Case Price Scenario, 2002-16
(In percent of GDP)

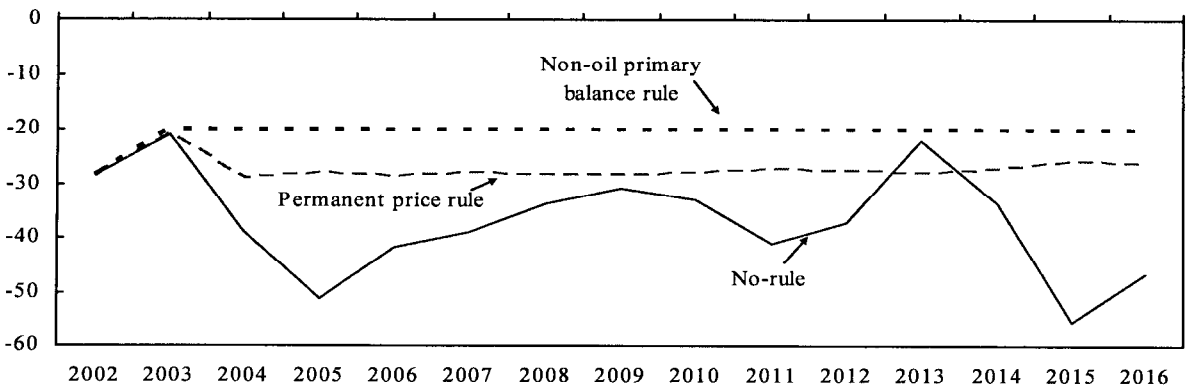
(i) Total Consolidated Expenditure



(ii) Overall Balance



(iii) Non-oil Primary Balance 1/



Source: IMF staff projections.
1/ In percent of non-oil GDP

In the low-price scenario, expenditure in nominal terms has declined in the no-rule case reflecting the lower oil revenue. In contrast, the expenditure paths under either of the two fiscal rules are unchanged in nominal terms, implying an unchanged non-oil primary balance.[22] The policy rules change the fiscal stance from pro-cyclical to counter-cyclical (or at least neutral). The implication of following either of the fiscal rules in the scenario with lower prices, however, is the need to finance a larger overall deficit. When introducing a rule, the ability initially to implement this in a fully symmetric fashion may therefore be restricted without having built up a sufficient financial cushion.

While both policy rules are quite effective at insulating the budget from oil price volatility, the behavior with regard to production changes is different. In the low-production scenario, assuming that production will be 10 percent lower than in the base case, following a permanent price rule will require additional expenditure cuts. This illustrates that large and sustained changes to the production assumptions will require exogenous changes to the parameterization of the price-rule. The non-oil primary deficit rule, on the other hand, will automatically reflect all changes to oil revenue.

Following either the permanent price rule or the non-oil primary balance rule reduce the volatility of expenditure, and as parameterized also the average level of expenditure. Under all three price scenarios, the average non-oil primary deficit is 27 percent of non-oil GDP (given current production assumptions) following the permanent price rule, and 20 percent following the non-oil primary balance rule. This compares with an average non-oil primary deficit of 30–43 percent of non-oil GDP across the different scenarios without a rule.

VI. Complementary Reforms

A. Budget Formulation and Execution

Introducing a fiscal rule will require complementary reforms to strengthen the formulation and execution of the budget. Key actions in the budget preparation and approval process include: (i) increasing the realism of cost estimates; (ii) strengthening and codifying the coordination between key players in the budget formulation and approval process; (iii) engaging a macroeconomic unit fully in the budget preparation; (iv) integrating the recurrent and capital budgets; and (v) developing procedures for a more proactive budget monitoring. As the budget formulation process is improved, the government could eventually consider moving toward a more comprehensive medium-term expenditure framework.

To improve expenditure management and the quality of fiscal data, the following actions could be taken: (i) strengthening cash management practice; (ii) consolidating the automation of the budget execution procedures; (iii) designing a system to monitor and control

[22] Relative to GDP, the expenditure share and the non-oil deficit are higher as nominal GDP has fallen with the lower oil prices.

expenditure arrears accumulation; (iv) enforcing payroll controls; (v) facilitating the preparation of timely audits of government operations; and (vi) strengthening the reporting of fiscal operations by subnational governments. However, while the positive role of a fiscal rule will be enhanced by expenditure management reforms, these can be introduced in parallel.

