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THE EXPOSURE OF AFRICAN GOVERNMENTS TO THE VOLATILITY OF INTERNATIONAL OIL PRICES, AND WHAT TO DO ABOUT IT

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Paper by the UNCTAD secretariat

Executive summary

African countries, whether oil importers or exporters, are severely affected by the volatility of international oil prices. Governments see their budget revenue and expenditure fluctuate greatly. Projects started when oil prices were high are abandoned when funds dry up, because of price falls. Oil consumers, such as transport companies, are often squeezed between the pressure of higher prices, and the potential discontent of their clients if they raise tariffs. Farmers see their terms of trade deteriorate when transport costs increase.

Managing this risk exposure is no mean task. Trying to forecast prices is to no avail: the margin of error in price forecasts is so large that they cannot legitimately be used as a planning or budgeting tool. So how should Governments deal with this large risk exposure?

Traditional tools such as domestic stabilization funds have amply demonstrated their weaknesses. Compensatory finance, from the IMF or the World Bank, has rarely been available, and if provided has fallen short and come late. Other measures such as privatizing oil trade and adapting tax levels eliminate the risks for Governments, but not for their populations.

More innovative market-based tools, such as futures, options, swaps and commodity-price-linked loans, also have their limitations, but by and large, perform well. Access to these tools has much improved, particularly for Governments that can now use multilateral facilities. Developing country Governments and African banks and oil companies should learn about these instruments, and explore how they can be used to mitigate the negative effects of oil price fluctuations on their economies and populations.

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Introduction

1. Most developing country Governments face heavy exposure to oil price volatility, either on the export or the import side – and sometimes, both. In oil exporters, declining revenues arising from falling prices inevitably place an enormous burden on maintaining levels of services as well as servicing debt; but when oil prices are high, the economic rent and windfall in tax receipts are often wasted. In oil-importing countries, when oil prices rise above expected levels budget planners struggle to make up the increased spending, often further debilitating an already hard-hit private sector. This paper discusses the impacts of this exposure, and how African Governments, with assistance from the international community, can improve their management of oil price risk exposure (most of the discussion is of course also relevant for other developing countries).

2. This paper builds on UNCTAD's longstanding work in the area of oil trade, finance and risk management, which has been particularly focused on Africa. The analysis has benefited from discussions with participants in the African Oil & Gas Trade and Finance conferences, Africa's largest annual energy conferences, which UNCTAD has been organizing since 1996 (budget risk management is a standard part of the conference programme). Furthermore, many African Governments have provided at times extensive responses to a survey on oil price volatility management circulated for the purpose of this publication.

3. Poor budget planning is sometimes said to be the root cause of a Government's inability to manage the economy. Budget planning requires effective fiscal forecasts of the resources that will be available in the future and controlled expenditure to minimize potential imbalances. In developing countries, resources typically come from three main sources; revenues from exports of commodities, taxes and royalties. In the case of oil-dependent countries, the difficulty in forecasting revenues and costs as a result of oil price volatility limits the ability of budget planners to draw up budgets and control the risk of large budget deficits. Oil importers are faced with the temptation to increase taxes to absorb the impact of oil price increases, but with consumers already struggling with current prices, such increases only serve to increase the social burden. In many cases cutbacks in services and supports seem to be the easy way out, at the expense of the proper functioning of the economy.

4. This paper is divided into four chapters. Chapter 1 looks at the causes of oil price volatility, and its impact on African economies. Chapter 2 examines the traditional methods used in overcoming budget risk caused by oil price volatility, and the shortcomings of these methods. Chapter 3 explores modern financial instruments used in the energy industry for locking in prices and reducing price risk exposure. This chapter also looks at the obstacles that are faced in implementing market-based strategies for African countries and offers solutions for overcoming such obstacles. The chapter also recommends policy measures that Governments may wish to introduce. The paper concludes with a discussion of possible strategies for managing the oil price risk exposure in African countries. Six appendices (including four that give an extensive practical overview of how exporters and importers can use oil futures, options and swap markets) complete the paper.

Chapter 1

THE EXPOSURE OF AFRICA'S ECONOMY TO OIL PRICE RISKS

The volatility and unpredictability of oil prices

A.1 Development of oil prices and oil price volatility

5. Even when the industry was very small, price movements occurred with seasonal changes in demand. But such movements were small: from 1948 to 1970, for example, nominal prices fluctuated between $2.50 and $3 per barrel. But in the 1970s two major events changed the perception of price volatility. First, the 1973 Arab oil embargo as punishment for US support for Israel's reprisal attacks on Egypt and Syria in the war dubbed the "Yom Kippur War" raised prices fourfold to $12.00 (this is equivalent to $38 in 2004 dollars). The Arab nations' cut in production, totalling 5 million barrels, could not be matched by an increase in production from by countries. This shortfall in production, which represented 7 per cent of world production outside the USSR and China, caused shock waves in the market. Second, the Iranian revolution in 1979 decreased Iran's output by 2.5 million barrels of oil per day (MMBPD) and the war with Iraq a year later further aggravated the situation, with a loss on the Iraqi side of 2.7 MMBPD and 600,000 BPD on the Iranian side. Oil prices increased from the $14 reached after the first shock to $35 per barrel[1] (equivalent to more than $60 in 2004 dollars).

6. A delicate balancing act by the Organization of the Petroleum Exporting Countries (OPEC) stabilized prices in between these two oil crises, but attempts to stabilize prices after the turmoil of 1978/1979 were largely unsuccessful. Analysis by WTRG Economics attributed this failure to members of OPEC producing beyond allotted quotas, whereas Saudi Arabia, the swing producer, tried to stem the free fall of prices. In August 1985, the Saudis departed from the role of swing producer when production fell to very low levels and linked their oil prices to the spot market, and by 1986 had increased production from 2 MMBPD to 5 MMBPD. Prices came crashing down for the first time since the supply shocks in the 1970s and by mid-year oil prices were below $10 per barrel (in real terms, less than their level in the 1960s). OPEC struggled to buoy up prices, but events beyond its control kept prices volatile. The run-up to the Gulf War in 1990 caused prices to spike, but they fell again soon afterwards, maintaining a steady decline until 1994. A strong economic recovery in the United States and Asia boosted demand and prices climbed once more, but in 1997 the financial crisis in Asia caused economies in the region to grind to a halt. Demand slumped and the glut in oil production pushed oil prices down. The excess oil on the market kept prices low, to levels previously witnessed in 1986. A sudden pick-up in demand in 1999, along with production cutbacks by OPEC, changed the fortunes of oil exporters as prices soared, but they fell once again in 2001. Oil prices have since regained an upward momentum, climbing to record levels.[2]

A.2 Drivers of price volatility

7. In the latter part of the 1980s, a market-related pricing system that links oil prices to the market price of a certain reference crude, namely Brent, Dubai or West Texas Intermediate, was developed. Other varieties of crude in producing countries used these as

[1] See http://www.wtrg.com/prices.htm for the complete article on oil price history and its analysis.
[2] For a complete explanation to all peaks and troughs in oil prices between 1970 and 2003, see appendix 1.

marker crudes to price their products at a discount or premium, depending on the quality. This resulted in a truly international commodity that is vulnerable to any event that will affect the market fundamentals of supply and demand. Price volatility is thus triggered when market participants observe a disequilibrium in the supply/demand balance prevailing in the market on the basis of information received. Mabro[3] (2000) describes the information available to oil companies, traders, oil-exporting countries and so on about the key parameters – production, exports, demand and stocks – as so poor that the responses to this information, which are important determinants of price formation in futures exchanges and elsewhere, do not always relate to actual economic conditions. Differences in information assimilation among market participants have been the major cause of oil price volatility in the markets today.

8. Other factors such as crude oil inventories, widely believed to be a substitute for the underlying supply/demand balance, also play a part (and inventory levels have been reduced in recent years, partly as a result of just-in-time logistics, partly to reduce the costs and therefore improve the margins of refineries). A stock build-up is considered to be an indication of overproduction, which leads to a fall in current oil prices and is reflected in a futures market in a steeper contango.[4] This situation continues until additional storage required in building up stocks reaches unacceptably high levels. In a reversal where the market receives signals of underproduction, because stocks are extremely low, current prices rise and future prices in distant months fall. The link between crude oil prices and price volatility to OECD industry stocks is clearly established in the IEA May monthly report.[5] Lower stocks create a tight market, contribute to higher overall prices and increase price volatility. Research by Pursell[6] (2000) has also identified a relationship between petroleum inventories, crude and major refined products, with crude oil prices based on US stocks. Pursell's study suggests that the markets use inventory change as a leading indicator of the underlying supply-and- demand balance to determine oil prices.

9. When the OPEC cartel was formed, its guiding principle was to establish stability in the petroleum market and help oil producers receive a reasonable return on their investments. Its member countries agreed on a quota system to help coordinate its production policies, but attempts to stabilize prices within a price band relied on producers having to constrain supply to create a tight market, thus generating an economic disincentive to build stocks. While its members benefit from higher short-term prices, a tight market generates volatility and reduces the market's ability to respond to contingencies. Furthermore, disagreements on production quotas and members' mistrust have added to uncertainty and fuelled volatility.

10. Markets where futures exchanges exist also contribute to short-term price swings in the market. The variety of instruments available serves speculators who seek arbitrage opportunities. Mabro describes the availability of an array of instruments to traders enabling a small number of powerful and sophisticated players to operate squeezes or launch other operations that cause prices to move in directions that do not always reflect the actual state of the supply/demand balance. In an article published by the Asian Wall Street Journal,[7] a Washington-based energy consulting company, PFC Energy, estimated that the total value of crude oil futures contracts outstanding more than doubled to $26 billion during the last week

[3] Mabro R. Oil markets and prices, OIES Monthly Comment, August 2000.
[4] A market in contango is a situation where future prices are higher in distant months than in the present. When future prices are lower in distant months than in present, the market is said to be in backwardation.
[5] See IEA Monthly Oil Report. Prices, Stocks and Volatility, May 2003.
[6] Pursell D. Crude Oil Forecast 2000 and 2001, March 2000.
[7] Asian Wall Street Journal. Oil prices face slippery triggers in futures markets, 18 May 2004.

of April (2004) from $12 billion a year earlier. The US Commodity Futures Trading Commission attributes this to large speculative investors at the New York Mercantile Exchange holding four times as many "long" positions as they did "short" positions in crude oil futures and options. It is believed that hedge funds operating on the New York Mercantile Exchange (NYMEX) alone account for 22 per cent or 48 million barrels of the daily futures transactions of 200 million barrels a day, an amount that can easily distort the market price.[8]

11. Other factors that drive prices include the weather, short-term political developments, transportation problems (shipping, pipeline etc.), economic growth, problems along the production- consumption chain, and even comments by OPEC members and leaders of oil-producing countries, as well as demonstrations as witnessed in Nigeria, Venezuela and elsewhere. At times alarmist price forecasts also contribute to the public's uncertainty regarding future oil prices.

A.3 Does oil price volatility matter?

12. Mabro[9] (2000) points out that "trading requires volatility. Without it there would be no need to hedge and where there are no hedgers, there are no speculators". But volatility does not only serve trading interests. Mabro notes that “volatility disturbs governments of exporting countries as they rely heavily on oil revenues. Low prices lead to severe curtailment of expenditures, but such are the constraints of domestic politics that the axe does not always fall on the less worthy projects. High prices lead to demands for expenditure increases that are not sustainable in the long run. Price instability generates instability on a wide front: investments, human capital, corporate performance and the economic development of oil exporting countries.” Verleger[10] (1994) points out that the income of a producer or purchases of a buyer would generally be unchanged if selling or buying is done daily or a monthly basis. However, “banks and other credit institutions might reduce the amount of credit available to producers when prices become more volatile and the reduction in credit might in turn depress long term supply. Volatility might also become a policy concern if it could be shown that consumers were induced to make irrational investments to cut demand because prices have been more volatile.”

A.4 Unpredictability of oil prices

13. Analysts are faced with a wide range of scenarios that alter the supply/demand balance, which makes it almost impossible to forecast prices. It is typical to hear explanations of price movements after the movement has occurred, but seldom does one get short-term forecasts right. If forecasts are that difficult and most are spectacularly wrong, then why do people make them? The simple answer is that there is a demand for price-forecasting tools by Governments, oil companies, analysts, oil traders and the like. Oil companies hate unpredictability because not knowing what the price is going to be affects their ability to plan for future investments. Analysts and traders make a living out of forecasting and Governments rely on forecasts to determine policy and draw up budgets outlining their fiscal strategy for the year. Has forecasting worked?

[8] The Bangkok Post. Blame oil price hedges on the hedge funds.
[9] Mabro R. Oil markets and prices, OIES Monthly Comment, August 2000.
[10] Verleger P.K. Adjusting to volatile energy prices 1994.

14. In 1983, the California Energy Commission created a qualitative technique for forecasting oil prices called Delphi.[11] It operates through a selected international panel comprising experts from financial, academic, industry, consulting and government institutions who give opinions on future changes in oil prices and related economic variables in a series of questionnaires. The results of the panel are averaged and returned to the panelists, who are then given an opportunity to change their responses. The final results are then used as the basis for the Delphi oil price forecast. Table 1 shows the results of the 1997 Delphi IX forecast spanning 20 years into the future.

15. A comparison of previous Delphi forecasts with Delphi IX (see figure 1) shows a wide variation between estimates for surveys done in different years and covering similar periods. The variation may be explained by new information coming to light that did not exist before and also the prevailing sentiments of forecasters that are affected by transient events. Reviewing the worst-case scenarios of Delphi IX with actual values for recent years shows most forecasts to be wide off the actual values. The 2004 estimate, for example, deviates by as much as 65 per cent. There is no evidence of the Delphi technique still being employed in forecasting oil prices today.

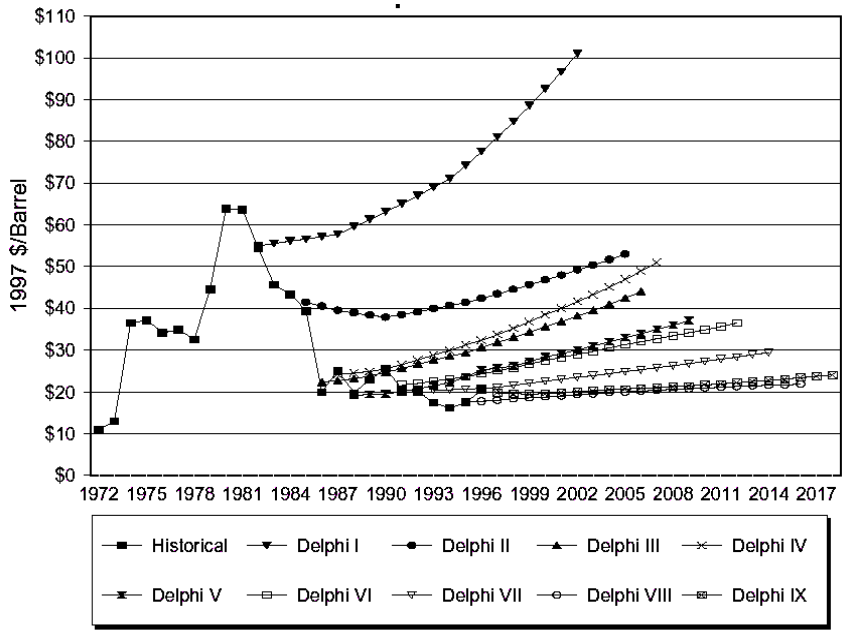
[11] For a full report see http://www.energy.ca.gov/reports/DELPHI-9.PDF.

Table 1. Delphi IX forecasts

Year	High ($)	Most likely ($)	Low ($)
1997	22.5	19.64	16.50
1998	22.57	19.07	15.98
1999	22.97	19.00	15.80
2000	23.42	18.88	15.93
2001	23.63	18.93	15.90
2002	23.99	19.27	15.86
2003	24.54	19.26	15.75
2004	25.19	19.49	15.43
2005	25.85	19.80	15.18
2006	26.54	20.01	15.09
2007	27.24	20.24	15.05
2008	27.76	20.55	15.01
2009	28.18	20.72	14.97
2010	28.62	20.90	14.93
2011	29.16	21.22	15.03
2012	29.72	21.57	15.15
2013	30.42	21.70	15.27
2014	31.15	21.83	15.39
2015	31.90	21.96	15.39
2016	32.68	22.09	15.32
2017	33.42	22.22	15.29
2018	34.09	22.36	15.26

Source: California Energy Commission.

Figure 1. A comparison of historical oil prices and Delphi forecasts (all forecasts are adjusted for inflation and compared with prices in a base year, 1997)



Source: California Energy Commission Delphi IX Forecasts.[12]

[12] http://www.energy.ca.gov/reports/DELPHI-9.PDF.

16. The Energy Information Administration (EIA) of the US Department of Energy in its Annual Energy Outlook, which is prepared to help Governments, industry and the general public understand the direction and trends of prices, produces its annual oil price forecasts on the basis of a modelling system. The model calculates the average annual world oil price on the basis of imported refiner acquisition costs, which is consistent with worldwide petroleum demand and supply availability and exogenous assumptions that are unknowns for many of the key inputs.[13] These assumptions, along with the error in the structure of the forecasting model, to a large extent determine the errors of the forecasts. Evaluation of the model performance conducted by the EIA Office of Integrated Analysis and Forecasting reveals the extent of errors in price forecasts and hence the difficulty in using forecast information for planning purposes.[14] Appendix 2 provides a detailed summary of AEO forecasts for the period 1998–2005 compared with actual historical figures and the percentage error.