B. Fiscal Federalism Reform[23]

A major challenge for the formulation of a fiscal policy rule in Nigeria is how to involve the subnational governments. Under current revenue-sharing arrangements, the budgets of the state and local governments are heavily affected by oil revenue uncertainty and exhibit substantial procyclicality. Therefore, the effectiveness of a fiscal rule in stabilizing expenditure will be enhanced by involving subnational governments. Ideally, one would seek to fully decouple the expenditure programs in the state and local governments from revenue volatility. This could be achieved by replacing the current revenue-sharing arrangement by a system of more stable transfers from the federal government to the subnational governments.[24]

However, substantive changes to intergovernmental arrangements in Nigeria may become politically contentious, given the current mistrust among different levels of government (and between the executive and the legislative arms of the federal government). If the political constraints are large, consideration should be given to implement less ambitious, second-best options. This could require looking for ways whereby subnational governments can participate in a fiscal policy rule, without reforming the current revenue-sharing arrangement; for example, by having individual (sub) savings accounts such as suggested in the draft Fiscal Responsibility Bill. If subnational governments were to adhere to a fiscal rule, that would also go a long way toward ensuring a stable and predictable resource transfer between the federal and subnational governments.

C. Oil Funds

Often the discussion of stabilization efforts in oil-producing countries focuses on the role of oil funds.[25] Arguably, however, the institutional question of whether or not to have an oil fund is secondary to the need to adhere to a credible fiscal policy rule. On the one hand, an oil fund in itself is not a fiscal rule, and it does not place formal restrictions on the conduct of

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[23] For a recent discussion of intergovernmental issues in Nigeria, see McDonald (2003).

[24] As states already collect most personal income taxes and local governments collect property taxes, there is limited scope to increase further their own-source of revenue. However, Ahmad and Singh (2003) argue in favor of developing a system of stable and predictable transfers linked to the provision of minimum expenditure standards across regions.

[25] International experience with oil funds is mixed. Research suggests that an oil fund is no panacea for oil-related ills, and no substitute for a prudent fiscal policy (Davis and others, 2001).

fiscal policy. On the other hand, any fiscal rule will require some mechanism for saving and investing, preferably externally, the excess revenue proceeds. The relevant question really is whether the establishment of an independent oil fund can provide an institutional setup that will foster more transparency and strengthen the commitment to the fiscal rule more than a situation where, for example, the central bank administers a savings account.

A case of an oil fund that, in principle, could provide such institutional support for a fiscal rule would be one that would receive all oil revenue and transfer to the budget the revenue consistent with the rule. Any excess oil revenue could then be saved in the oil fund, ideally with a clear determination as to the unit of government to which the savings "belonged." For this setup to be effective, the oil fund should not have its own expenditure program and it should be the only source of financing for the budget.[26] However, the creation of such a fund would need to be supported by stringent transparency, fiduciary, and accountability mechanisms.

D. Hedging

It has been suggested that one way to avoid the destabilizing impact of oil revenue fluctuations on the budget is for a country to hedge its oil revenue on international capital markets (Daniel, 2001).[27] While in principle an attractive proposition, in practice there may be some challenges implementing this. For a country with most of its oil revenue in the form of physical oil production (either from production sharing or through equity ownership), the national oil company could indeed be expected to have a hedging program in place. This really should be a commercial decision assessing the extent to which hedging is feasible and desirable.[28] But, since private sector participants are typically engaging in the hedging of their sales, the government is already benefiting indirectly from hedging at least as far as it is taxing those participants. Ultimately, the costs involved may also be difficult to justify against competing budget demands.

VII. Conclusion

A fiscal rule is no panacea for all fiscal-related ills in Nigeria; unless a rule is supported by measures to strengthen the quality of spending, addressing corruption and transparency issues, little real improvement will be achieved. In an environment where credibility has been undermined by past fiscal profligacy, however, a fiscal rule as a critical component of a

[26] Nigeria had a mixed experience with the Petroleum Special Trust Fund, which (during 1995–2001) used earmarked revenue from domestic crude receipts to execute its own expenditure program outside the federal budget.

[27] Using the same hedging instruments that oil companies are applying. See Kessler (2002) for a description of the energy derivatives market.

[28] Particularly for large producers, it may not be feasible to hedge a meaningful part of their oil production.

broader reform strategy could provide a strengthened framework for fiscal policy. An appropriate fiscal rule will require some oil revenue to be saved to ensure long-run fiscal sustainability, including satisfying to some extent intergenerational equity objectives. But more pressing in the short run, is the need for a rule to decouple the execution of the expenditure program from oil revenue volatility and so reduce the procyclicality in the budget. This will require sufficient precautionary savings to build up financial assets in periods with high oil prices that can be used to finance the desired expenditure programs when oil prices are low. An important issue will be the establishment of a proper savings mechanism that, ideally, would extend to all levels of government.

The choice of a specific fiscal rule will need some consideration. Targeting a constant non-oil primary deficit may be conceptually superior because it will decouple the budget from all sources of oil revenue volatility, while a permanent price rule will only decouple the budget from oil price volatility. Nevertheless, a price-based rule has the advantage of simplicity. Arguably, insulating the budget from swings in the oil price would also constitute a substantial improvement over the current situation, although it would still leave room for further refinements. Given the current expansionary fiscal stance, it will be possible to implement a rule only gradually. Moreover, until sufficient financial assets are accumulated, it may be realistic initially only to adhere to a rule in an asymmetric manner, whereby any decline in oil prices below the reference price would require offsetting expenditure adjustments.

In order for any fiscal rule to be effective, broad-based political support for it must be built up. It is encouraging that President Obasanjo in his 2003 budget speech announced the government's intention to establish a fiscal rule. But one also needs to better understand the nature of the obstacles that have been preventing Nigeria from adhering to the fiscal rule that, in principle, already underpins its budget. Perhaps instituting a more formally binding fiscal rule could help to overcome these obstacles, which are likely to be political in nature and hinge on relations between the federal and subnational levels of government. The preparation by the federal government of the draft Fiscal Responsibility Bill could be a step in that direction.

The extent to which intergovernmental reforms can be agreed upon to support a fiscal rule is unclear. Undoubtedly, getting political agreement on a rule across all levels of government will be a challenge. There are clear benefits also to subnational governments from participating in a rule, however, particularly from replacing a volatile revenue source by a more stable and predictable resource transfer. The draft Fiscal Responsibility Bill includes a mechanism to transparently save excess proceeds at various levels of government. This mechanism would increase the confidence of the states contributing to a fiscal rule that their savings accumulated during times of high oil prices could be drawn on during times of lower oil prices and, hence, increase the likelihood that they would agree to participate in a rule.

I. Measures of the Fiscal Balance

Assessing the fiscal stance in an oil-dependent economy require looking at several fiscal balances simultaneously. Simply focusing on the overall balance in isolation can be misleading. However, each measure of the fiscal balance has its merits:

The **non-oil balance** is an important measure of the fiscal stance. It approximates the domestic demand impact of fiscal activities. Since increases in oil revenue do not reduce domestic demand (in contrast to increases in non-oil taxes) they can justifiably be excluded. Government expenditure, however, has an import component, and, therefore, this is only an approximation.

The **non-oil primary balance** (the non-oil balance excluding interest payments and receipts) may better reflect the discretionary effort of fiscal policy. This is also a key concept for the sustainability assessment. As financial assets are accumulated, the fiscal balance including interest payments and receipts would improve as interest earnings are increasing. Therefore, adjusting the fiscal balance for interest payments and receipts is necessary to see the underlying non-oil fiscal balance.

The **overall balance** is important when measuring financing needs and the associated fiscal vulnerability. With a policy rule, swings in oil revenue would change the financing mix of the expenditure program (from oil revenue to other sources of financing, and vice versa). But changes to the overall balance and the associated financing needs also provide a measure of the vulnerability of the budget to exogenous changes, including changes in the oil market and investor sentiment.

The example below illustrates a hypothetical case of a large positive oil revenue shock that seemingly improves the overall balance (hence tightens the fiscal stance); eliminating the deficit is assumed to reduce the financing needs and hence lower the interest payments. However, as part of the oil windfalls is spent, the non-oil balance deteriorates; arguably a more proper reflection of the now more expansionary fiscal stance, despite the improvement registered in the overall balance.

	Prerevenue shock	Post-revenue shock	Difference
Total revenue	100	150	+50
Oil	75	125	+50
Non-oil	25	25	--
Total expenditure	120	150	+30
Interest payments	30	25	-5
Overall balance	-20	0	+20
Primary balance	10	25	+15
Non-oil balance	-95	-125	-30
Non-oil primary balance	-65	-100	-35

II. Assumptions for the Long-Run Simulations

The long-run fiscal stance is simulated under four different scenarios for the oil and gas sector in 2002 constant prices (Table 2). The base case scenario projects an illustrative path for future oil and gas production assuming that the current proven reserves of oil and gas will be exhausted by the year 2045.[29] However, as the proven reserves of oil under these assumptions will be exhausted by 2033, sustaining this level of production requires full development of the currently underutilized gas reserves as a substitute for oil (as also is reflected in government policy). This production scenario is then replicated under three different sets of oil price assumptions. The base case assumes a long run oil price in real terms of US$20 per barrel. Two simple alternative price scenarios are presented: a low case scenario with the long run price US$4 dollars below this level; and a high case scenario with the long run price of oil US$4 above.