17. Table 2 shows a comparison of projections from some of the industry's well-known forecasters with the Annual Energy Outlook 2004. Different methods and variables in models were employed by the forecasters, which gave rise to different forecasts – a further indication of the importance attached to information available and of perception differences among analysts. The AEO 2004 forecasts, for example, are based on composite US refiners' acquisition cost of crude oil, including transportation and fees, whilst some of the other forecasters based their forecasts on the spot price of West Texas Intermediate (WTI), Brent or a basket of crude oils. Whilst most of the forecasts remain within the AEO 2004 wide, low and high range, the budget planner is faced with a dilemma as to which figure will be a realistic estimate to use. In Africa some country budget forecasts of oil prices for 2004 have deviated by as much as 60 per cent. This was shown in the UNCTAD 2004 survey of oil price volatility management. The Cameroon price estimate for budgeting, for example, was $23.925 but the realized price was $37.65. Morocco had budget estimates of $25 but ended up with a realized cost for its oil imports of $36.2. Petroleum product forecasts have had similarly wide deviations, as much as 50 per cent. Our survey reveals country forecasts for 2005 in the mid-$30 range, well below prices attained so far in 2005.

[13] http://www.eia.doe.gov/oiaf/aeo/overview/international.html.
[14] For a full survey, see http://www.eia.doe.gov/oiaf/analysispaper/tables2_18.html.

Table 2. Forecasts of world oil prices, 2005–2025
(2002 dollars per barrel)

Forecast	2005	2010	2015	2020	2025
AEO 2003	23.57	24.28	25.01	25.77	26.89
AEO 2004					
Reference	23.30	24.17	25.07	26.02	27.00
High price	31.16	33.27	34.23	34.63	35.03
Low price	16.98	16.98	16.98	16.98	16.98
G11	21.77	21.95	24.03	25.68	27.06
IEA	21.75	21.75	23.82	25.89	27.96
PEL	20.96	21.27	18.41	15.60	NA
PIRA	23.80	23.90	26.70	NA	NA
NRCan	22.57	22.57	22.57	22.57	NA
DB	18.13	18.03	18.41	18.16	18.26
EEA	20.99	20.33	19.84	19.36	NA
NPC	18.00	18.00	18.00	18.00	18.00
SEER	21.08	19.86	20.88	22.49	24.53
CGES	23.82	21.27	18.41	15.60	NA

NA = not available.

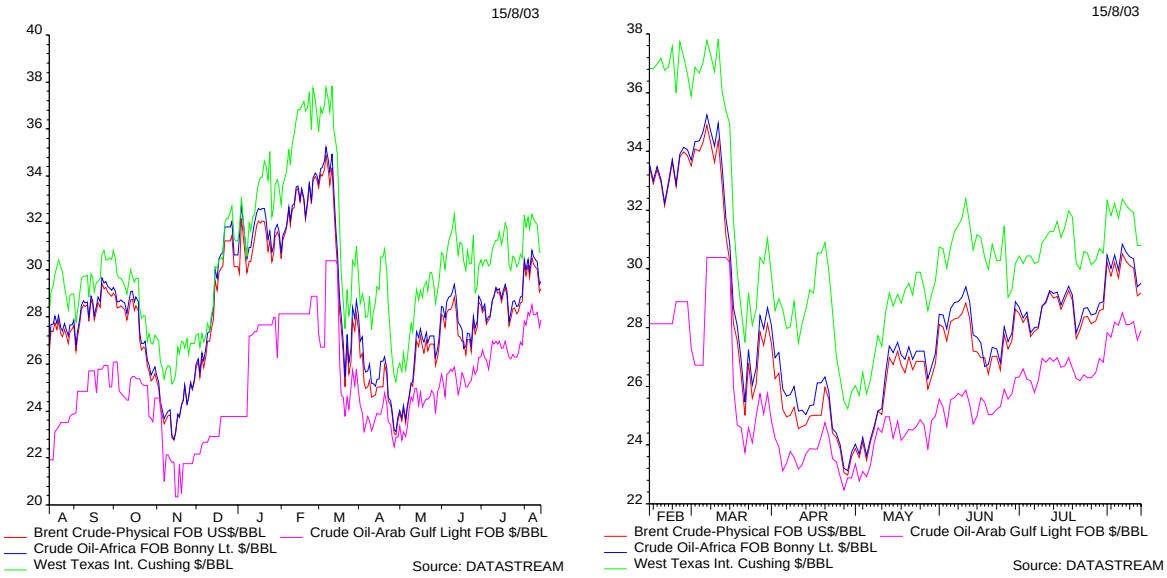
Sources: Energy Information Administration (http://www.eia.doe.gov/oiaf/aeo/forecast.html).
Global Insight, Incorporated (GII), the International Energy Agency (IEA), Petroleum Economics, Ltd. (PEL), Petroleum Industry Research Associates, Inc. (PIRA), Natural Resources Canada (NRCan), Deutsche Bank A.G. (DB), Energy and Environmental Analysis, Inc. (EEA), National Petroleum Council (NPC), Strategic Energy & Economic Research, Inc. (SEER) and Centre for Global Energy Studies (CGES).

18. The futures market has sometimes been used to provide projections of market prices, but research has shown limitations in its use. According to the Federal Reserve Bank of Cleveland, predicting 12 months into the future is too long for reliability and spot prices may be better in incorporating new information in forthcoming oil prices than future prices. The bank's research revealed that "the 12-month futures prices guessed only about 60% of the forthcoming movements correctly, but were somewhat more accurate at predicting declines than increases. The other futures prices performed no better."[15]

19. The forecasting of oil prices will always pose a challenge to those involved in the forecasting business whether it is done qualitatively, with models or using futures as a guide, principally because of unforeseen natural, political and economic events. The analysis is further complicated because different types of crude do not always move in parallel, and because the relationship between nearby and further-away prices is far from stable (see figure 3).

[15] http://www.findarticles.com/p/articles/mi_m0KFQ/is_2003_April/ai_101009840.

Figure 3. One-year and six-month chart of price fluctuations in major crude oils



Source: Datastream.

B. The nature of oil price risk exposure in Africa

20. Oil price movements are of major concern to Governments because of the potential economic impacts and the possible political consequences of not dealing with associated risks satisfactorily. For oil-producing countries poor price forecasts have contributed to underestimating revenue generated from crude sales, royalties and taxes on profits of petroleum companies and their subcontractors along with several other taxes. Movements in oil prices in oil-dependent countries have also seen the national currency/dollar exchange rate fluctuate. This combination of oil price risk and foreign exchange risk creates significant potential instability in earnings because of the volatile nature of both oil and foreign exchange markets.[16]

21. In 1998/1999 Africa's oil-producing countries in general showed a great reliance on revenues received from their oil industry (see table 3).

[16] Weiner R. Petroleum fiscal exposure. Presentation at 7th African Oil and Gas Conference in Angola, May 2003.

Table 3. Oil revenue as a percentage of total public sector revenue

Africa	Oil revenue as a percentage of total public sector revenue of selected oil-exporting countries (1998–1999 averages)
Nigeria	75.7
Angola	78.8
Congo	64.2
Algeria	58.4
Gabon	49.9
Cameroon	23.3

Source: IMF staff estimates.

This situation has worsened for almost all African oil-producing countries according to 2002 estimates compiled by the Catholic Relief Services from sources including the IMF, the CIA World Factbook 2002, the U.S. Department of State and the U.S. Energy Information Administration. (see table 4). However, adequate risk management programmes are not in place to mitigate their exposure. An oil price rise during the run-up to the 1991 Gulf War netted Nigeria $12.5 billion more than it had budgeted for in its annual budget.[17] Net oil export revenues in 2004 according to the EIA[18] are expected to top $27 billion, an increase of 29 per cent over the 2003 level of $20.9 billion. Often, increased revenue from high oil prices has dictated budget allocation for large public expenditure programmes in Africa and spending on non-tradable goods. The problem, however, has been the poor planning and selection of projects that are necessary for development, as exporters somehow believe booms are a permanent feature and fail to recognize the consequences of relying on imports. The impact is clearly shown in Nigeria's earlier encounter with the spending disease in the 1970s and early 1980s, when emerging export revenues were spent on the domestic economy, and on non-tradables particularly, increasing the relative prices of non-tradable goods and wages, and thus damaging the development of tradable goods (other than oil). Thus, Nigeria, a net exporter of agricultural products in the early 1970s, was importing more than $2 billion a year in foodstuffs a decade later.[19] The spending disease symptom features prominently in the economies of Africa's producers and has proved to be difficult to cure because of political factors.

Table 4. Oil dependence in African exporters
(2002)

Country	% GDP	% Exports	% Govt. revenue
Nigeria	40	95	83
Angola	45	90	90
Congo	67	94	80
Equatorial Guinea	86	90	61
Gabon	73	81	60
Cameroon	4.9	60	20

Source: Catholic Relief Services.[20]

[17] Nwanma V. and Scott N. Nigeria has oil but it's low on gas. 26 May 2004.
[18] http://www.eia.doe.gov/emeu/cabs/orevcoun.html#Venezuela.
[19] http://www.worldbank.org/afr/findings/english/find30.htm.
[20] Gary I. and Karl TL. Africa's oil boom and the poor. Catholic Relief Services. June 2003.

22. The high percentage contribution of crude revenue to total government revenue in Africa makes a downward slide of oil prices unwelcome news for oil-producing countries as they face huge income shortfalls. It hampers their ability to meet expenditure plans, causing countries to take decisions that shield their economies from low prices, including curtailing public services, reducing the government payroll, abandoning vital projects that contribute to development (e.g. electrification projects, schools, hospitals), reducing imports to offset oil revenue losses and finding ways in servicing external debt that more often than not has been based on a minimum expected revenue of oil exports.

23. In contrast, importers face less pressure on budgeted plans as the burden of purchasing energy requirements is reduced, but risk devastation of their economies when exposed to high oil prices. Debt repayment and the apprehension of default are a key risk concern to budget planners of oil-importing countries. Guillaumont[21] et al. consider the size of oil shocks with regard to budgetary resources to be the main cause of recurrent payment incidents in sub-Saharan Africa countries. As a consequence of high oil prices more money is spent on servicing debt than on basic services needed for the smooth running of the economy, because a country unable to service its debt obligations faces sanctions, a drop in country ratings on financial markets and more difficulty in obtaining external financing. Another concern associated with rising oil prices for importers is the unexpected extra expenditure for the acquisition of crude oil and petroleum products. The value of oil and oil products purchased by Ghana, for example, increased from $333.8 million in 1999 to $520.1 million in 2000[22] solely because of a jump in the average price of oil from $18 in 1999 to $30.8 in 2000. Similarly, the Common Market for Eastern and Southern Africa (COMESA) saw its oil imports increase from $9 billion in 2003 to $15 billion in 2004[23] because of oil price increases. For 2005, IEA officials estimate that the oil import bill of sub-Saharan Africa will reach $20 billion on the back of crude prices of more than $55 a barrel.[24] The higher energy bills for some of these countries that employ price controls either to stabilize the economy or reduce the burden on consumers pose an additional problem of government subsidies. The difficulty in keeping up with unexpected expenditure on petroleum products and maintaining subsidies has led to new debt, and staggering levels of debt repayment, huge budget deficits, depletion of foreign exchange reserves and balance-of-payments problems. International trade is also affected as imports are reduced to balance increased expenditure on petroleum products.

24. Budget shortfalls and the financial pressure on Governments caused by volatile oil prices create difficult times for politicians, who cannot afford to be unpopular by cutting back on expenditure plans or increasing taxes, especially in an election year. Instead, politicians are inclined to opt for short-term solutions so as to maintain popularity with the electorate rather than embarking on policies that ask for immediate sacrifices that help minimize long-term risks.

[21] Guillaumont P, Jeanneney SG, Jacquet P, Chauvet L and Savoye B. Dampening the vulnerability to price shocks: A role for aid. May 2003.
[22] Budget statement and economic policy for the 2001 financial year.
[23] Remarks of outgoing Chairman of COMESA (President of Sudan).
[24] UNCTAD's survey on oil price volatility in African countries revealed that some importers have budget expenditure estimates for 2005 below $40 a barrel and $400/MT (petroleum products) in spite of oil prices above these levels in 2004.

C. The vulnerability of countries to price shocks

25. Particularly vulnerable to high oil prices are government agencies operating large transport fleets that provide passenger and freight transportation. Fuel alone accounts for over 70 per cent of the variable costs in the transportation business. Therefore, a small rise in gasoline costs has a considerable effect on an agency's fuel procurement budget and threatens the delivery of much-needed services. Rail transport as an alternative to freight distribution would have helped lessen the burden of fuel consumption, but the poor state of Africa's rail infrastructure limits its use. Other forms of transport such as the airline business, where fuel constitutes the second largest expense after labour, and shipping lines, which play an important role in moving bulk of foreign trade, are also badly hit by rising oil prices. In general, sustained high oil prices erode the ability to manage price levels without transferring the cost to users as a surcharge. Transport-related problems are not limited to oil- importing countries but also affect exporting countries that happen to be net importers of refined products. In countries that have partly liberalized the transport sector there is an additional problem of public transport agencies having to compete with the private sector, which may be engaged in price risk management.

26. Half of Africa's refineries are government-owned, with procurement of crude inputs controlled by government agencies with little or no risk management strategies. Adverse price movements therefore cause huge procurement costs exceeding budgetary forecasts, which subsequently affect prices of refined products. Crude oil stocks have been used to help reduce the impact, but a country with a refinery production of 100,000 barrels a day and with crude oil stocks of 1.5million barrels has only 15 days of production during a sustained period of high prices. All new purchases are exposed to high prices on the spot market and, unless transferred to end users, become a government headache to subsidize as is currently done in many countries.

27. Africa's economy on the whole is very reliant on agriculture, with over 60 per cent of the working population actively engaged in the agricultural sector. Despite the prevalence of subsistence farming, there remain a significant number of large farms that grow cash crops and are operated by large corporations with a reasonable degree of mechanization. High energy prices raise production costs for these farmers because of the increases in prices of fuel to operate farm equipment, agricultural pumps and water irrigation systems, and because of higher costs of fuel-based supplies such as fertilizer. Other energy-intensive processes associated with farming also impact heavily on earnings. In Kenya, for example, tea farmers require five million litres of oil monthly to operate their boilers that provide steam for tea drying in 54 factories controlled by the Kenya Tea Development Agency (KTDA). The farmers lose Sh25 million ($320,000 dollars) on a monthly basis owing to rising oil prices.25 Also impacting on farmers in general is the cost of transportation of products from remote farming regions to urban areas, and similarly for landlocked countries to export points, as a result of fuel increases directly affecting freight rates. In effect, higher transport costs reduce the prices that they receive for their products, make their products uncompetitive in relation to imported goods and increase the prices for the products they buy and for the basic fuel, kerosene, which many of them use for cooking, lighting and heating.

[25] http://allafrica.com/stories/200410050597.html.

28. Fishing has changed over the years, in that local fishermen no longer rely on sails and wind direction to travel farther in search of fish. Many of Africa's local fishermen use diesel-powered motors to venture into deeper waters, scouring for better fishing grounds, and that has brought about an increase in the quantity and the type of fish caught. Unfortunately, in times of high prices, the high cost of key inputs such as fuel and lubricants for the outboard motors makes it impossible for fishermen to fill their tanks to undertake such expeditions, and this threatens their livelihoods.

29. Many electric utilities in Africa are run as State-owned monopolies, although privatization and restructuring have greatly reduced the burden of electricity generation and distribution. Countries at risk in relation to oil price increases are those that generate electricity by thermal methods using crude oil and others that depend on standby diesel barges and temporary generators for generating electricity. Cameroon, for example, uses 30 diesel stations as back-up power during extended droughts, and during Ghana's droughts of 2000/2001 a 30 MW plant was installed using light fuel for energy generation.26 Similarly, Nigeria acquired barges for electricity generation to ensure a stable supply of electricity. With a 3.4 per cent 27 annual electricity growth rate forecast for the period from 1999 to 2020, more demand will be placed on existing plants and standby generators reliant on petroleum products, but high oil prices threaten to impact on the provision of continued supply. In addition, the constraints of utilities in passing on high operational costs to consumers worsen their ability to provide decent services. The unpredictability of electricity supply has contributed to the slow economic growth of the continent.

30. Oil price volatility has caused many energy-intensive industries in Africa to cut back on investment because of the uncertainty surrounding expected revenues. Firms will invest money in purchasing new capital equipment or make investments in new technologies only if the expected return is greater than the cost of obtaining the funds needed to finance it. Investor decisions to purchase may therefore be suspended as a result of volatile oil prices, with a potential loss of market opportunities and inefficient long-run resource allocations. Investment decisions deteriorate further when consumer expenditure falls because of higher payments for petroleum products, thus resulting in less disposable income. Another energy-price-exposed industry is tourism: the costs of international flights are greatly affected by jet fuel prices, and if these are high, tourist numbers in countries such as Mauritius and the Seychelles, which are heavily dependent on tourism earnings, are reduced.

Macroeconomic impacts

31. Oil price jumps and drops are usually unexpected, and, when they are sustained, often lead to grave macroeconomic consequences for both oil importers and exporters. The large fluctuations in oil prices significantly impact on inflation, economic growth, exchange rate appreciation, balance of payments and benchmark interest rates.

D.1 Oil price and inflation/unemployment

32. High oil prices impact on the economy in two phases. In the first phase or "first round effects", the immediate higher price paid for energy pushes up the overall level of prices and translates into a higher cost of living. Faced with higher energy costs, companies cut down on energy use, and this results in a drop in workers' productivity. However, the drop

[26] http://www.mbendi.co.za/indy/powr/af/p0005.htm.
[27] http://www.mbendi.co.za/indy/powr/af/p0005.htm

in productivity is usually not accompanied by a drop in real wages and as a consequence employers opt for redundancy plans. Fluctuating oil prices have the added effect of creating instability in demand, thus stifling business investment, which in turn slows down the growth of re-employment.

33. The second phase or "second round effects" is triggered when the public's expectation of prices of goods and services unrelated to fuel oil use rises, thus affecting the core rate of inflation (i.e. excluding volatile energy and food prices). At this stage companies struggle to keep up with lower demand, and the higher costs of buying energy make it difficult for companies to operate. According to Toman,[28] researchers have shown that a sharp and sustained increase in energy prices could make fixed capital idle or prematurely obsolescent. As a result, the economy as a whole experiences a decline in economic growth and adjustment costs when producers and consumers change the bundles of goods and services they make or buy. The second round effects on inflation see businesses passing on higher costs to the public.

34. External borrowing also contributes to inflationary pressures in a country. Exporters borrow more on the basis of substantial increases in the public purse, whilst importers borrow more to survive high energy costs. In both cases the risk of high borrowing shows in the public deficits that it creates during periods of falling prices for exports. Guillaumont et al.[29] warn that "these deficits are difficult to absorb owing to the downward rigidity of expenditures, particularly in the case of wages and salaries. As a result, inflation and public indebtedness become a chronic problem." The risk of uncontrolled inflation is a great deterrent for potential investors.

D.2 Oil price and economic growth

35. The three major recessions that followed the oil price shocks of 1973, 1979 and 1985 have been attributed to changes in the world oil price. The effect of a price increase today on an economy is negligible if users believe that the increase will be short-lived, but when uncertainty kicks in, consumers change their preferences regarding purchases and business investments become more staggered with less focus on boosting productivity. In 2004, when prices rose to over $35 a barrel, IEA economists estimated that 0.5 per cent had been shaved off world GDP, equivalent to $255 billion, as a result of a year's sustained rise of $10.

36. For oil-importing developing countries with energy-intensive industries, the high consumption of oil to produce a unit of economic output magnifies the impact on GDP as compared with the developed countries, where efficient energy processes lessen the burden. The inability to substitute for alternative fuels or efficient use of fuels in general leads to higher production and transportation costs and higher consumer prices, which in turn lead to a fall in demand and less trade. According to the IEA,[30] "on the basis of IMF estimates, the reduction in GDP in the sustained $10 oil-price increase case would amount to more than 1.5% after one year in those countries". It further goes on to say, "The Sub-Saharan countries within this grouping, with more oil-intensive and fragile economies, would suffer an even bigger loss of GDP, of more than 3%".

[28] Toman MA. International oil security: Problems and policies. January 2002.
[29] Guillaumont P, Jeanneney SG, Jacquet P, Chauvet L and Savoye B. Dampening the vulnerability to price shocks: A role for aid. May 2003.
[30] International Energy Agency. Analysis of the impact of high oil prices on the global economy. May 2004.

D.3 Oil price and exchange rates

37. Oil-exporting countries experience a large flow of income when oil prices soar, but inappropriate measures to deal with the sudden inflow of foreign exchange can have harmful consequences on the nominal exchange rate – that is, the price of the domestic currency in terms of a key foreign currency. The petrodollars earned from a crude oil trade could be used to finance countries' imports, converted into local currency or simply put in a savings account. If it is decided to spend foreign exchange entirely on imports, the country's money supply or demand for domestically produced goods is not affected. Alternatively, the country may decide to convert foreign currency into local currency and spending on domestic non-traded goods. In that case, the choice of the country's central bank to float the currency (which is set in free markets by the laws of supply and demand) or fix the currency (that is the rate set by Governments as the official exchange rate) will ultimately determine what will happen to the nominal exchange rate.

38. "If the exchange rate is fixed, the conversion of the foreign currency into local currency would increase the country's money supply, and pressure from domestic demand would push up domestic prices. This would amount to an appreciation of the 'real' exchange rate – that is, a unit of foreign currency now buys fewer 'real' goods and services in the domestic economy than it did before. If the exchange rate is flexible, the increased supply of foreign currency would drive up the value of the domestic currency, which also implies an appreciation in the real exchange rate, in this case through a rise in the nominal exchange rate rather than in domestic prices. In both cases, real exchange rate appreciation weakens the competitiveness of the country's exports and, hence, causes its traditional export sector to shrink".[31] Many authors have described the effect of exchange rate appreciation as the "Dutch disease" following the Netherlands' discovery of natural gas, which caused the currency to appreciate significantly, in the process destroying the local industry's competitiveness as exports became more expensive and imports became relatively cheaper. This has far-reaching consequences in causing trade balances to deteriorate and the current account balance to widen.

39. When oil prices fall, the appreciated exchange rate becomes overvalued. Devlin and Lewin[32] draw attention to the possible loss of non-oil export markets in the agricultural, manufacturing and other sectors or even reviving these sectors if the real overvaluation is corrected by a subsequent depreciation. In addition, adjustments to the real exchange rate are unlikely to be smooth. The effect of large fluctuations in oil prices transmitted to the real exchange rate, as explained by Devlin and Lewin, "would result in large risk premiums in the non-oil sectors and thus depress investment in those sectors. This may cause a secular decline in productivity, resulting in lower rates of growth or stagnation on the non-oil sectors."

40. With regard to oil importers, an increase in expenditure on oil imports results in an increase in supply in the local currency, thus weakening the currency relative to foreign currencies. The weakened currency will increase the burden of payments and lead to balance-of-payments problems, as well as to a reduction in other imports and spending. When oil products are heavily subsidized, the effects on the budget become more pronounced, leading to increasing budget deficits and a widening balance-of- payments deficit. Unsustainable budget deficits lead to capital flight as the private sector becomes wary of an increase in taxes and inflation. Oil price increases have disrupted some of the World Bank's Structural

[31] Ebrahim-zadeh C. Too much wealth managed unwisely. Finance and Development. March 2003.
[32] Devlin J. and Lewin M. Managing oil booms and busts in developing countries. March 2004.

adjustment programmes in Africa as countries experience unanticipated financing requirements. In the light of this, supplemental credits were approved to mitigate the impact of unexpected oil price increases and other terms-of-trade losses (see box 1).

Box. 1 World Bank balance-of-payments support

"Mauritania (US$18 million): The value of petroleum products imports by the Mauritanian Government has risen rapidly, from US$46 million in 1998 to US$56 million in 1999. It is expected that for the year 2000, petroleum products imports will average around US$100.5 million, if oil prices remain in the range of US$30-35 per barrel. The financing will provide balance of payments support to help the government sustain their macroeconomic policies.

"Niger (US$12 million): The projected value of oil imports in the year 2000 is estimated at around US$39 million as compared to an original projection of US$18 million. This will increase pressure on the balance of payments which cannot be compensated by improving exports of other products such as uranium and agro-pastoral products. In such an environment, the poor are severely affected by the increase in the price of petroleum products which is used for domestic energy and transportation."

Source: World Bank, 2001.[33]

[33] World Bank. Press release no. 2001/183/AFR.

Chapter II

THE FAILURE OF TRADITIONAL METHODS IN STABILIZING BUDGET REVENUE AND EXPENDITURE

Stabilization funds

41. Frequent fluctuations in revenue make budget planning extremely difficult and make it almost impossible for coherent policies to be implemented. Therefore, to mitigate adverse effects when faced with oil price volatility, decision makers have a tendency to cut down on spending to meet budget projections; however, cutting spending sharply at short notice is costly. Davis[34] et al. point out that current expenditure cuts can be notoriously difficult and unpopular, and cutting spending might mean abandoning viable projects that are crucial to a country's development. It is hard to justify cutting services that provide for the basic needs of the people. Aware of the repercussions of spending cuts in an era of falling oil prices, countries often decide not to cut spending, but instead, borrow to finance the revenue shortfall. However, the resulting debts have often been unsustainable, and the logical response has been to save in times of favourable prices. This has been the inherent reasoning behind the formation of stabilization funds. Such funds are supposed to insulate government expenditure, revenues and repayment of debt from swings in oil price changes, with the secondary objective of maintaining fiscal discipline, thus avoiding monetary expansion, and controlling the excessive appreciation of the exchange rate.[35] Stabilization funds are, at least in principle, governed by rules that will transfer windfalls to the fund when oil prices are above normal and from the fund to the budget when prices are below normal.

42. Norway established a petroleum fund in 1990, when it became apparent that its long-run fiscal position was unsustainable. The falling output of crude oil meant that budgetary revenue was decreasing, whereas expenditure on pensions due to an ageing population was increasing, and thus a buffer was needed against drops in revenue. The Norwegian State Petroleum Fund (SPF) was designed to accumulate resources only if the central Government achieved an overall budget surplus, depending mainly on oil prices and the size of the non-oil budget deficit (which is defined as the overall fiscal balance excluding government oil revenue). Therefore, given that oil revenue accrues first to the budget, the decision about how much revenue to save is made every year through the budget process. In this context, the fund does not have specific rules for access to its resources, and this makes its operation flexible.[36]

43. The fund's capital is normally invested in assets that would yield a return, thus acting as a form of savings for the future. The Norwegian Government outsourced the management of the fund but issued specific guidelines for the management and choice of investment assets of the SPF. The background to the establishment of the Norwegian fund is explained in box 2.

[34] Davis J, Ossowski R, Daniel J and Barnett S. Oil funds: Problems posing as solutions? December 2001.
[35] Wakeman-Linn J, Mathieu P and van Selm B. Oil funds and revenue management in transition economies: The cases of Azerbaijan and Kazakhstan. 16 October 2002.
[36] Fasano U. Review of the experience with stabilization and savings funds in selected countries. IMF Working Paper. June 2000.

Box 2. Background to the establishment of the Norwegian fund

The Petroleum Fund provides a buffer against fluctuating revenues from the petroleum sector. It helps to buffer fiscal and monetary policy against variations in the oil price and in production volume, which may be substantial.

The Fund is the Government's instrument for transferring wealth from oil and gas reserves to a broad-based portfolio of international securities. This provides a better balance between expected return and the expected risk associated with overall asset management.

The Fund makes it possible to distinguish between using petroleum revenues and actually earning them. This in turn makes it possible to avoid abrupt shifts in the industry structure, such as we have seen in many other countries with substantial revenues from natural resources, and contributes to sustainable business and industry in the long term.

The Fund helps to maintain a balance by distributing the petroleum wealth across generations. Although Norway's petroleum wealth is being depleted, the return on the invested capital will benefit many future generations.

Source: Norges Bank.[37]

44. Countries that import crude oil/ petroleum products have also used the idea of stabilization funds to stabilize domestic retail prices of petroleum products so as to minimize the economic impact on consumers. The revenue accruable to the fund is from tax levies at the pump, which are used to subsidize the expenditure of refineries/suppliers/traders (in a deregulated market) during periods of high prices. Box 3 describes a fund operated by an African importer of petroleum products.

Box 3. The Namibian Energy Fund

Namibia is using a special account called a Slate Account, managed by the National Energy Fund (NEF). Currently, this account is being kept for the equalization of fuel prices and fuel subsidies in the far outlying areas (rural areas) of Namibia. It is being kept pursuant to an agreement between the Government of Namibia and the suppliers of the refined petroleum products for the purpose of determining, in accordance with a formula likewise agreed upon, the amount of compensation payable from time to time by the State to the suppliers of the refined petroleum products or by such suppliers to the State, as the case may be in respect of losses suffered or profit gained by such suppliers as a result of fluctuations in the purchase price of petroleum products. The Slate Account can experience an under-recovery and an over-recovery situation. In the case of an under-recovery, the State has to pay the suppliers of petroleum products, while in the case of an over-recovery, the supplier pays the State. The State's equalizing of the fuel price is taken care of by a levy, called the Equalisation Levy, imposed on consumers for every litre of the controlled petroleum products (diesel and petrol). This money is collected every month and kept in the NEF.

Source: Ministry of Mines and Energy, Namibia.[38]

[37] http://www.norges-bank.no/english/petroleum_fund/about/background.html.
[38] UNCTAD survey of oil price volatility management in Africa. February 2005.

B. Compensatory finance

45. The international finance institutions' mechanism of compensatory finance (explicitly called so in the case of the IMF, and implicit in the lending practices of the multilateral banks) is another possibility for insulating countries against a shortfall in export receipts or excessive import bills. When exports fall below a predetermined level, institutions such as the World Bank, the IMF and the African Development Bank (AfDB) allow countries to borrow on concessional terms to be repaid according to a previously agreed formula. Financing this deficit is intended to give a reprieve to the benefiting country that may face severe balance-of-payments problems because of oil price volatility. See box 4.

46. Compensatory finance schemes are also offered by exporting countries to importing countries. One such agreement is the San José Accord, whereby Venezuela and Mexico export oil to many countries in the Caribbean Basin region at concessionary rates. Under the terms of the accord the two nations are obliged to finance up to 20 per cent of the total bill for oil purchased by their neighbours.[39] The concessions have become less favourable, but in recent times the agreement has offered deferred payment on 20 per cent of the cost of the crude, to be made available to each Government concerned as a low-interest loan for development projects along with other contingencies.[40]

Box 4. The traditional approach: An example of "compensatory" World Bank lending

" World Bank helps African countries deal with oil price increases

Washington, December 22, 2000.The World Bank today approved a total of US$ 155 million in supplemental credits to assist seven sub-Saharan African countries mitigate the impact of unexpected oil price increases and other terms of trade losses. The increase in oil prices is jeopardizing the sustainability of ongoing reform programs in Madagascar, Mali, Mauritania, Niger, Rwanda, Zambia and Uganda.

"Supplemental credits are being provided to these countries because the oil price shock has led to an unanticipated increase in the financing requirements of the countries' adjustment programs. Real import levels will be lower than assumed in original program projections threatening the sustainability and objectives of the various reform programs, and having a severe impact on the poor in terms of rising costs of domestic energy and transportation."

Source: World Bank press release.[41]

C. Other methods

47. Some countries are able to manage exposure to volatile prices by buying oil/petroleum products directly from oil-producing countries or refineries through long-term fixed-price contracts. These are term contracts for selling fixed quantities of oil/petroleum products over longer periods at fixed stable prices based on quotes from an oil index or at an adjustable price that may include a ceiling price or a target price, or both.

48. Other price stabilization mechanisms such as buffer stock schemes have been proposed by many economists and used by countries affected by fluctuations in oil prices.

[39] http://cybercircle.org/downloads/oil%20accords.pdf.
[40] http://www.pcj.com/alliance_main.htm.
[41] World Bank. News release no. 2001/183/AFR.

These schemes take advantage of a market slump in prices to accumulate stocks and release the stockpile when prices are high. Stockpiling of oil reserves allows a country to determine and regulate its own oil consumption in times of price increases. Tapping into the reserves may also serve to reduce worldwide demand for oil. There would be no pressing need to revise budgets and buy at market prices during periods of high prices as the stockpile acts as a buffer. Oil exporters operating buffer schemes may stabilize their dwindling oil revenues when prices fall by waiting for a turnaround in prices and sell high to smooth the adverse domestic effects of fluctuations. Of course, such schemes are possible only for countries with large storage capacity and no financial constraints.

49. On the international front, supply management by OPEC has been seen to help through the allotting of quotas to member countries. When there is a glut in the market, quotas are decreased to decrease supply and boost prices, and the reverse occurs when there is a shortage and prices are too high. For example, OPEC's supply management helped stabilize world commodity prices during the 1990s, thus increasing returns and smoothing income to producers.

50. Government revenue is sometimes boosted through direct taxation on petroleum products to counterbalance extra expenditure on crude oil and refined products. There is no better time to carry out this highly unpopular political act than when oil prices are low and the money collected is quickly handed back in lower taxes elsewhere. When taxes are increased significantly it may also act as a way of reducing consumers' demand for petroleum products as they exercise caution in its use.

D. Why traditional approaches do not work

51. Oil stabilization funds have become popular tools for Governments to implement countercyclical fiscal policies that could potentially reduce the disruptive impact of a sharp drop in the price of oil, but operating such funds is not an easy task. "Policymakers need reliable estimates of the magnitude and duration of commodity price shocks when considering countercyclical stabilization policies. Although policy initiatives that smooth national income and consumption may be effective in the face of short-lived price shocks, long-lived shocks call for policies that enable countries to adjust to new income and consumption levels."[42] Oil prices are generally characterized by a random walk, do not appear to have a constant average and are not mean reverting. Forecasts are therefore unreliable for establishing price levels to save or spend. Furthermore, when price levels have been established, they are based on administratively set benchmarks that require large resource transfers in years of low prices. The international task force on commodity risk management in developing countries[43] attributes many failures to these administrative prices, often the outcome of political bargains that fail to reflect market fundamentals.