In calculating the optimal consumption out of nonrenewable resources, the initial focus would be only on the proven reserves of oil and gas. However, when there may be large probable or potential reserves (including undeveloped offshore gas), greater uncertainty will affect the simulations. Since new discoveries will increase the net worth of the government and hence allow it to run higher non-oil deficits over the long run, any calculation based only on proven reserves may result in a suboptimal long-run fiscal policy stance. In principle, any new discoveries would require a reassessment of the optimal long-run fiscal stance. To illustrate this, a (conservative) high case production scenario is included, where it is assumed that new finds over the medium term will increase the stock of oil and gas reserves by about 9.8 billion barrels. This allows for a higher annual production, particularly over the 2021–45 period, with an average long-run production of 3.6 million barrels of oil per day.[30]

In addition to oil-related variables, the determination of the sustainable fiscal stance is also dependent on other parameters, including the population growth rate (affecting the constant wealth per capita target) and the non-oil GDP growth rate (affecting the constant wealth to non-oil GDP target). The simulations will also be very sensitive to assumptions regarding the long-run real interest rate (assumed at 4 percent). The simulations could be developed further by, for example, applying Monte Carlo simulations to the interest rate and oil projections to get mean and standard deviations for the expected oil wealth estimate.

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[29] The stock of proven reserves in 2001 amounted to 24.0 billion of barrels of oil and 22.1 billion of barrels of oil equivalent in natural gas (see BP Energy Review, 2002).

[30] Alternatively, it could have been assumed that the new finds would have extended the period until the reserves were exhausted.

Table 2. Nigeria: Assumptions for Long-Run Fiscal Policy Simulations

	2002-10	2011-20	2021-30	2031-45	2002-20	2021-45	2002-45
Oil price (in 2002 US$ per barrel)							
Base case oil price	20.6	20.0	20.0	20.0	20.3	20.0	20.1
Low case oil price	16.6	16.0	16.0	16.0	16.3	16.0	16.1
High case oil price	24.6	24.0	24.0	24.0	24.3	24.0	24.1
Oil/gas production (in millions of barrels per day)							
Base case (production of proved reserves)	2.6	3.3	3.1	2.7	3.0	2.9	2.9
Oil	2.3	2.7	1.9	0.0	2.5	0.8	1.5
Natural gas (in terms of oil equivalent) 1/	0.3	0.6	1.2	2.7	0.4	2.1	1.4
High case	2.8	3.6	3.7	3.8	3.3	3.8	3.6
Oil	2.3	2.7	1.9	0.0	2.5	0.8	1.5
Natural gas (in terms of oil equivalent) 1/	0.3	0.6	1.2	2.7	0.4	2.1	1.4
Potential new gas and oil reserves	0.2	0.3	0.6	1.1	0.3	0.9	0.7
Population (in millions)	150	182	206	234	167	223	198
Population growth rate (in percent)	2.5	1.6	1.1	1.0	2.1	1.0	1.5
Non-oil GDP (annual real growth)	4.2	3.0	3.0	3.0	3.6	3.0	3.2

Source: IMF staff estimates.

1/ The million of barrels of oil equivalent is derived by multiplying the gas production in billion of cubic feet by 6.29 (BP Energy Review).

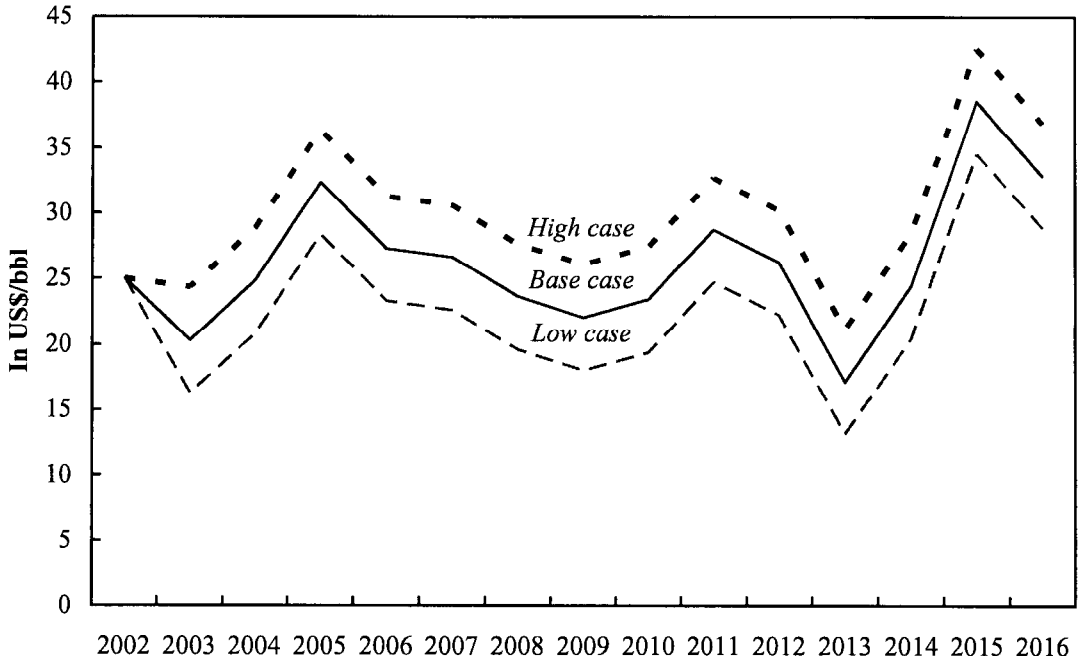
III. Simulations of Policy Rules

The **permanent price rule** is simulated by calculating a hypothetical oil revenue stream at an assumed permanent price of US$20 per barrel of oil. The expenditure path is then adjusted to achieve an overall balanced budget at the permanent oil price. In years when the realized oil price is higher than the permanent oil price, the excess proceeds are saved. These funds can then be tapped into in years when the oil price dips below the permanent price to reduce the need for expenditure adjustments offsetting the lower oil revenue. It is assumed that the deposits of oil revenue into the federation account are based on the permanent price instead of the realized price, with changes in discretionary federal expenditure closing the model, to achieve a balanced budget at the permanent oil price. In effect, this means that both federal and lower-level governments contribute to the fiscal adjustment by saving their share of excess proceeds.

The **constant non-oil primary deficit rule** is implemented by targeting a deficit of 20 percent of non-oil GDP. Transfers to the federation account (for revenue sharing) are adjusted every year to meet the targeted non-oil primary deficit. The same savings mechanism will be utilized as under the permanent price rule enabling the saved excess funds to be allocated according to the revenue sharing formula across the respective levels of government. The rule could also be implemented, however, by assuming that only discretionary federal expenditure is the adjusting variable. However, this would require substantial fiscal adjustment at the level of the federal government, which is unlikely to be feasible. It would also work counter to the objective of stabilizing expenditure. At the extreme, with high oil prices, this would require large reductions in federal expenditure to offset the automatic increases in spending at the subnational level.

The hypothetical price path for the medium-term is shown in Figure 5. To reiterate, this is a constructed price series with the intent to illustrate the impact of potential price volatility, rather than representing a necessarily realistic forecast for medium term oil prices. It is constructed by assuming that the price volatility experienced during the last 14 years will be replicated over the medium-run starting from the oil price level in 2002. In addition to the base case price scenario, two alternative high and low cases are simulated.

Figure 5. Nigeria: Hypothetical Oil Price Paths



Source: IMF staff estimates
Note: US$/bbl denotes U.S. dollars per barrel.

The results from the simulations under the various price and production scenarios are presented in billions of US dollars in Table 3. In nominal terms, the expenditure paths and non-oil primary deficits will be unchanged in the fiscal rule cases under all three price scenarios. In the low production scenario, however, the expenditure path and the non-oil primary deficit will adjust under the permanent price rule. The adjusting variable with a fiscal rule is the overall balance, reflecting the changes to the financing-composition of the non-oil primary deficit between current oil revenue and financial assets accumulated from oil revenue saved in the past. Presented in percent of non-oil GDP in Table 4, the non-oil primary balance under the fiscal rule cases remain the same in the different price scenarios. However, as oil GDP has changed reflecting the different price and production assumptions, the expenditure path relative to total GDP is different in the various scenarios (although, it is unchanged in nominal terms).