52. Davis et al. draw attention to the way oil prices behave, which helps explain why many domestic and international commodity price stabilization schemes collapsed during the 1980s and 1990s. When an oil fund is 1 per cent of GDP nobody asks too many questions. At 10 or 50 per cent of GDP, there are a lot of people asking questions (e.g. domestic interest groups, donors, bankers) and urging Governments to spend more, and the expenditures then turn out to be poorly planned. Whenever additional investments are needed in the economy for infrastructure, education and research, services and so forth, funds act as a ready source

[42] http://www.imf.org/external/pubs/ft/fandd/1999/09/cashin.htm.
[43] http://www.itf-commrisk.org/documents/dsp73.pdf.

since resources are fungible. Stabilization funds have an unfortunate history of acting as a capital source for deteriorating budget balances and not being used for the purposes for which they were set up. Daniel[44] 2003 argues that funds in general, unless accompanied by other policy actions such as expenditure restraint, do not stabilize government finances. This is because "governments can typically borrow finance expenditure while still meeting their obligations to the stabilization fund during times of "high" oil prices. Moreover stabilization funds will likely create duplications, overlaps, and inefficiency in the management of public resources, complete fiscal policy, and may foster poor governance and damage transparency."

53. As an example, Venezuela's dependence on oil is unrivalled in the Latin American region. In 2000 export revenue accounted for approximately 23 per cent of GDP, half of government revenue and 85 per cent of exports. Venezuela set up a macroeconomic stabilization fund in 1998 to act as a buffer against volatile oil prices, and it began operating the following year. After only two months in operation the rules for saving in the fund were changed. The executive in power was given the freedom to withdraw capital from the fund. After accumulating $4 billion in the first two years, the Government failed to make its obligatory deposits in the third year. Instead the funds were used as a source of finance for other budgetary obligations. "Venezuela's brief experience with its Macroeconomic Investment and Stabilization fund (known as FIEM) suggest that stabilisation funds are unlikely to be effective without a clear commitment to countercyclical fiscal policy."[45]

54. According to the Catholic Relief Services,[46] "no African oil producer has an effective stabilisation fund". However, if the funds are considered to be a viable option, Devlin and Lewin[47] suggest that "funds should be based on transparent integration into the budgetary process, to avoid off-budgetary spending. Parliamentary/legislative oversight should be included with the aim of preventing the executive from maintaining sole discretionary powers of the fund's resources." Skance[48] says that “Oil stabilisation funds seem to work best where oil does not dominate the local economy and where a long tradition of good governance and transparency both with respect to the government's fiscal policy strategy and operations of the central bank exists as in Norway". An examination of funds by Davis[49] et al. also shows that instead of minimizing the transmission of oil price volatility to fiscal policy by smoothing budgetary oil revenue, funds, "can complicate fiscal management, lead to an inefficient allocation of the government's total resources, and contribute to lack of transparency and governance problems". Many opponents of such funds argue that conditions prevailing in poor countries do not make managing easy since there is very likely to be a temptation to dip into funds. The stabilization fund is depletable in just the same way as the non-renewable resource is, and to make matters worse, the nature of oil price volatility makes it impossible to forecast when the fund will be exhausted. A country's fiscal plan cannot therefore depend on using the fund as a safety net for a shortfall in revenues. Davis et al. raise an interesting point from the empirical analysis of countries' experiences with oil funds. They say that, with or without an oil fund, government expenditure will have no relationship to earnings. Funds rather tend to have an adverse impact.

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[44] James DA. Hedging government oil price risk. International Monetary Fund, November 2001.
[45] Kay JS. A mixed blessing: Oil and Latin American countries. 2002.
[46] Gary I and Karl TL. Bottom of the barrel: Africa's oil boom and the poor. Catholic Relief Services publication. June 2003.
[47] Devlin J and Lewin M. Managing oil booms and busts in developing countries. March 2004.
[48] Skance M. Fiscal policy and petroleum fund management in Norway.
[49] Davis J, Ossowski R, Daniel JA and Barnett S. Stabilization and savings funds for non-renewable resources: Experience and fiscal policy implications. IMF Occasional Paper No. 205.

55. The drawback to compensatory finance is similar to that relating to stabilization funds, where adverse price shock can be prolonged periods of an upward rise in prices. IMF[50] research shows that even when shocks to commodity prices are relatively short-lived, the likelihood that the benefits of smoothing the path of domestic prices (given world commodity prices) will outweigh the costs of operating stabilization schemes or servicing external borrowing remains open to question. Another downside with compensatory finance is the unavailability of the loans when they are most needed. UNCTAD's meeting of eminent persons on commodity issues in 2003[51] proposed that this financing be linked to automatic payouts to specific occurrences and the easing of access in terms of technical requirements, among others, in order for such financing to be effective. During periods of favourable prices, as Daniel points out, "it is politically difficult to generate the corresponding surplus to repay the debt leading to solvency problems".

56. The storage strategy also has its limitations, including in terms of storage and financial capacity. Sustained high prices for oil will eventually diminish the stocks, and replenishing them will mean high financial costs worsened by the sharp fluctuation in currency values or other economic events.

57. Long-term fixed-price contracts reduce volatility, improve the predictability of cash flows and inject more certainty into budget plans. They also allow consumers to be allowed a fixed price over a long period. However, such contracts are becoming increasingly rare in today's volatile energy market. Nowadays, modifications to long-term contracts allow price adjustments to be made on the basis of market prices.

58. Finally, using the tax system as a domestic price stabilization tool (the exposure of the country as a whole remains) also has severe shortcomings. The government tax take is the most significant link between the petroleum sector and the rest of the economy and it is the mechanism by which the increase in the value of oil is translated into higher real income, and hence living standards, for the community as a whole. The problem with increased taxation on petroleum products is that it affects the poor most and often leads to demonstrations that demand higher subsidies which increase the burden on government spending plans. The knock-on effects may contribute to a general price rise.

[50] Cashin P, Liang H. and McDermott JC. How persistent are shocks to world commodity prices? IMF Working Paper No. 99/80.
[51] UNCTAD. Report of the meeting of eminent persons on commodity issues. TD/B/50/1, Geneva, 6–17 October 2003.

Chapter III

MARKET-BASED APPROACHES TO MANAGING OIL PRICE RISKS

A. Controlling financial price risk

59. The traditional price risk management mechanisms have achieved limited success in managing exposure to price shocks in the physical market. However, financial markets have created instruments that enable oil-exporting and oil-importing countries to reduce the revenue/expenditure uncertainty that arises from oil price volatility. The basic instruments commonly used are forwards, futures, swaps and options, but use of different instruments is not mutually exclusive and sometimes they are used in combinations such as caps, collars and floors, depending on the end user's strategy to shift risk.

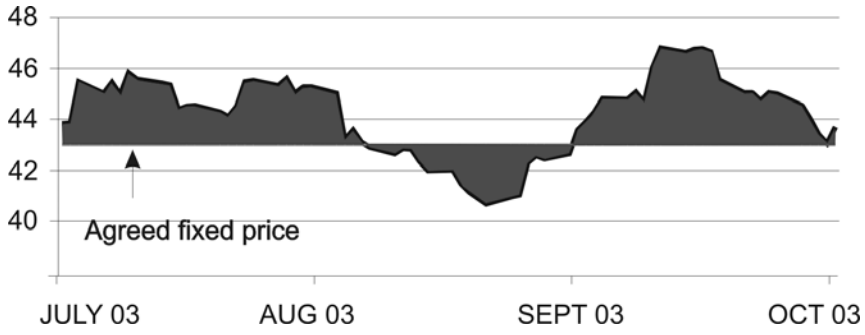
B. Instruments

B.1. Forwards

60. There are two types of markets for trading crude – spot and forward. The spot market is used to buy or sell excess crude that is not covered by longer-term contractual agreements. Pricing in the spot market is in real time, where the buyer discovers what he has paid for at the time the crude oil is loaded at the terminal for shipment. To reduce or eliminate the possible price variation at the time of sale or buying, an exporting or importing country can lock in prices using contracts such as forwards. These are agreements made to buy or sell an asset (e.g. crude oil) at a certain time in the future and at a certain price fixed or a price predetermined by a formula at the time of delivery to the location specified in the contract. The contract may be structured to include a minimum or maximum price as well as inflation escalators. Agreed prices are not forecasts but simply the price today at which market participants are willing to buy or sell oil for delivery in the near or distant future. Forwards are predominantly bilateral agreements traded in over-the-counter markets when trading partners have mutual confidence in each other because of the high credit risk.

61. The terminology used on both forward and futures markets when a party has agreed to buy an asset is a "long position" and a "short position" for the other who agrees to sell an asset. Suppose that an oil importer is wary of the effects of oil price increases on its budget plans: it can guard against exposure by taking a long position. This would lock in the oil price and free the importer from price increase worries (see figure 4). Similarly, an oil exporter can take a short position to guard against oil prices falling below a minimum acceptable level. In both scenarios the worry about uncertainty in expected revenue/expenditure is eliminated, but the importer or exporter forfeits the benefits of participating in the market when prices change.

Figure 4. Agreed fixed price compared with volatile market prices



B. 2 Futures[52]

62. A futures contract allows a buyer to accept and a seller to deliver a given quantity of a particular commodity at a specified place, price and time in the future. It is another form of forward contract that has been standardized for the amount to be delivered or bought.[53] According to the NYMEX, deliveries of most futures contracts represent a minuscule part of the share of the trading volume, less than 1 per cent in the case of energy.[54] The other traded contracts are used by market participants who wish to minimize the risk to oil price volatility and those seeking to profit from bearing the risk of price movements by speculating on the direction the price change takes. The standardized nature of future contracts facilitates trading, with market participants having only to negotiate the contract price.

63. A successful hedge must overcome three basic problems. First, there is the difficulty in deciding what hedging instrument to use, as the underlying asset may not necessarily have tradable futures in any of the exchanges. Second, the hedger needs to know when to hedge and when to adjust the hedge position. Third, there is the problem of how much of the exposure to cover.

64. The first problem can be overcome by choosing a futures contract that has a good correlation with the price of the asset being hedged. Nigeria's Bonny Light, for example, has a better price correlation with Brent crude than West Texas Intermediate, and therefore the latter would be a better choice for hedging. Similarly, a transport operator would choose a tradable fuel with a high correlation to its diesel fuel consumed in order to have an effective hedging programme. In general, the higher the correlation, the less the basic risk.[55]

65. Timing considerations must take into account the choice of delivery month. The delivery month specified in the contract must be chosen with consideration of the increased volatility caused by erratic trading as contract expiration nears. "A good rule of thumb is, therefore, to choose a delivery month that is as close as possible to, but later than, the expiration of the hedge. Suppose that the delivery months are March, June, September, and December for a particular contract. For hedge expirations in December, January and February,

[52] Appendix 3 provides a detail practical introduction to the futures market.
[53] A NYMEX standard futures contract specifies 1,000 barrels to be delivered at Cushing, Oklahoma, at a specified date in a future month. Futures contracts detail the grade of oil that conforms to a certain API specific gravity and sulphur content.
[54] www.nymex.com.
[55] Basis risk is the risk of varying fluctuations of the spot and futures price, which consequently adds risk to the position taken in a hedge.

the March contract will be chosen; for hedge expirations in March, April and May, the June contract will be chosen; and so on."[56].

66. In addition to choosing a contract and the correct timing for implementing a hedge, the hedger has to consider how much of a cash market position at risk can be hedged with futures market contracts to minimize the imperfect correlation between the cash and futures position. This relationship is known as the hedge ratio.[57]

67. A Government can also hedge its oil revenue streams accrued from royalty and production tax since they are directly tied to oil prices. If the treasury stands to lose $100 million per year for every dollar drop in the price of oil, an ideal hedge will compensate each dollar loss in revenue. A futures contract based on the number of barrels of oil is determined in order to protect expected revenue. Barring basis risk, the value of the contract will rise and fall as oil prices continue in their random walk making up the shortfall in income (i.e. if the royalty and tax revenues fall by $100 million, the hedge will gain $100 million).

B. 3 Options

68. Options are financial tools that allow flexibility not offered by forwards and futures in managing the price risk of an asset. An option holder has the right to buy or sell the underlying asset at a certain price known as exercise or strike price and a specified quantity by a certain date, but is under no obligation to do so. The two basic types of options traded are the call and the put. In a call option the holder has the right to buy the underlying asset, whereas the put option gives the holder the right to sell the underlying asset with the above conditions. It is this distinguishing feature about options and the ability to participate in favourable market moves that make it attractive to use in a risk management programme, although there is a cost (also known as a premium) involved in purchasing an option. The premium paid is affected by the futures price in relation to the option strike price, the time remaining before options expiration, the volatility of the underlying futures price and interest rates. A put/call option in the money (i.e. the put strike price is above the underlying futures price or the call strike price is below the futures contract price) would cost more than an option at the money (the strike price equal to the underlying futures price). The cheapest option but not necessarily the most useful would be one that is out of money (the put strike price is below the underlying futures price or the call strike is above the futures price).

69. To simplify, an option holder with the right to sell/buy will allow the option to expire when the exercise price is lower/higher than the market price and gain directly from the market, incurring only the loss of premium. On the other hand, if the market moves in favour of a position, the virtually unlimited profit potential to the buyer of an options contract is parallel to a futures position, net of the premium paid for the options contract. Therefore, protection from unfavourable market moves is achieved at a known cost, without the ability to participate in favourable market moves being given up.[58]

[56] Hull JC. Options futures and other derivatives, 2002, p. 38.
[57] Ibid., p. 39. The hedge ratio is determined by the product of the coefficient of correlation between change in spot price and change in futures price and the ratio of the standard deviation of change in futures price.
[58] See http://www.nymex.com/jsp/education/option_info.jsp?pg=8.

B.4 Swaps[59]

70. Swaps, sometimes called "contracts for differences", are basically financial instruments that allow one party to exchange its cash flow at regular intervals with another party over a predetermined period of time. They are normally privately negotiated financial instruments (an over-the-counter instrument), customized to meet the needs of the parties involved, and as such are non-tradable. The swap provider receives a fee for structuring the transaction and taking on the price risk.

71. Swaps follow to a great extent the way in which forward contracts are organized. In a swap contract, however, the exchange is normally not limited to a single transaction but a sequence of transactions. A swap contract can therefore be described as a package of forward contracts settled monthly or two to four times per year for, say, the next four years. In a swap agreement, the commodity does not change hands, but there is an exchange of periodic payments between two parties, with one side agreeing to pay a fixed price and the other side paying a variable price. The payments are calculated as the difference between the fixed and the variable multiplied by a notional volume specified in the swap contract. The variable price is usually linked to an agreed upon market index, usually Platt's Oilgram, NYMEX or IPE.

72. The swap explained above is referred to as "plain vanilla" because of the simple exchange of cash flows in the transaction. However, swaps can increase in complexity when they are tailor-made to suit the exact circumstances of the user. They can be combined with other derivative instruments, notably with options, and this makes them less liquid instruments and difficult to get rid of when adverse movements are experienced. Even so, some swaps are structured such that the fixed payer or receiver has the right to terminate the agreement after a certain time when price movements are adverse. The downside of a swap agreement for producers is the loss of potential revenue when price movements are beneficial, but the protection it offers when prices swing downwards makes it very attractive during periods of falling prices. Its potential benefits can be very useful in stabilizing expected revenues and expenditure for a proposed budget. In a swap transaction, the exposure to price risk can be managed without one's necessarily having crude oil in one's possession.

B.5 Commodity-linked bonds

73. Oil price volatility places an enormous burden on servicing debt, often leading to a debt and economic crisis and subsequently affecting investment in education, health and other social needs. Countries with commodity-dependent revenues can, in many cases, link their revenues and debt service in such a way that much of this vulnerability is eliminated. Commodity-linked bonds are available in two types, namely the forward type and the option type. In a forward-type bond, the coupons or principal, or both, are linked to the market price of the commodity, whereas the option type gives the holder the right to buy or sell the commodity at a preset price (see box 6).

74. Properly structured commodity-indexed obligations can significantly reduce bankruptcy risk for companies, and enable government to avoid budget crises. Such structures are also attractive to lenders, as they reduce default risks. While the markets for these instruments can be difficult to access for developing countries and countries in transition,

[59] See appendix 5.

international financing organizations, in particular the World Bank, now offer new facilities that can provide access.

Box 6. Oil- linked bonds

"Oil-backed bonds appeared in the financial market during the late 1970s. The government of Mexico is believed to have been the first to issue such bonds. These bonds, known in the financial markets as Petrobonds, were issued on behalf of the government by the National Financiere S.A.(NAFINSA), a development bank owned by the Mexican government. Each 1,000 peso bond was linked to 1.95354 barrels of oil.

"The coupon rate was 12.65823 per cent per annum and matured at the end of three years. On the maturity date, the Petrobonds were redeemed at a value equal to the maximum of the face value or the market value of the referenced units of oil plus all coupons received during the life of the bond. With this issue, the government was not only raising new money at low nominal cost, but was also hedging part of its oil production against fluctuations in oil prices. On the other hand, bearers of the Petrobonds were hoping to benefit from an upswing in the price of crude oil.

"In 1981, Petro-Lewis Corporation of Denver issued US$20 million worth of oil-indexed notes. Each note had a lifetime of five years and paid an annual coupon rate of 9 per cent. ….. each note was expected to pay the face value (principal), the accrued interest, and a contingent interest on the maturity date. The contingent interest, which had a feature of a cap, was defined as the increase over US$668.96 of (i) the average crude oil price of 18.5 barrels of crude oil for the three months ending 28 February 1986 or, (ii) if greater, the highest average price of 18.5 per cent barrels of crude oil, up to a maximum of US$1,258 or US$68 per barrel for any calendar quarter through the quarter ending 31 December 1985. This feature enabled an investor to make at most an additional US$589 per bond. The oil notes of Petro-Lewis differed from the Petrobonds in that the repayment of the face value included a call option on oil prices, and therefore offered protection to the bearers from a fall in oil prices. In the case of Petrobonds, the payment of the principal was fully indexed to specified units of oil."

Source: Bank of Canada.[60]

B.6 Commodity-linked loans

75. International loans can be expressed in a range of currencies, and the interest rates can be fixed or indexed to a reference rate. Borrowers are normally careful to link the terms of their loan to their expected revenue and avoid a mismatch – for example, if most of the revenue is in Yen, most borrowers would wish to express much of their debt service obligations in Yen. Similarly, debt service obligations for a commodity-dependent country or company can be explicitly linked to the prices of its commodities. Such commodity-indexed obligations are structured by the lender by combining the straightforward debt obligation with a financial derivative contract called a swap. Swaps exist for currencies, interest rates and a range of other assets; a “commodity swap” fixes the market price of commodities for a producer or consumer. Instead of requesting the lender to link the loan with a swap, borrowers could in principle enter into stand-alone over-the-counter “hedge” transactions to lock in commodity prices. For sophisticated market players with high credit ratings, this is a viable alternative. But for many with “weaker” credit ratings, such as producers in developing nations, the financial guarantees they would have to provide in order to qualify for such stand-alone hedges make this alternative impractical.

[60] Atta-Mensah J. Commodity linked bonds: A potential means for less-developed countries to raise capital, Bank of Canada Working Paper 2004-20. June 2004.

76. Commodity-indexed loans make it possible to directly link revenues and expenses, and this drastically reduces the risk of bankruptcy or debt crises for the company or country involved. This reduced risk will be viewed quite favourably by lenders and should therefore result in reduced borrowing costs. Given the significant borrowing needs of many developing countries and highly leveraged companies, commodity-indexed financing structures provide an optimal solution for countries and companies with revenues directly impacted by world commodity prices. Until recently, it was, however, difficult for developing countries and transition countries, and most of the companies in these countries, to access the market for such loans because they were seen as too risky by international financiers.

77. A summary of the risks and costs of the various hedging strategies that consumers and exporters can use to protect budget income and expenditure is given in table 5.

Table 5. Summary of hedging instruments and risks

Instrument	Characteristics	Transaction costs	Risks
Spot sales and purchases	Completely unhedged	Fees are embedded in quoted price	Totally exposed to market prices
Forwards	Lock in specific purchase or sale price	Fees are embedded in quoted price	Lose all exposure to beneficial price developments. Can have large credit or margin call exposure if market prices move in favour of the user
Futures	Lock in specific purchase or sale price	Brokers' commissions, exchange fees and margin requirements.	Lose all exposure to beneficial price developments. Can have large credit exposure if market prices move in favour of the user
Options	Protect against negative price developments; retain exposure to beneficial price developments	Premiums, which can be expensive	Lose premiums
Collars	Protect against negative price developments; gain minimal exposure to beneficial price developments	No fees or commissions. Fees are embedded in quoted price.	Lose most exposure to beneficial price developments. Large credit exposure can develop if market moves in users' favour, owing to potential costs of delivering against the position
Synthetic puts	Protect against negative price developments and retain exposure to beneficial price developments	Premiums, which can be expensive	Lose small portion of beneficial price developments
Swaps	Like forwards, lock in specific purchase or sale price	No fees or commissions. Fees are embedded in	Lose all exposure to beneficial price developments. Can have large credit exposure if market

		quoted price	prices move in favour of user.
Commodity-linked loans	Protect commodity producer against high debt repayments. A commodity producer has less credit risk than a conventional loan	Interest rates are charged by lender at favourable rates	
Commodity-linked bonds	Protect commodity producer against high debt repayments	Fees are charged by international banks which underwrite these bonds	

Source: World Bank.[61]

C. Dealing with private sector providers of commodity risk management instruments

78. Oil price risk management activities have significantly increased with a greater involvement of private sector providers filling the gap for instruments not provided by exchanges. Such instruments can be very complex as they are often tailored to meet many objectives of the hedger in a changing risk environment. However, the advantages of customization comes with potential liquidity, legal, market (or position) documentation, large exposure and credit risks for the derivatives dealer and its counterparty, which are normally overcome as far as the dealer is concerned by entering into contracts with opposite risk profiles in exchanges or other over-the-counter markets. The challenges posed to dealers in managing their own risks in this largely unregulated derivatives market sometimes lead to risk management failures, with dealers facing insufficient cash to sustain normal business activity and consequently default on the terms of agreement. For this reason, it is sensible to search for trusted providers of risk management instruments from dealers, ranging from investment banks, some commercial banks and specialized companies with a reputation for delivering in respect of a successful transaction over the counter.

79. Moor[62] recommends that when dealing with private sector providers, dealers should be vetted in order to identify creditworthy counterparty companies that are able to meet the objectives of the hedger at a reasonable cost. In the vetting process, detailed information from the hedger must be provided as risk profiles differ from country to country and not all dealers are able to satisfy the demands of counterparts to match the characteristics of their physical market positions. It is therefore the responsibility of a hedger to make it clearly understood by the dealer what the country's objectives and constraints are, and to ensure that price expectations and levels of indifference are understood. Other information, for example about country subsidies, taxes and management, must be freely offered, as well as historical information to help tailor the risk management programme. The extent and the quality of information received by the hedge provider enhance the chances of a dealer's meeting the objectives of the hedger.

80. To deal with the risk of default using instruments, the EIA recommends that "parties scrutinize the creditworthiness of counterparties and deal with parties that maintain good credit ratings. They may also limit how much they will buy from or sell to a particular trader

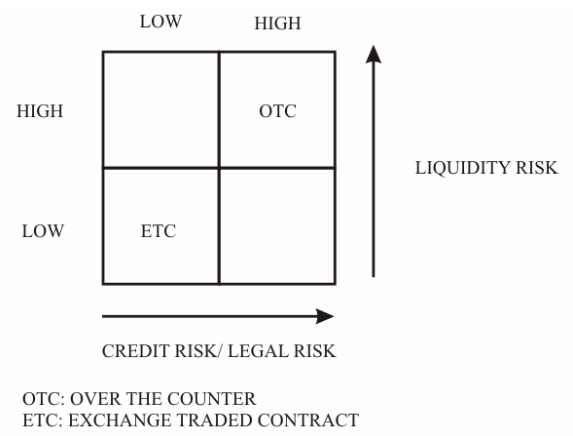
[61] Akiyama T. and C J. Effective risk management strategies: Cases of hedging by governments, firms and smallholders. World Bank and CPM Group. July 1998.
[62] Moor de Giorgio E., How can African counterparts optimise hedging proposals? Presentation at the first Africa oil conference, Harare. 1996.

based on his credit rating. In some circumstances parties may also ask counterparties to post collateral or good faith deposits to assure performance."[63]

81. Over-the-counter deals are often structured to cover long periods, which gives rise to complex legal issues. The potential sources of legal risk in transactions arise as a result of insufficient documentation to cover the transaction and the enforceability of the terms in a contract. Some potential hedgers and dealers may not even have the legal authority to enter into a transaction, and this gives rise to an *ultra vires* contract. It is therefore prudent to obtain adequate knowledge of the level of financial sophistication and the laws governing a hedger before drafting contract documents on the instruments being purchased or sold. To reduce exposure to legal risks, the International Swaps and Derivatives Association Inc. (ISDA) provides master agreements for derivatives transactions. These are an inherently fair set of forms that can be used as standard documentation for many types of OTC derivatives transactions with minimal expense and negotiation. "In the event of counterparty's default, such agreements permit the termination of all transactions with the counterparty and the netting of the resulting gains and losses."[64] However, in order to get the benefit of these forms, the ISDA agreements must be properly prepared and executed. A dealer and its lawyers using the ISDA master agreement as guidelines can easily modify the agreement to make it one-sided, thus avoiding the basic concerns of the counterparty.

82. In recent years, financial innovation in OTC markets has led to the ability to manage commodity price risk and other specific types of identifiable risk on terms not offered by exchanges. Unfortunately, the deal terms can be difficult to sustain if the market moves against the issuer of instruments and since the issuer also acts as the guarantor of the transaction, there is a probability of default. However, more scrutiny of how the counterparty will fare in a volatile market, together with master agreement guidelines, should help minimize the risk. A golden rule to observe is never to assume that the counterparty's financial stability will remain constant during the term of the transaction. Simple checks such as those highlighted above will significantly contribute to a successful transaction.

Figure 4. Risk matrix



[63] http://www.eia.doe/oiaf/servicerpt/derivative/chapter2.html.
[64] Greenspan A. Corporate governance. Speech at conference on bank structure and competition. 8 May 2003.

D. Obstacles in using financial instruments

83. Improved information technology has resulted in an increased number of users of financial instruments in recent years, particularly amongst private and public entities operating in developed countries. However, for counterparts in developing countries many obstacles have impeded the use of instruments to hedge.[65] The main reasons often given for this are set out below.

84. *Lack of information on actual use of commodity risk markets*. Hedging programmes are shrouded in secrecy, with producers unwilling to reveal market-sensitive information and counterparties protecting client confidentiality. The Texas hedging programme, among a few others, accounts for only a small number of case studies from which potential users of oil risk markets can learn. In addition, the providers of risk management instruments in developing countries lack access to timely market information, and this results in asymmetric information about market prices and hedging opportunities.

85. *Limited expertise*. Risk management is a complex operation requiring knowledge of market instruments and their strategic use. Too often, developing countries lack technical and management expertise, as well as the institutional framework within which to carry out these operations. While it is clear that improved external risk management can assist developing countries in their economic management, it is important to realize that risk management can be performed effectively only when certain key conditions are fulfilled. These financial techniques, when used inappropriately, can be very costly. Therefore, it is important to introduce an institutional framework that ensures adequate reporting, recording, monitoring and evaluating mechanisms, and to establish internal control procedures that avoid and protect against speculative transactions.[66] UNCTAD's guide on company controls[67] provides a detailed overview of how to set up internal structures and controls.

86. *High upfront premiums*. The use of some financial techniques, such as buying options, caps and floors, can involve high premiums as well as high transaction costs, which can dissuade countries from hedging, especially when the volume to be hedged is not significant. Research has shown that the limited access of small hedgers to foreign exchange makes it difficult to execute transactions at the reduced per unit costs available to large-volume purchasers.

87. *Margin payments*. The transaction costs of entering into a futures contract may seem reasonable at the outset, but all can change quickly. As discussed earlier, a futures contract guarantees a price, but the position taken may require sudden large-margin payments due to volatile oil prices. Although the margin required will decrease and payment will sometimes be returned when price movements become favourable, the sums involved could be very damaging financially, with political repercussions. Furthermore, such payments may be forbidden because of the country's financial situation and agreements with its debtors.

88. *Low credit standing*. For many developing countries, access to some risk management instruments is limited by creditworthiness considerations. This is particularly the

[65] Such obstacles are also typical in Western government entities. See the report on management of fuel price risk in the public sector, prepared for the Energy Information Administration. 31 October 1993.
[66] Claasens S. How can developing countries hedge their bets? Finance and Development. 1 September 1992.
[67] UNCTAD. Company control and management structures: The basic requirements for a sound use of market-based risk management instruments. UNCTAD/ITCD/COM/MISC.1, New York and Geneva, 1996.

case with long-dated instruments where the longer the length of the contract, the larger the potential range of price movements and the higher the credit risk. Credit risk is less of a barrier in the case of short-dated instruments where margin requirements at the outset of the contract minimize the credit risk.[68] Swap transactions, for example, can be structured for many years and sometimes require financial intermediaries to assume the potential risk that the Government will default. Otherwise, an adequate credit standing for the Government is required.

89. *Finding counterparties*. The problem with hedging risks using OTC instruments such as swaps/forwards is that it is not easy for buyers and their counterparties (sellers) to find each other and settle on a price. This is particularly serious for developing countries, which – ironically – need risk management tools most to manage their market price risk. Research by the Energy Information Administration shows that discovering the market price for a delivery at a specific place far into the future is difficult and when the agreed upon price is far different from the market price, one of the parties is likely to default. In addition, one party's circumstances may change, and since you are tied to the contract the only way out is to face penalties or renegotiate.

90. *Private sector providers*. The over-the-counter market for derivatives is not completely prepared for dealing with developing countries because of lack of familiarity with the policy and regulatory issues involved in doing business. Before taking on new clients, providers must fulfil the stringent regulatory requirements of "performing financial due diligence, evaluating clients' understanding of risk management and fulfilling general 'know-your-client' guidelines".[69] Inasmuch as a new client has a potential for increasing transactions over time, the potential difficulties limit their use of risk management strategies to put options.

91. *Strict domestic rules*. Domestic legal and regulatory barriers affect, in particular, the country's capacity to hedge abroad. Some countries have laws that forbid them from participating in international futures markets. Exchange controls, for example, may prevent the purchase of collateral for engaging in the futures market or laws may prohibit domestic access to such instruments.

92. *Political constraints*. High political costs await pursuers of hedging programmes when losses are amassed. In that case, even when the economic case is clear, the decision maker forgoes embarking on such a programme. "In the case of a fall in the spot price, any financial gains from a hedging program may be seen as speculative returns. If the Minister had not hedged, it would be easy to blame the international oil markets for any budgetary problems. In the case of the spot price of oil rising, a hedging strategy may well result in the government 'missing out' on higher revenue, which could be politically costly. If the government were to use a pure insurance hedging strategy, it may be politically difficult to use scarce resources to pay an option premium rather than say, build a hospital."[70]

93. *Volume limits*. To prevent market impacts by large-volume hedgers, limits are placed by the exchange on how much can be hedged, especially beyond six months.

[68] Op. cit.
[69] http://www.itf-commrisk.org/itf.asp?page=13.
[70] Daniel JA. Hedging government oil price risk. IMF Working Paper WP/01/185. November 2001.

94. *Lack of institutional framework to implement a risk management programme*. Often government departments and other stakeholders scuttle attempts to implement a risk management strategy that may ultimately benefit the exposed party. As sound risk management strategy is not an individual's responsibility, but an institutional one, the likelihood of this happening is very common when they feel threatened by it. There may be genuine reservations because of the high level of losses experienced by Western companies, but generally those that have adopted the use of these instruments are not willing to do without them.

95. *Basis risk.* In futures hedging the asset whose price is to be hedged may not be exactly the same as the asset specified in the futures contract, and sometimes different from the asset underlying the hedge, which gives rise to uncorrelated price movements. Closing a futures contract well before its expiration date may result in what is termed basis risk. Movement in spot prices in relation to future prices may lead to the basis strengthening or weakening on the expiration or the transaction of a futures contract. This can either improve or worsen a hedger's position. In a short hedge, the basis strengthening unexpectedly improves the hedger's position, whereas an unexpectedly weakening basis worsens the hedger's position.[71]

D.1 Overcoming obstacles in using financial instruments

96. Daniel[72] proposes that international agencies and research organizations do more to promote awareness and understanding of hedging opportunities. Staff should be trained to be able to monitor and choose appropriate hedging instruments that would minimize the cost of hedging. The UNCTAD expert meeting in 1998 recommended coordination and cooperation not only among international organizations but also with the private sector in enhancing the use of commodity price risk management. The weaknesses in the legal, regulatory and institutional framework can be improved with help from the international community through capacity- and institution-building and reform of government policies.

97. When a hedging strategy is chosen, management should be persistently petitioned through the presentation of risk analysis showing gains or losses to the Government per fluctuation in relevant crude or product markets. A fully comprehensible analysis showing benefits and associated costs and risks is likely to be accepted by decision makers. When management is unable to understand the objectives, risks and rewards of such a strategy it is obvious that questions will be asked and hedging will only be seen as speculation or gambling State funds. Verleger[73] suggests "establishing a high level committee that consists of representatives from oil companies or the state oil company, the ministry of finance, the central bank, and possibly the ministry of energy", which will give government a mandate to enter into hedging activity. A public debate will also help to demystify price risk management markets and calm public uneasiness about using financial instruments.

[71] Basis risk is known to worsen when there is a weak correlation between a hedger's underlying asset and the price of the asset specified in the contract. To alleviate this problem, a regression analysis can be conducted of price movements of the fuel in the contract. This will not eliminate the basis, but the choice of contract will greatly strengthen the basis. In other situations, over-the-counter swaps and options offer the possibility of reducing basis risk to zero as the price reference used in the contract can be chosen to be the same as the physical oil.

[72] Daniel JA. Hedging government oil price risk. IMF Working Paper WP/01/185. November 2001.

[73] Verleger Jr. PK. Adjusting to volatile energy prices. 1993.

98. A number of option-based programmes have solutions to some of the major problems faced by developing countries in implementing a risk management programme. Upfront fees can be eliminated, and this will make financial instruments accessible to countries that otherwise cannot afford the huge financial burden of purchasing them; also, the hedger has an opportunity to share in the benefits of rising oil prices.

Box 7. Practical tips for introducing a risk management programme

Be well prepared and have all the arguments ready. A careless attempt to sell a risk management programme in a company or government department can backfire: it can result in the build-up of resistance so strong that a later, better-prepared approach is also rebuffed. To quote Machiavelli: "There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things".