Table 3. Nigeria: Fiscal Policy Rules, Ilustrative Projections
(In billions of US dollars)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
1. Base case price scenario																
No rule scenario																
Total consolidated expenditu	19.1	17.6	22.6	27.5	25.0	25.1	23.3	22.6	24.2	28.9	27.7	20.8	27.5	40.2	36.3	25.9
Overall balance	-2.3	0.2	-0.2	0.0	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.2
Non-oil primary balance	-8.8	-6.9	-13.2	-18.3	-16.0	-15.9	-14.0	-13.3	-14.6	-18.8	-17.5	-10.8	-16.9	-28.6	-24.7	-15.9
Permanent price rule																
Total consolidated expenditu	19.1	17.6	19.2	19.2	20.0	20.7	21.1	21.6	22.1	22.7	23.3	23.7	24.4	25.0	25.6	21.7
Overall balance	-2.3	0.2	3.2	8.3	5.0	4.6	2.6	1.5	2.6	6.8	5.0	-2.3	3.7	15.8	11.3	4.4
Non-oil primary balance	-8.8	-6.9	-9.8	-10.0	-11.0	-11.4	-11.9	-12.2	-12.5	-12.6	-13.0	-13.7	-13.8	-13.4	-14.0	-11.7
Non-oil primary balance rule																
Total consolidated expenditu	19.1	17.3	16.2	16.4	16.7	17.4	17.6	18.0	18.5	19.3	19.7	19.7	20.6	21.9	22.2	18.7
Overall balance	-2.3	0.6	6.2	11.1	8.4	8.0	6.1	5.1	6.2	10.2	8.6	1.6	7.4	18.9	14.7	7.4
Non-oil primary balance	-8.8	-6.5	-6.8	-7.2	-7.6	-8.1	-8.4	-8.6	-8.9	-9.2	-9.4	-9.7	-10.0	-10.3	-10.6	-8.7
2. Low price scenario																
No rule scenario																
Total consolidated expenditu	19.1	15.1	19.9	24.8	22.2	22.3	20.4	19.7	21.2	25.8	24.5	17.6	24.2	36.8	32.8	23.1
Overall balance	-2.3	0.2	-0.2	0.0	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.2
Non-oil primary balance	-8.8	-4.4	-10.6	-15.7	-13.2	-13.0	-11.1	-10.3	-11.5	-15.7	-14.3	-7.6	-13.5	-25.2	-21.2	-13.1
Permanent price rule																
Total consolidated expenditu	19.1	17.6	19.2	19.2	20.0	20.7	21.1	21.6	22.1	22.7	23.3	23.7	24.4	25.0	25.6	21.7
Overall balance	-2.3	-2.3	0.5	5.6	2.3	1.8	-0.3	-1.5	-0.4	3.6	1.8	-5.6	0.3	12.4	7.8	1.6
Non-oil primary balance	-8.8	-6.9	-9.8	-10.0	-11.0	-11.4	-11.9	-12.2	-12.5	-12.6	-13.0	-13.7	-13.8	-13.4	-14.0	-11.7
Non-oil primary balance rule																
Total consolidated expenditu	19.1	17.3	16.2	16.4	16.7	17.4	17.6	18.0	18.5	19.3	19.7	19.7	20.6	21.9	22.2	18.7
Overall balance	-2.3	-1.9	3.6	8.4	5.6	5.1	3.2	2.2	3.2	7.1	5.4	-1.6	4.1	15.5	11.2	4.6