Timing is important. A time of high price volatility often provides the best moment to introduce a risk management programme

Adapt to the skills level and level of understanding present in the company or country. It is often advisable to go for a risk management programme which is sub-optimal, but which it is easy to manage and explain. For example, risk management programmes, which aim to obtain the year's average prices, are likely to be acceptable even to the most conservative public. The proposal to use an over-the-counter instrument such as a swap, which locks in prices for the year, can be decided on by the full managing board, while to use futures, the board has to feel confident that nothing will go wrong in the day-to-day management of positions; thus, the over-the-counter market could be the one most easily acceptable.

Calm fears. For many decision makers, "a futures market" is a place to speculate, and then go bankrupt. In effect, a good control structure to prevent risk management programmes from turning sour can be set up without too much difficulty; and looking at the cases of large losses in the past few years, one cannot fail to notice that they are all the result of very basic management errors. Anticipate the possible reactions to the various potential outcomes of a risk management programme. It can be difficult for many people to understand why an entity finally receives a price that is lower than that actually quoted on the world markets – the difference between opportunity costs and real costs, as they impact on the company's or the Government's budget's bottom line, are not well understood. Therefore, it is very useful to develop a mechanism whereby senior management can express its views on prices, otherwise their forecasts will be adjusted only ex post facto to fit reality, and the risk manager/trader, who does not have the benefit of hindsight, will be told that he or she should have known, like "everyone else", where prices would be moving.

Plan for possible future scenarios. For example, given the volatility of commodity prices, it is quite possible that from time to time, and only during a limited period, a price level is reached that allows a company to lock in a tremendous profit, or a country to fix an export price more favourable than any received over the previous few years. If this occurs, decision makers need to be able to evaluate a proposed risk management deal and decide quickly. If discussions only start at that moment, it is likely that a consensus will be reached too late. One needs a prior concept of what to do in exceptional circumstances, whether these are highly favourable or highly unfavourable price levels.

Don't make it look like a boardroom coup. The people who have been pulling the strings will continue to do so. They need to delegate some operational authority, but will still determine the framework of action.

Box 7. cont'd

Understand who controls the purse strings. An innovative marketing manager or budget officer may propose a perfectly sound concept for risk management, only to see it torpedoed by those who authorize financial transfers. Risk management is indeed a way to ensure future cash flows, so as to make certain that in future the company or government department has enough money to do what it wants to do. But in order to get this far, funds may have to be immobilized for a period of time. For example, when Mexico's Ministry of Finance decided to lock in the extremely high oil prices prevailing at the time of the Gulf crisis in the early 1990s (a highly profitable decision), it had to put up an estimated $200 million in guarantees.

Be transparent. There is no reason to keep a risk management approach secret, or to have an under-the-table mechanism for entering into over-the-counter contracts. For exchange-traded products, the fair prices are known. But for over-the-counter contracts, there is no such objective yardstick. To avoid being accused of corruption or incompetence, it is therefore advisable to always ask for price quotes, for given instruments, from several companies.

Think of the wider public. Some opinion makers, in politics or in the press, consider that risk management instruments are like "alligators in a swamp". Explain, in publicly available material, what is the purpose of the risk management strategy and of what it consists.

E. Possibilities for African Governments

E.1 Policy options for government importers in controlling price risk

99. Importers can explore a number of strategic approaches:

- Create a reserve of crude oil that could be tapped in the event of a sudden increase above a benchmark and maintain a level that triggers off drawing down reserves.
- Focus on possible tax options on petroleum products to conserve energy/curtail demand and reduce government subsidies on fuel. During periods of low oil prices, revenues accrued from higher taxes are placed in a stabilization fund.
- Increase cost of services dependent on petroleum products to reflect the increase in prices.
- Use flexible budgeting methods.
- Promote use of energy efficiency programmes to reduce oil intensity in manufacturing and offer tax incentives for use of alternative fuels.
- Encourage the use of more-energy efficient cars and trucks, as well as hybrid vehicles, by reducing import tariffs on vehicles falling within that category, but impose high taxes on high- fuel-consumption vehicles.
- Maintain a good fiscal policy. Cut down on expenditure when petroleum imports reach intolerable levels and embark on a rationing of imports to control unbudgeted expenditure.
- Liberalize fuel imports and ensure that suppliers have some storage facilities available. Also, impose price limits so that the burden of price risk management is on the private sector.
- Raise or adjust the cap on retail fuel prices so as to allow refineries to pass on some of the higher costs to consumers.

- Explore the use of market-based risk management instruments as highlighted in the previous chapter to hedge exposure to price risk and maximize resources to focus on Governments' budget choices.

E.2 Policy objectives, advantages and disadvantages for importers

100. **Petroleum reserve.** The appropriateness of each policy varies with the size and duration of the oil price shock. The rationale for creating a petroleum reserve is primarily to limit economic damage. It may be used as a cushion against oil price increases and the short-term deterioration in balance of payments, but building and maintaining petroleum reserves to a considerable volume to mitigate the long-term effects may prove too much for African countries. The estimated cost of building storage to stock 15 million tonnes of crude proposed for India in 2004 was estimated to be about Rs 43.5 billion (approx $950 million).[74] The reserve idea may be feasible as a short-term supply disruption solution but not in mitigating prices.

101. **Tax options.** While higher taxation on petroleum products may be in the interest of the Government in order to recoup some of the increased expenditure on petroleum supplies, raise government revenues and at the same time reduce demand, it is most likely to affect the low-income consumers most. It is also questionable whether price increases will hold back demand since oil and its derivatives are vital inputs for the production and distribution of goods and services in Africa. The lack of substitutes suggests that imports are relatively inelastic to changes in oil prices: the consumption of fuel varies little in response to changes in the price of oil. Hence, although tax increase will increase revenue, it will also raise fuel prices and have a direct impact on the production costs of goods and services, and can contribute to an increase in the inflation rate if these increased prices are passed on to the consumer. Furthermore, it can be politically suicidal to increase taxes to keep pace with rising oil prices as the social costs can be hefty. On the other hand, more realistic oil costs should encourage efficient consumption.

102. **Cost of services.** Increasing the cost of services in order to provide decent services can greatly increase public acceptance, although it has considerable impacts on low-income earners. For example, surveys have shown that low-income households in African cities spend as much as 40 per cent of their income on transport. Governments will be able to recoup extra expenditure on crude, but other sectors of the economy will also be affected. Prices of goods and other services will rise in tandem. When prices fall, the expectation is that these increases will also fall in tandem, but prices are sticky in a downward direction, which means that the overall price level has increased because of an initial policy to raise prices and inflation becomes a chronic problem.

103. **Flexible budgeting.** As forecasting leads to uncertainties and budgeting always involves forecasting, some countries have adopted the flexible budgeting approach. It involves the establishing of oil price benchmarks as opposed to the single best estimate. Flexible budgeting will allow countries to deal with the price changes on the oil market and plan their budgets to suit expenditure and revenues. However, the major drawback in flexible budgeting is that it is more costly and time- consuming than fixed budgeting.

[74] http://www.rediff.com/money/2003/feb/04oil.htm.

104. **Energy efficiency.** Embarking on energy-efficient programmes offers a long-term solution to reducing consumption of crude oil and its products for industry, utilities and services. Tax incentives will generate more support for employing highly efficient energy processes that can significantly reduce the oil intensity in developing countries. However, such policies take time to bear fruit and the extra spending on subsidies may not generate the necessary savings because of the high costs of technology.

105. **Fiscal policy.** The rational approach in dealing with oil price volatility is to respond by cutting down on expenditure. However, this has a direct impact on projects that are needed for ongoing development. Countries therefore seek more debt to finance projects, thus worsening their ability to perform existing debt obligations. Resorting to cutting services as a last alternative only meets with strong public disapproval and also has negative impacts on the economy.

106. **Stabilization funds.** The argument for having a fairly stable fuel price for consumers deepens, whether trade is privatized or not, as fuel prices affect the quality of life in most developing countries. In principle, Governments could use stabilization funds – imposing extra taxes or levies on imported fuels when prices are low – and use the proceeds to subsidize prices when import costs are high. In practice, however, such stabilization funds tend not to work, as the earlier discussion highlights: accumulated funds are an easy target for policymakers intent on finding resources for more urgent programmes, and price fluctuations are so great that it is difficult to build up a fund large enough to stabilize prices even within a relatively short (say one year) period.

107. **Financial instruments.** A variety of financial instruments exist today in organized exchanges and over the counter as compared with only a few years ago, and the effectiveness of these tools, as well as the knowledge of their use, is more established. For long-term risk management, the adoption of swaps to manage price exposure is the easiest to set up and manage.

108. There are a number of reasons why swaps have emerged as a front runner over other financial instruments for hedging risk in developing countries. Swaps offer flexibility and can be customized to meet the exact needs of the Government requesting it. They are easy to set up and require minimal personnel to handle the trading, accounting and paperwork as well as management controls. Swaps provide the necessary protection against budget and cash flows from market volatility through a fixed price or shared exposure to price risk. In swaps there is no need to raise capital to meet margin calls and upfront calls as in premiums for options. Agreements can also be structured on the basis of the price of the specific type of crude oil that the country exports rather than on the price of commodity crudes such as WTI or Brent on which futures contracts are based. Swaps are also preferred to forwards because they involve cash settlement of net values only and not the total value of the crude oil or oil products before maturity.

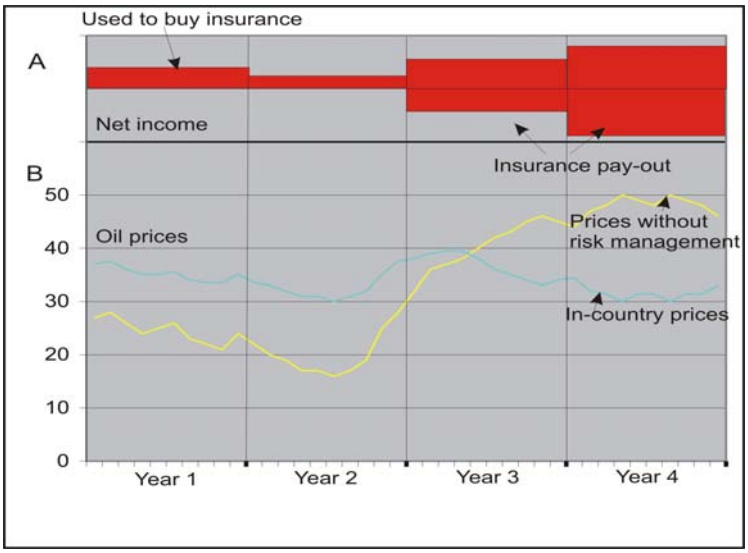
E.3 Managing price risk in a liberalized environment

109. The changing prices that consumers pay for various oil products reflect the volatility of world crude oil prices. If imports are monopolized by a State entity, this entity can fairly easily manage risks by the use of swaps and/or options. Many United States government agencies (states' budget offices, public transport companies, public utilities, municipalities, etc.) now use these instruments to protect their own budgets, and protect consumers against

price increases. However, if trade is in private hands, it is much more difficult to align the interests of the oil buyers with those of the public at large. Private traders/importers are interested in the margin that they make between the prices at which they buy and those at which they sell – the absolute price levels are of little relevance to them, and thus they have little incentive to protect themselves against price increases.

110. Instead, in a liberalized environment, Governments can use a combination of the taxation system and option markets to keep fuel prices within a certain band over a two–three year time horizon. Figure 6 shows how this would work. When crude oil prices are below a certain level (the lower level of a band determined by the Government), import taxes or levies are set at a higher level. This increases the costs of import, and thus the prices in the domestic market. The resultant government revenue is used to buy average price "out of the money" crude oil options, at a level (strike price) that corresponds to the upper band determined by the Government. The crude oil market is the most liquid of all derivatives market, and the pricing of the products available on the market is much more attractive (particularly for longer periods) than that for heating oil and the like. Figure 6 also shows the pay-out mechanism – what would happen if world oil prices increase. It should be noted that this strategy is compatible with a policy of targeting subsidies at oil products of most importance to the poor.

Figure 6. Using the taxation system to stabilize oil prices



111. The strategy described above in broad detail is not perfect (there is room for further fine-tuning). First, if the country imports fuel products, import costs may not always correspond perfectly with crude oil prices. While this is a risk, it is small, as competition between refineries is strong, and the relationship between crude oil and product prices is thus a fairly direct one. Secondly, this strategy provides protection against price increases over a period of two–three years. If prices remain high over a longer period, the Government would have to adjust the price band, but the economy would still have had a breathing space of two–three years and time to prepare for future price increases.

E.4 Policy options for government exporters in controlling price risk

112. A key component for the performance of oil-exporting countries' budgets is the cash flow from oil exports. High oil revenues improve current account balances and replace fiscal deficits by fiscal surpluses. But extra revenue has often led to waste on projects that are not viable and mounting debt obligations, as good policies are difficult to come by in good times. In an era of low prices, it becomes apparent that policies need to be implemented to stabilize revenue, control expenditure and minimize debt.

113. Many attempts have been made to stabilize revenue, but traditional methods discussed earlier have not worked effectively in developing countries. However, there are other policy options available to producing countries to deal with burgeoning budget risks in an environment of volatile oil prices. Progress can be made in protecting budget revenue, which would minimize social costs, by introducing some of the following policies:

- Using commodity loans offered by the World Bank and the African Development Bank to control debt repayment;
- Hedging government budget revenue against commodity price declines using market-based approaches;
- Hedging against exchange rate risk;
- Raising or adjusting the cap on retail petrol prices so as to allow refineries to pass on some of the higher costs to consumers and phase out fuel subsidies;
- Establishing a fund where windfall revenues are used to stabilize oil revenues when prices decline.

114. It is evident from experience that it is not advisable for Governments of oil-exporting countries to try to invest the windfall gains of high oil prices. However, it does not follow automatically from this that they should save these windfalls. Rather, they should use them to invest in their economies, not directly but through independently run investment funds (preferably with a regional focus).

E.5 Policy objectives, advantages and disadvantages for exporters

115. **Commodity loans.** To reduce budget risks associated with price volatility, countries can use commodity-indexed loans offered by the World Bank and African Development Bank. Existing or new debts with financiers can be converted in whole or in part into commodity-linked loans, in which, at a charge of 0.375 per cent, the international organization (with its AAA rating) interposes itself between the provider of the risk management instrument (which it will identify) and the borrower. As of early 2002, this new facility had not been used, probably because of the intended beneficiaries' lack of familiarity with the instruments and the facility. However, the facility offers affordable security from price shocks for key export and import commodities, and it is abundantly clear from recent fluctuations in the oil market how expensive the failure to manage price risk can be.

116. **Stabilization funds.** The pros and cons of stabilization funds have been discussed in preceding chapters but it is worth noting the other uses of such funds. Setting up a stabilization fund to capture extra revenues can help avert upward pressure on the currency and protect against the effects known as the "Dutch disease". This can be achieved by investing the funds savings in foreign- currency-denominated securities.

116. (continued) Stabilization funds have been known to work only where the country is not dependent on one export commodity and the control of the fund is independent of the Government. Furthermore, such policies deal with smoothening of income and since funds are not an infinite resource, the policy may not be appropriate in the long term. On the other hand, dealing directly with the problem by embarking on a strategy to lock in prices will stabilize and provide better protection against falling prices. This calls for a use of market-based instruments that can offer significant protection against adverse price movements.

117. **Risk management instruments.** The argument for adopting the use of risk management instruments is gaining ground not only because traditional methods have failed to hedge risk away satisfactorily but also because of the practicality of dealing with the problem of price risk. Financial engineering has come of age to offer the unique protection desired by exporters to minimize potential loss and participate in rising markets. However, caution must be exercised in respect of other risks that arise in the use of hedging instruments. The advantages of financial instruments over traditional methods have been highlighted in previous chapters. Nevertheless, dangers associated with using financial instruments are real and more than a passing knowledge of the instruments is needed in order to implement a successful hedge. A lack of understanding of how instruments function will inevitably lead to catastrophic outcomes.

118. **Raise prices.** Artificially low prices have the effect of extra government spending on subsidies accentuated when oil prices drop. This very often encourages waste which can be controlled when fuel retail prices are gradually raised to a more realistic level. More realistic oil costs should encourage more efficient fuel consumption. The windfall of receipts can be channelled into programmes that will sustain development instead of squandering money on subsidized imported petrol.

CONCLUSION: MOVING FORWARD

119. The direction of crude prices is contingent on a number of imponderable factors that make successful price prediction almost impossible to achieve. As a result, oil price fluctuations will continue to greatly influence the ability of budget planners in both oil-exporting and oil-importing countries to manage budgets. The well-tried traditional tools for dealing with such risks may play a role in a more comprehensive risk management programme, but by themselves are insufficient. Fortunately, financial markets have created financial instruments to allow price risk to be shifted to others willing take it on. The variety and flexibility of these financial instruments on the markets offer hope to Governments looking to mitigate their exposure. International corporations, oil refineries, transport agencies and many other users of the financial markets have successfully achieved this. Doing nothing and hoping that the risk will be short-lived is by itself a risky position to adopt as the severity of price shocks can erode savings and put enormous pressure on the macro economy. Funds, for example, are exhaustible in the long run, and using the fund as insurance against low oil prices poses questions about the sustainability of public finances. Several stabilization funds testify to the limitations of using such a method in managing price risk, not to mention operational difficulties.

120. African Governments seeking to protect budget revenues and expenditure need not be afraid of adopting and implementing risk management programmes using financial instruments. Some countries in Africa already have programmes that employ options (e.g. Mauritius) or futures (e.g. Cameroon), and others have thought of how swaps can be used for their benefit. Experience in the United States, where many municipal and state-level governments, as well as many parastatal transport companies, have been using such instruments successfully for years shows how public entities can use market mechanisms to enhance their performance. Budget planning can be made better since income will become more predictable and, in addition, hedging increases creditworthiness. However, to choose the right strategy to mitigate risk, the country must be able to quantify just how much price fluctuations affect the revenues or expenditure, and consider identifying and managing the basis risk of the underlying asset, location risk, cross-hedging risk, credit risk, timing risk and volume risk. If these other risks are not considered, the hedging instrument may be counterproductive and may increase its exposure to risk.

121. Currently (late 2005) both price levels and the shape of the forward curve (with longer-term prices not much below short-term ones) are highly favourable for a long-term, market-based risk management programme for exporters. Governments of oil-exporting countries can lock in unprecedented budget revenue for the years to come, and build an ambitious investment programme around this. For oil importers, however, things are more difficult.

122. Pressure is now large on oil exporters, which are benefiting from the crude oil price boom, to save. Compared with the previous decade, oil prices were very high in 2004, and everything indicates that they will remain high in the foreseeable future – well above the $20–25 a barrel reference price on which most Governments of African oil-exporting countries have been basing their budget decisions until recently. Windfall gains for African oil exporters in 2004 were more than $30 billion (compared with 2003 export revenue), and the situation is expected to be even better in 2005. Of that amount, more than $14 billion accrued to Governments in the form of higher royalties, taxes and direct export revenue for State-owned enterprises. This is a very significant amount: compare it, for example, with the total

122. (continued) amount of foreign direct investment in Africa in 2002, namely $11 billion, bilateral grants of around $10 billion or worldwide World Bank lending for fossil fuel projects that year totalling some $2.5 billion. However, just saving these windfall gains, at a time when the international community is calling for more investments in Africa, may not be the best strategy. A combination of a proactive hedging strategy (to lock in the high revenue) and an ambitious investment programme (outsourced to the private sector and implemented through public–private partnerships) may well be the better option.

123. For the majority of African countries that are oil importers, rising oil prices can pose a serious risk. Oil is often their major single import, and a rising import bill can rapidly deplete foreign currency reserves. Moreover, rising oil prices have a strong impact on transport costs, which, particularly for landlocked countries, implies that if oil prices are high, consumers have to pay more for imported goods, farmers receive less for their exports and public transport (one of the major expenditure categories for urban populations) is likely to become more expensive. Furthermore, in many countries Governments have direct exposure: parastatals may account for a large part of oil purchases, and as price increases cannot easily be passed on to consumers, they can put considerable pressure on government budgets. Moreover, local refineries may receive government subsidies that are a function of the difference between the prices at which they buy crude oil and the prices at which they are allowed to sell oil products locally.

124. The various impacts of oil price increases are sufficiently serious for Governments to adopt a proactive approach to managing oil price risks; this should be discussed and decided at cabinet level. Such an approach has a number of stages:

- Identification of risks. What really happens when oil prices increase? Certain effects may not be linear, but may become strong only when certain price benchmarks are reached (for example, certain energy- or transport-intensive export industries may become non-viable when costs reach certain levels).

- Quantification of risks. What exactly is the relationship between a $1 oil price increase (again taking into account the possible non-linear effects) and various economic variables (balance of payments, government budgets, cash flow of parastatals, price levels for imported goods, public transport and export commodities)? This analysis requires some understanding of how prices are passed on in various parts of the economy (e.g. what is the impact of oil price increases on local fertilizer prices?); in practice, when a sector is dominated by private sector companies, price increases will be passed on rapidly to the weakest parts of the chain (farmers or consumers). This analysis may have to take into account covariant risks – for example, can a country that depends on coffee for much of its exports accept, at the same time, low coffee prices and high oil prices?

- Decisions on acceptable “pain levels”. Realistically speaking, how much damage could the government budget or the country’s foreign currency reserves sustain, and for how long? How many losses can parastatals absorb without serious long-term negative effects? By how much can public transport companies raise their tariffs without causing social disruption? What level of price falls is acceptable for a country’s exporting farmers? It should be noted that price forecasts figure only marginally in these decisions. It may well be that the Government expects prices to remain low, but as experience has shown abundantly, oil price forecasts are unreliable, and what matters is what is possible rather

than what is expected (in any case, if the market expects that prices will remain low, "insurance" against the risk of price increases will be relatively cheap).

- Formulation of a risk management strategy. Possible impacts that go beyond these "pain levels" should, in all reasonableness, be managed systematically and proactively, possibly directly by the central Government, possibly by parastatals, and possibly also by private sector groups through some form of government pressure (e.g. transport companies or fertilizer distributors can be informed that no price increases beyond certain levels will be accepted on the basis of oil price increases alone). Governments may also decide to lock in very favourable price levels for opportunistic reasons (e.g. in a year of exceptionally low prices, to ensure that the oil import bill in the years to come remains low). A risk management strategy can contain different instruments: savings funds built up in times of low prices; arrangements with international organizations or banks which ensure that extra loans will be forthcoming in times of high prices: strategic oil reserves; indexing foreign debt to oil prices; or the use of various market-based instruments, to mention just the main ones.

- Development of the implementation mechanism for the strategy. This operational aspect has been discussed at length in this paper. It can be simple (e.g. a cabinet decision, at opportune times, to link a certain part of foreign debt to oil prices or to enter into an oil price swap), or more complex (e.g. the formation of a dedicated unit in the Ministry of Finance that manages oil price risks on a day-to-day basis, and has a certain maximum budget with which it has to reach specific risk management goals). Private sector entities (farmers, processors, traders and distributors) can be made to manage their risks through framework rules and regulations, or through the tax system. In any case, the ability to actually use the planned instruments should figure prominently in the design of the implementation mechanism (e.g. it is of little use to decide that one will use long-term swaps to lock in attractive price levels if the country's credit risk is such that no international bank is willing to offer such swaps at a reasonable price).

- Regular re-evaluation of the strategy and implementation mechanism, and when necessary, adaptation and fine-tuning.

125. Of course, the actual price environment has a considerable impact on what is feasible. If one wishes to build up a stabilization fund for oil imports, it should be started when oil prices are low. Similarly, if one wishes to lock in low import prices for 10 years or so (the market mechanisms for this are available), one can do so only when prices are low. Hindsight is of no use in these matters – if one does not act in time, the opportunity is gone. It is clear that a few years ago Governments of African oil-importing countries could have used quite simple hedging schemes to protect their economies. At that time, prices were not only relatively low, but also in a fairly steep backwardation, with prices quoted for two-three years forward 5-10 per cent below current prices, something from which importers could benefit. Also, price volatility was not very high, and so options were affordable. Both have changed now. For example, in early May 2005, WTI prices for July delivery were about the same as for December 2007, and even after that they remain very high.

126. The time to protect oneself against a shock is of course before the shock occurs, not afterwards. The Governments of African oil-importing countries and their populations would have saved many hundreds of millions of dollars had they decided two or three years ago to insure themselves against the risk of price increases. A few countries (e.g. Mali) had asked for

126. (continued) assistance from the international community to help them design price insurance schemes, but this assistance was not forthcoming (UNCTAD, one of the two international organizations with expertise in this area, can undertake technical assistance activities of this nature only if there is funding from third parties). Unfortunately, the current oil price environment makes it very difficult for African oil importers to decide on a realistic risk management programme. It would seem that as prices are already beyond acceptable "pain levels", African Governments can probably not afford to lock in the current situation – they will just have to hope that prices will fall again. True, prices may increase even further, but protection against this risk may be difficult to afford (except perhaps through some exotic instruments, e.g. the Government of a copper-exporting country giving up part of the potential benefits of copper price increases to buy protection against oil price increases).

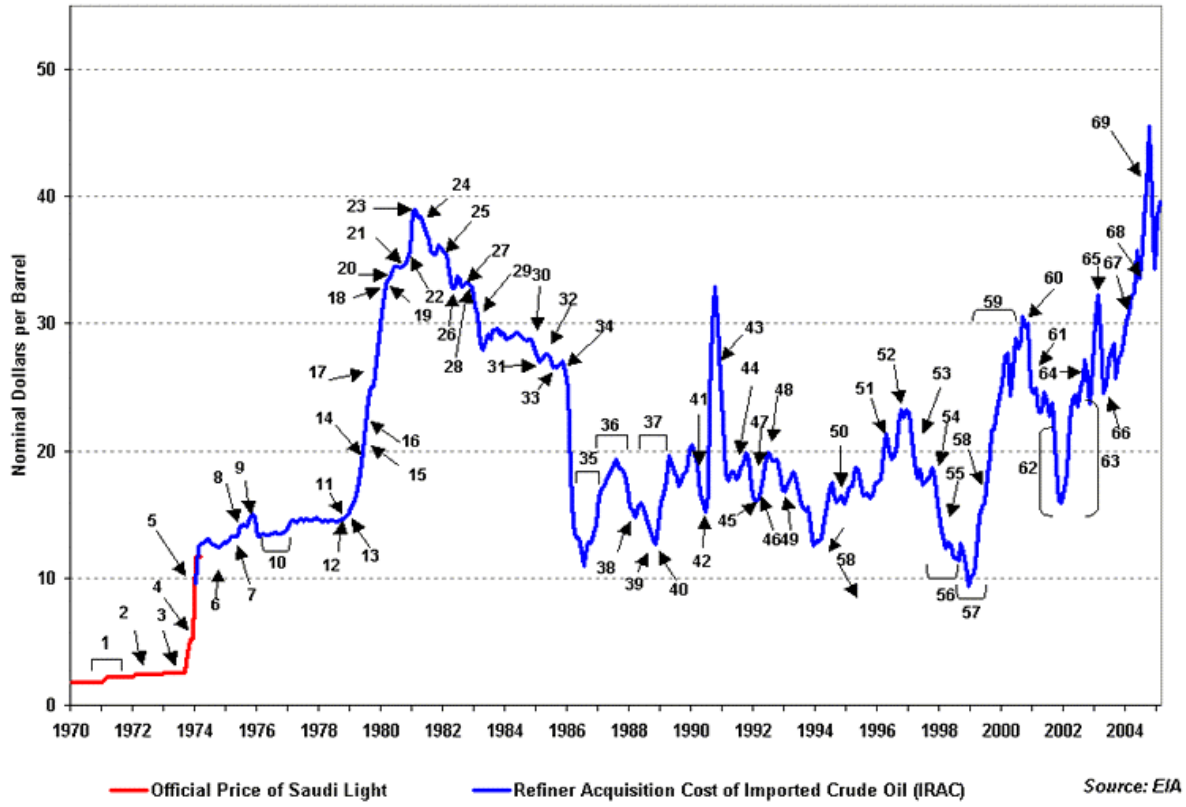
127. But while this may not be the best time to lock in future prices, Governments of oil importers should still be proactive in managing their exposure, along the lines discussed above. Then, when prices fall again (and hopefully for these countries, these times will soon arrive, although it is unlikely that prices will fall below the historically high level of $30 per barrel), they will be ready to implement this strategy. Otherwise, memories are often remarkably short, and it is often expedient to assume that bad times will not arrive again (at least not on the current Government's watch). Some implementation mechanisms are simple – for example, any World Bank loan can be indexed to oil prices through not much more than a simple decision by the Government – but they require Governments to be ready to act fast when the time is ripe.

Appendix 1

WORLD OIL MARKET AND OIL PRICE CHRONOLOGY, 1970– 2005

The following chronology of oil price movements is taken from the Energy Information Administration website. It was originally published by the Department of Energy's Office of the Strategic Petroleum Reserve, Analysis Division. Updates for 1995–2005 are provided by the Energy Information Administration.

World oil price chronology, 1970–2005



The price data are in nominal terms, that is they are in "dollars-of-the-day" and have not been adjusted for inflation.

1. OPEC begins to assert power; raises tax rate and posted prices.
2. OPEC begins nationalization process; raises prices in response to falling US dollar.
3. Negotiations for gradual transfer of ownership of Western assets in OPEC countries.
4. Oil embargo begins (19–20 October 1973).
5. OPEC freezes posted prices; United States begins mandatory oil allocation.
6. Oil embargo ends (18 March 1974).
7. Saudis increase tax rates and royalties.
8. US crude oil entitlements programme begins.
9. OPEC announces 15 per cent revenue increase, effective 1 October 1975.
10. Official Saudi Light price held constant for 1976.
11. Iranian oil production hits a 27-year low.
12. OPEC decides on 14.5 per cent price increase for 1979.
13. Iranian revolution; Shah deposed.

14. OPEC raises prices by 14.5 per cent on 1 April 1979.
15. US phased price decontrol begins.
16. OPEC raises prices by 15 per cent.
17. Iran takes hostages; President Carter halts imports from Iran; Iran cancels US contracts; non-OPEC output hits 17.0 million b/d.
18. Saudis raise marker crude price from 19$/bbl to 26$/bbl.
19. Windfall Profits Tax enacted.
20. Kuwaiti, Iranian and Libyan production cuts drop OPEC oil production to 27 million b/d.
21. Saudi Light price raised to $28/bbl.
22. Saudi Light price raised to $34/bbl.
23. First major fighting in Iran–Iraq War.
24. President Reagan abolishes remaining price and allocation controls.
25. Spot prices dominate official OPEC prices.
26. United States boycotts Libyan crude; OPEC plans 18 million b/d output.
27. Syria cuts off Iraqi pipeline.
28. Libya initiates discounts; non-OPEC output reaches 20 million b/d; OPEC output drops to 15 million b/d.
29. OPEC cuts prices by $5/bbl and agrees to 17.5 million b/d output.
30. Norway, the United Kingdom and Nigeria cut prices.
31. OPEC accord cuts Saudi Light price to $28/bbl.
32. OPEC output falls to 13.7 million b/d.
33. Saudis link to spot price and begin to increase output.
34. OPEC output reaches 18 million b/d.
35. Wide use of netback pricing.
36. Wide use of fixed prices.
37. Wide use of formula pricing.
38. OPEC/non-OPEC meeting failure.
39. OPEC production accord; Fulmar/Brent production outages in the North Sea.
40. Exxon's Valdez tanker spills 11 million gallons of crude oil.
41. OPEC raises production ceiling to 19.5 million b/d.
42. Iraq invades Kuwait.
43. Operation Desert Storm begins; 17.3 million barrels of SPR crude oil sales are awarded.
44. Persian Gulf war ends.
45. Dissolution of the Soviet Union; last Kuwaiti oil fire is extinguished on 6 November 1991.
46. UN sanctions threatened against Libya.
47. Saudi Arabia agrees to support OPEC price increase.
48. OPEC production reaches 25.3 million b/d, the highest in over a decade.
49. Kuwait boosts production by 560,000 b/d in defiance of OPEC quota.
50. Nigerian oil workers' strike.
51. Extremely cold weather in the United States and Europe.
52. United States launches cruise missile attacks into southern Iraq following an Iraqi-supported invasion of Kurdish safe haven areas in northern Iraq.
53. Iraq begins exporting oil under United Nations Security Council Resolution 986.
54. Prices rise as Iraq's refusal to allow United Nations weapons inspectors into "sensitive" sites raises tensions in the oil-rich Middle East.
55. OPEC raises its production ceiling by 2.5 million barrels per day to 27.5 million barrels per day. This is the first increase in four years.

56. World oil supply increases by 2.25 million barrels per day in 1997, the largest annual increase since 1988.
57. Oil prices continue to plummet as increased production from Iraq coincides with no growth in Asian oil demand owing to the Asian economic crisis and increases in world oil inventories following two unusually warm winters.
58. OPEC pledges additional production cuts for the third time since March 1998. Total pledged cuts amount to about 4.3 million barrels per day.
59. Oil prices triple between January 1999 and September 2000 owing to strong world oil demand, OPEC oil production cutbacks and other factors, including weather and low oil stock levels.
60. President Clinton authorizes the release of 30 million barrels of oil from the Strategic Petroleum Reserve (SPR) over 30 days to bolster oil supplies, particularly heating oil in the North-East.
61. Oil prices fall owing to weak world demand (largely as a result of economic recession in the United States) and OPEC overproduction.
62. Oil prices decline sharply following the 11 September 2001 terrorist attacks on the United States, largely because of increased fears of a sharper worldwide economic downturn (and therefore sharply lower oil demand). Prices then increase as a result of oil production cuts by OPEC and non-OPEC at the beginning of 2002, plus unrest in the Middle East and the possibility of renewed conflict with Iraq.
63. OPEC oil production cuts, unrest in Venezuela and rising tension in the Middle East contribute to a significant increase in oil prices between January and June.
64. A general strike in Venezuela, concern over a possible military conflict in Iraq and cold winter weather all contribute to a sharp decline in US oil inventories and cause oil prices to escalate further at the end of the year.
65. Continued unrest in Venezuela and oil traders' expectation of imminent military action in Iraq cause prices to rise in January and February 2003.
66. Military action commences in Iraq on 19 March 2003. Iraqi oil fields are not destroyed as had been feared. Prices fall.
67. OPEC delegates agree to lower the cartel’s output ceiling by 1 million barrels per day, to 23.5 million barrels per day, effective April 2004.
68. OPEC agrees to raise its crude oil production target by 500,000 barrels (2 per cent of current OPEC production) by 1 August, in an effort to moderate high crude oil prices.
69. Hurricane Ivan causes lasting damage to the energy infrastructure in the Gulf of Mexico and interrupts oil and natural gas supplies to the United States. US Secretary of Energy Spencer Abraham agrees to release 1.7 million barrels of oil in the form of a loan from the Strategic Petroleum Reserve.