Non-oil primary balance	-8.8	-6.5	-6.8	-7.2	-7.6	-8.1	-8.4	-8.6	-8.9	-9.2	-9.4	-9.7	-10.0	-10.3	-10.6	-8.7
3. High price scenario																
No rule scenario																
Total consolidated expenditu	19.1	20.1	25.2	30.2	27.8	27.9	26.2	25.6	27.2	32.0	30.9	24.1	30.9	43.6	39.8	28.7
Overall balance	-2.3	0.2	-0.2	0.0	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.2
Non-oil primary balance	-8.8	-9.3	-15.8	-21.0	-18.7	-18.7	-16.9	-16.2	-17.6	-21.9	-20.6	-14.1	-20.2	-32.0	-28.2	-18.7
Permanent price rule																
Total consolidated expenditu	19.1	17.6	19.2	19.2	20.0	20.7	21.1	21.6	22.1	22.7	23.3	23.7	24.4	25.0	25.6	21.7
Overall balance	-2.3	2.7	5.8	11.0	7.8	7.5	5.5	4.5	5.6	9.9	8.1	0.9	7.0	19.2	14.8	7.2
Non-oil primary balance	-8.8	-6.9	-9.8	-10.0	-11.0	-11.4	-11.9	-12.2	-12.5	-12.6	-13.0	-13.7	-13.8	-13.4	-14.0	-11.7
Non-oil primary balance rule																
Total consolidated expenditu	19.1	17.3	16.2	16.4	16.7	17.4	17.6	18.0	18.5	19.3	19.7	19.7	20.6	21.9	22.2	18.7
Overall balance	-2.3	3.0	8.8	13.8	11.1	10.8	9.0	8.1	9.2	13.3	11.7	4.9	10.8	22.3	18.2	10.2
Non-oil primary balance	-8.8	-6.5	-6.8	-7.2	-7.6	-8.1	-8.4	-8.6	-8.9	-9.2	-9.4	-9.7	-10.0	-10.3	-10.6	-8.7
4. Low production scenario																
No rule scenario																
Total consolidated expenditu	19.1	17.4	22.1	26.8	24.5	24.6	22.9	22.3	23.8	28.3	27.1	20.7	27.0	39.1	35.4	25.4
Overall balance	-2.3	0.2	-0.2	0.0	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.2
Non-oil primary balance	-8.8	-6.6	-12.8	-17.6	-15.4	-15.3	-13.6	-12.9	-14.2	-18.1	-16.9	-10.7	-16.4	-27.4	-23.8	-15.4
Permanent price rule																
Total consolidated expenditu	19.1	16.2	17.7	17.7	18.5	19.1	19.5	19.9	20.4	21.0	21.5	21.9	22.6	23.2	23.8	20.1
Overall balance	-2.3	1.4	4.2	9.1	6.0	5.7	3.8	2.8	3.9	7.8	6.1	-0.6	5.0	16.5	12.2	5.4
Non-oil primary balance	-8.8	-5.4	-8.4	-8.5	-9.5	-9.9	-10.3	-10.6	-10.8	-10.9	-11.3	-11.9	-11.9	-11.6	-12.2	-10.1
Non-oil primary balance rule																
Total consolidated expenditu	19.1	17.3	16.2	16.4	16.7	17.4	17.6	18.0	18.5	19.3	19.7	19.7	20.6	21.9	22.2	18.7
Overall balance	-2.3	0.3	5.8	10.4	7.8	7.4	5.7	4.8	5.8	9.5	8.0	1.5	6.9	17.8	13.8	6.9
Non-oil primary balance	-8.8	-6.5	-6.8	-7.2	-7.6	-8.1	-8.4	-8.6	-8.9	-9.2	-9.4	-9.7	-10.0	-10.3	-10.6	-8.7

Source: IMF staff estimates.

Table 4. Nigeria: Fiscal Policy Rules, Ilustrative Projections
(In percent of GDP)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
1. Base case price scenario																
No rule scenario																
Total consolidated expenditu	44.4	41.6	49.9	55.8	50.6	48.7	45.1	43.3	45.0	51.1	48.5	37.3	46.3	62.0	56.1	48.4
Overall balance	-5.2	0.5	-0.4	-0.1	0.1	0.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.3
Non-oil primary balance 1/	-28.3	-21.1	-38.8	-51.1	-41.8	-39.0	-33.5	-30.8	-32.8	-41.0	-37.0	-22.3	-33.8	-55.5	-46.6	-36.9
Permanent price rule																
Total consolidated expenditu	44.4	41.6	42.5	38.9	40.6	40.1	41.0	41.4	41.1	40.1	40.7	42.4	41.1	38.5	39.6	40.9
Overall balance	-5.2	0.5	7.0	16.8	10.1	9.0	5.1	2.9	4.8	11.9	8.7	-4.2	6.2	24.4	17.4	7.7
Non-oil primary balance 1/	-28.3	-21.2	-29.0	-27.9	-28.8	-28.1	-28.4	-28.4	-28.1	-27.4	-27.6	-28.2	-27.5	-25.9	-26.4	-27.4
Non-oil primary deficit rule																
Total consolidated expenditu	44.4	40.7	35.8	33.2	33.8	33.7	34.2	34.5	34.4	34.1	34.4	35.3	34.8	33.8	34.3	35.4
Overall balance	-5.2	1.4	13.7	22.5	16.9	15.4	11.9	9.8	11.5	17.9	15.0	2.9	12.5	29.1	22.7	13.2
Non-oil primary balance 1/	-28.3	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.6
2. Low price scenario																
No rule scenario																
Total consolidated expenditu	44.4	37.2	45.7	51.9	46.3	44.4	40.5	38.6	40.3	46.6	43.8	32.1	41.5	57.7	51.6	44.2
Overall balance	-5.2	0.6	-0.4	-0.1	0.1	0.5	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.3
Non-oil primary balance 1/	-28.3	-13.5	-31.1	-43.6	-34.6	-32.1	-26.6	-23.9	-26.0	-34.3	-30.3	-15.6	-27.1	-48.9	-40.0	-30.4
Permanent price rule																
Total consolidated expenditu	44.4	43.3	44.0	40.1	41.8	41.2	42.1	42.4	42.1	41.0	41.6	43.3	41.9	39.2	40.3	41.9
Overall balance	-5.2	-5.6	1.2	11.7	4.7	3.6	-0.6	-2.8	-0.9	6.6	3.2	-10.2	0.6	19.5	12.2	2.5
Non-oil primary balance 1/	-28.3	-21.2	-29.0	-27.9	-28.8	-28.1	-28.4	-28.4	-28.1	-27.4	-27.6	-28.2	-27.5	-25.9	-26.4	-27.4
Non-oil primary balance rule																
Total consolidated expenditu	44.4	42.3	37.1	34.2	34.8	34.6	35.0	35.3	35.2	34.8	35.1	36.1	35.4	34.4	34.9	36.3
Overall balance	-5.2	-4.6	8.2	17.6	11.7	10.2	6.5	4.3	6.0	12.7	9.6	-3.0	7.0	24.3	17.6	8.2
Non-oil primary balance 1/	-28.3	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.6
3. High price scenario																
No rule scenario																
Total consolidated expenditu	44.4	45.6	53.9	59.5	54.7	52.8	49.5	47.9	49.5	55.4	52.9	42.2	51.0	66.1	60.5	52.4
Overall balance	-5.2	0.5	-0.4	-0.1	0.1	0.4	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.2
Non-oil primary balance 1/	-28.3	-28.7	-46.5	-58.6	-49.0	-45.9	-40.4	-37.6	-39.6	-47.8	-43.8	-29.0	-40.4	-62.1	-53.2	-43.4
Permanent price rule																
Total consolidated expenditu	44.4	40.1	41.1	37.8	39.5	39.1	40.0	40.4	40.2	39.3	39.9	41.6	40.3	37.9	38.9	40.0
Overall balance	-5.2	6.1	12.4	21.6	15.3	14.1	10.4	8.4	10.2	17.0	14.0	1.6	11.6	29.2	22.4	12.6
Non-oil primary balance 1/	-28.3	-21.2	-29.0	-27.9	-28.8	-28.1	-28.4	-28.4	-28.1	-27.4	-27.6	-28.2	-27.5	-25.9	-26.4	-27.4
Non-oil primary balance rule																
Total consolidated expenditu	44.4	39.2	34.6	32.3	32.9	32.9	33.3	33.6	33.7	33.4	33.7	34.6	34.1	33.2	33.7	34.6
Overall balance	-5.2	6.9	18.9	27.2	21.9	20.4	17.1	15.1	16.8	22.9	20.1	8.6	17.8	33.8	27.6	18.0
Non-oil primary balance 1/	-28.3	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.6
4. Low production scenario																
No rule scenario																
Total consolidated expenditu	44.4	41.8	50.1	55.7	50.5	48.5	45.0	43.2	44.8	50.7	48.1	37.5	46.1	61.3	55.5	48.2
Overall balance	-5.2	0.5	-0.4	-0.1	0.1	0.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.3
Non-oil primary balance 1/	-28.3	-20.3	-37.5	-49.1	-40.4	-37.7	-32.5	-29.9	-31.9	-39.6	-35.9	-22.1	-32.8	-53.3	-44.9	-35.7
Permanent price rule																
Total consolidated expenditu	44.4	39.0	40.1	36.8	38.2	37.7	38.4	38.7	38.5	37.7	38.2	39.5	38.5	36.4	37.3	38.6
Overall balance	-5.2	3.4	9.6	18.8	12.4	11.3	7.5	5.5	7.3	14.0	10.9	-1.1	8.5	25.8	19.2	9.9
Non-oil primary balance 1/	-28.3	-16.7	-24.6	-23.8	-24.8	-24.3	-24.5	-24.5	-24.3	-23.7	-23.9	-24.4	-23.9	-22.5	-23.0	-23.8
Non-oil primary balance rule																
Total consolidated expenditu	44.4	41.5	36.6	34.0	34.4	34.3	34.7	34.9	34.9	34.6	34.9	35.6	35.2	34.4	34.8	36.0
Overall balance	-5.2	0.8	13.1	21.6	16.2	14.7	11.3	9.3	10.9	17.1	14.2	2.8	11.8	27.9	21.6	12.5
Non-oil primary balance 1/	-28.3	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.6

Source: IMF staff estimates.

1/ In percent of non-oil GDP .

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