Source: EIA.[75]

[75] http://www.eia.doe.gov/emeu/cabs/chron.html.

Appendix 2

US ENERGY INTELLIGENCE AGENCY OIL PRICE FORECASTS COMPARED WITH ACTUAL PRICES; AND PERCENTAGE ERRORS

World oil prices, actual vs. forecasts
(Current dollars per barrel)

	1998	1999	2000	2001	2002	2003
AEO 1982						
AEO 1983						
AEO 1984						
AEO 1985						
AEO 1986	54.30	58.99	64.42			
AEO 1987			57.72			
AEO 1989*	42.47	46.36	49.98			
AEO 1990			46.17			
AEO 1991	32.03	34.28	36.89	39.84	43.34	47.08
AEO 1992	31.17	33.96	36.96	39.90	42.96	46.05
AEO 1993	26.71	28.64	31.02	33.48	36.27	38.90
AEO 1994	22.12	23.76	25.52	27.51	29.67	31.86
AEO 1995	20.39	21.59	22.97	24.33	25.79	27.27
AEO 1996	19.72	20.97	22.34	23.81	25.26	26.72
AEO 1997	19.55	20.07	20.59	21.68	22.71	23.75
AEO 1998	18.79	19.87	20.95	21.79	22.53	23.46
AEO 1999	12.50	13.64	14.67	16.35	17.87	19.64
AEO 2000		17.35	21.80	20.99	21.52	22.05
AEO 2001			28.21	24.86	22.82	22.36
AEO 2002				22.99	21.99	24.00
AEO 2003					23.65	26.92
AEO 2004						27.65
Actual	12.04	17.26	27.70	22.00	23.71	27.71
Average absolute error (all AEOs)	15.20	11.6	11.7	5.7	5.7	6.2

World oil prices, actual vs. forecasts
(percentage error)

	1998	1999	2000	2001	2002	2003
AEO 1982						
AEO 1983						
AEO 1984						
AEO 1985						
AEO 1986	351.0	241.7	132.5			
AEO 1987			108.4			
AEO 1989*	252.7	168.6	80.4			
AEO 1990			66.7			
AEO 1991	166.0	98.6	33.2	81.1	82.8	69.9
AEO 1992	158.9	96.7	33.4	81.4	81.2	66.2
AEO 1993	121.8	65.9	12.0	52.2	53.0	40.4
AEO 1994	83.7	37.7	-7.9	25.0	25.1	15.0
AEO 1995	69.4	25.1	-17.1	10.6	8.8	-1.6
AEO 1996	63.8	21.5	-19.3	8.2	6.5	-3.6
AEO 1997	62.4	16.3	-25.7	-1.5	-4.2	-14.3
AEO 1998	56.1	15.1	-24.4	-1.0	-5.0	-15.3
AEO 1999	3.8	-21.0	-47.0	-25.7	-24.6	-29.1
AEO 2000		0.5	-21.3	-4.6	-9.2	-20.4
AEO 2001			1.8	13.0	-3.7	-19.3
AEO 2002				4.5	-7.3	-13.4
AEO 2003					-0.3	-2.9
AEO 2004						-0.2
Average absolute percentage error (all AEOs)	126.3	67.4	42.1	25.7	24.0	22.3

* There is no report entitled Annual Energy Outlook 1988 owing to a change in the naming convention of the AEOs.

Source: EIA.[76]

[76] http://www.eia.doe.gov/oiaf/analysispaper/excel/table12.xls.

Appendix 3

PRACTICAL INTRODUCTION TO A FUTURES MARKET FROM THE VIEWPOINT OF GOVERNMENTS OF OIL- EXPORTING AND OIL-IMPORTING COUNTRIES

SOME KEY QUESTIONS ANSWERED

What is a futures market?

- A futures market is an organized marketplace with a number of characteristics:

- The market provides for a framework within which trade takes place: a physical trading environment (which can be a trading floor or an electronic network), a set of rules (trading rules and rules for arbitration in the event of conflict), a system for gathering and distributing information on the trade that takes place (generally on a real-time basis) and a mechanism to make trade secure.

- On the market, contracts ("futures contracts") are being continuously bought and sold. Unlike in an auction, where products are being sold one by one by the auctioneer to a large public of competitive buyers, on the futures market all participants can be both buyers and sellers, and as a result, the market is highly competitive.

- The products which are traded are standardized. Again, to compare it with an auction: in, for example, a coffee auction, each lot has different characteristics – potential buyers need to see and smell the beans in order to know which bids to make. In contrast, if coffee is traded in a futures market, potential buyers are unable to actually test the physical product. The exchange provides for a standard contract: a standard size, standard delivery modalities and a standard (minimum) grade. The trading on the exchange takes place only on the basis of price, and all the other contract specifications are standard. This makes trading very easy, and at any time, one can find a ready market either to sell to or to buy from.

- The market users are anonymous. If you are a large exporter, the news that you have a lot of crude oil/petroleum products for sale may well depress prices. On the futures market, you can sell contracts without anyone (apart from your broker and the exchange officials), knowing that your company is the seller.

- The exchange provides an environment for trade to take place. Exchange officials are paid a salary: they do not make a profit on the basis of the way prices move. The exchange earns its money by, firstly, selling the price information it has on the trade that takes place on its floor (often, this is the main source of income), and secondly, by fixed and very small commissions on each contract traded. The exchange and its staff have an interest in maximizing the use of their market, and the only way they can do this is by providing an attractive marketplace, with fair treatment for everyone.

Futures markets exist for a large number of commodities, for currencies, for interest rates and for other financial assets. These markets trade contracts which provide for future delivery of these products, in the case of crude oil up to seven years forward. However, in practice, most

users of these markets "close out" their earlier sales or purchases by opposite transactions, and at the end, do not make or take delivery.

So why is a futures market useful for a crude oil/petroleum products exporter or importer?

A futures market is useful for an exporter or importer because, if the exchange is properly set up, its prices move in parallel to the prices on the physical market. This makes it possible to use the futures exchange for eliminating most of the price risks you are exposed to in the physical market, and for anticipating physical market transactions.

Are there financial requirements for using the exchange?

Yes. The exchange guarantees to all of its users a perfect contract performance. There are no defaults on the exchange. This guarantee is possible only because in turn, the exchange requires guarantees from all of its users. This guarantee is called the **margin**. When one enters into a futures position, one deposits a "safety deposit" equivalent to a few per cent of the price of the underlying contract (this deposit has to be sufficient to cover the total possible loss which may result from two days of relatively large price changes). If the futures market position is loss-making, one is asked to put up additional **margin calls**, so that at any time a sufficiently large guarantee is in place. If one is unable to pay these margin calls, positions are forcibly closed out.

Now, for a hedger, any loss on the futures market should be compensated by a simultaneous gain on the physical market. But this gain is not necessarily already realized, and so the hedger may have a cash flow problem. This is unlikely to occur if the hedger has good bank relations: the value of the commodities that the hedger can give as collateral increases, and thus the bank should be willing to provide extra finance which can be used to pay margin calls (if banks are familiar with this business, they should be able to manage the whole hedge account without necessarily even bothering the hedger). In other words, for a sound risk management programme based on futures contracts, one needs either good relations with one's bank or sufficient access to cash.

How does a futures hedge work?

A buyer of the futures pays a margin[77] to a brokerage firm, which in turn pays the margin to the clearing house.[78] As the value of the underlying asset increases, a request is made to the holder of the futures to service the margin account to a minimum level, called a "maintenance margin". This process, called "mark to market", is done daily to eliminate credit risk between the parties and the clearing house. The initial margin is typically 2–10 per cent of the contract value and the maintenance margin is calculated approximately as 75 per cent of the initial margin.

In the long hedge (the purchase of futures, typical for, say, an oil importer who wishes to protect himself against the risk of price increases) the hedger does not fare well on the long futures position when the asset price falls but gains on the purchase of the physical oil

[77] A deposit of good faith paid at the beginning of a transaction.

[78] The clearing house of the exchange is the official counterparty to all futures transactions to eliminate all credit risk. It acts as a buyer to the seller and a seller to the buyer, and so there is always a safety net when one party does not honour its obligations.

(physical market prices are lower than expected). When the asset price rises the gains are reversed: there are rewards from the futures position but losses on the purchase of physical oil. Futures markets can be used without necessarily having access to the underlying commodity, as happens regularly in the case of market participants called speculators, who buy and sell futures contracts in anticipation of price changes.

An importer in a hypothetical transaction purchasing 2,000 barrels on 15 July would on the day of starting the hedge be requested to make a deposit. For the purpose of illustration the maintenance margin is assumed to be $1,000 per contract and the initial margin $2,200 per contract.

Table 7. Operation of margins for a long position in two crude oil futures contract (2,000 barrels)

Day	Futures price (dollars)	Daily gain (loss) (dollars)	Cumulative gain (loss) (dollars)	Margin account Balance (dollars)	Margin call (dollars)
	55			4400	
4 July	54	(2000)	(2000)	2400	
5 July	55	2000	0	4400	
6 July	54	(2000)	(2000)	2400	
7 July	54	0	(2000)	2400	
8 July	53	(2000)	(4000)	400	4000
9 July	56	6000	2000	6400	
10 July	57	2000	4000	8400	
11 July	62	10000	14000	18400	
12 July	54	(16000)	(2000)	2400	
13 July	55	2000	(0)	4400	
14 July	54	(2000)	(2000)	2400	
15 July	58	8000	6000	10400	

In the above example the hedger is called to service the margin account to the initial margin level on 8 July within a very short period of time because the balance fell below the maintenance margin. On 15 July the importer decides to close its position by selling the two contracts at a cumulative gain of $8,400. If the closing price is the same as the futures price, the initial margin is returned.

Margin requirements can run into millions of dollars, as shown in table 8 for the (theoretical) hedging of the estimated production of some African exporters in 1993. Verleger[79] notes that these huge cash upfront deposits exclude many countries from the futures market because they lack access to such funds. Verleger also points out, for example, that Nigeria's production in 1993 of 1.9 million barrels would have required $1.3 billion in margin payments. This could not have been possible since Nigeria had arranged an external debt rescheduling programme with the Paris Club for over $15 billion and the only way to obtain the necessary funds would have been to reach an agreement with their lenders to amend loan agreements.

[79] Verleger Jr. PK. Adjusting to volatile energy prices. 1993.

Table 8. Futures contracts and associated margin payments required to hedge 1993 crude oil production of 14 oil-exporting countries

Country	Estimated 1993 production (mill. bbl/day)	Futures contracts required	Margin requirements $ million
Algeria	0.8	292000	584
Gabon	0.4	146000	292
Libyan Arab Jamahiriya	1.3	474500	986
Nigeria	1.9	693500	1387

Source: International Institute of Economics.

The initial margin is usually settled in the form of cash, but a letter of credit or a short-term treasury bill is also acceptable. In times of high price volatility, margin payments can rise dramatically, thus limiting participation in the market only to those who can undertake sudden payments. Low margins offer significant leverage to the position taker, who can make large gains from small changes in the futures price, but also runs the risk of making large losses. Box 8 explains in detail the strategy of a transport agency to lock in a price for purchasing crude oil and petroleum products in a period of rising oil prices.

Box 8. The long or buying hedge for crude oil and petroleum products

On July 10, a large motor vehicle fleet operator, FleetCo., determines it will need 100,000 barrels (4,200,000 gallons) of gasoline on November 19. At that time, it will purchase the gasoline at the prevailing market price. On July 10, FleetCo. assumes a long position or purchases 100 November gasoline futures contracts at 85.5¢ per gallon. The futures contract fixes the cost of its anticipated physical supply requirements for November 19. FleetCo. will designate the futures contracts as a cash flow hedge. In this scenario, the company does not have a contract to buy the gasoline inventory but anticipates that the purchase is probable. By buying, or taking a long position, FleetCo. has contracted to purchase 100,000 barrels gasoline at 85.5¢ a gallon on November 19.

The futures contract can be terminated at any time prior to the purchase date by executing a sell order on the Exchange to close out the long futures contract. The company chooses to assess effectiveness by comparing the entire change in the fair value of the futures contracts to expected changes in the cash flows from the forecasted purchase transaction.

On September 30, the financial statement reporting date of FleetCo., November gasoline futures have risen to 88¢ a gallon. The gain on futures is recognized by recording the fair value of future contracts at $105,000 [($0.88-$0.855) x 4,200,000] with the corresponding entry credited to other comprehensive income. Each day, the futures contracts are marked-to-market and margin funds are paid or collected reflecting the change in the value of the futures position.

At the end of trading in the November contract, the spot price and future prices have increased to 90¢. FleetCo. liquidates its long position by selling 100 November gasoline contracts at 90¢, the futures price at the last day of trading. This generates a total gain in the futures market of $189,000 [$105,000 from September and $84,000 for October 1 to November 19 calculated as follows:$0.90-$0.88)x4,200,000=$84,000].

FleetCo. then acquires 4,200,000 gallons of gasoline for $3,780,000, given the spot price of 90¢. FleetCo recognizes this purchase by increasing inventory by $3,780,000 and recording a cash payment for the same amount. The gain recorded in other comprehensive income from the futures transaction of $189,000 is used to fund the increase in the cash market price since July 10.

Effectively, FleetCo. paid $3,591,000 for the inventory ($3,780,000 - $189,000), locking in a purchase price of 85.5¢ instead of the prevailing spot price in November of 90¢. The gain recorded in other comprehensive income of $189,000 ($105,000 from September and $84,000 for October 1 to November 19 period) will be released into current earnings when the inventory is eventually sold/used. This will be accomplished by reducing other comprehensive income by $189,000 and reducing cost of goods sold by the same amount at the time of sale.

Source: Nymex.[80]

A hedge can be executed on the whole asset or part of it, but as it turns out, it is not always optimal to hedge your whole asset. The following example illustrates how to minimize exposure by calculating a hedge ratio.

[80] A practical guide to hedging: http://www.nymex.com/media/hedge.pdf.

Example 1
A country knows that it will buy 500,000 barrels of crude oil in three months. The standard deviation of the change in the price per barrel of crude oil over a three-month period is calculated as 0.032. The country chooses to hedge by futures contracts on Brent crude oil. The standard deviation of the change in the futures price over a three-month period is 0.040 and the coefficient of correlation between the three-month change in the price of Bonny Light and the three-month change in the futures price is 0.8. The optimal hedge ratio is then calculated as:

h = 0.8x0.032/0.040 = 0.64
One Brent crude oil futures is on 1,000 barrels. The hedger should therefore buy
0.64 x 500000/1000 = 320 contracts

But are prices on the futures market really fair? Are there not too much speculation and manipulation on the market?

In principle, everyone can use the futures market. Anyone who sees a profit opportunity can use it. The market is not monopolized by a particular group of people. The market is also closely regulated to avoid abuses. Yes, there is a lot of speculation, and occasionally, someone tries to manipulate the market. But if you are a producer, trader or end-user, there is very little risk that this will hurt you: dangerous situations are easy to avoid, and you will in effect benefit from the use of the market by speculators.

Why is that? Basically, if the market is "wrong" (that is, prices do not reflect the underlying supply/demand conditions), you normally have extra profit opportunities. For example, imagine that a manipulator is trying to push up prices. This means that you will be able to deliver your crude oil/petroleum products to the exchange at prices that are above fair market prices; as the manipulator would need to sell his crude oil/petroleum products stock again at one moment or another, you may even be in a position to buy it back later at a price below your own production cost.

How often is the market wrong? It is wrong sometimes, of course, but you have to realize that the price that you see on the futures market is the result of the interaction of hundreds, thousands or even tens of thousands of people – it is the "common wisdom" of the market. If the price you see on the exchange is different from what you think it should be, you may be right – you may know better than all these other people. But it is equally possible that "the market" knows something that you do not know. For example, imagine that a large Chinese trading house knows that it will be able to sell a large amount of crude oil to a large refinery. It also knows that when it starts buying this crude oil on the physical market, prices will go up. So what it does is to start to buy futures contracts. Prices will also go up, but as the rest of the market does not know that this purchasing comes from this Chinese company, the price increase will not be that large (once the company starts using the physical crude oil, prices will go up further, which means it can resell the futures at a profit, and this will compensate for the higher prices it pays in the physical market). So what you see, as an outsider, is that futures prices are increasing. Even though you do not know why, the market is not wrong: simply, "the market" is at a price level which reflects more and better information than you have at your disposal.

Who uses the futures market?

There are two categories of users of the futures market: those active in the underlying physical market (producers etc.) and those without any exposure to this underlying market. The first group are commonly called "hedgers", and the latter group "speculators", although in reality it is a little more complicated than that. Producers, traders and end-users will, of course, speculate from time to time (without a futures market, they will be speculating the whole time, trying to anticipate the way prices will move). And some speculators, in effect, are people who put their eggs into many different baskets (so-called portfolio investors), knowing that some of their investments will go wrong, but that on average, they will do very well.

In effect, in the category of speculators, there are several groups:

L**ocals**. These are small traders in futures contracts who make a living trading on the exchange floor. During the day, they continuously make sales and purchases, hoping that at the end of the day they will end up with a profit. They are the "oil" in the exchange machinery: at any moment in time, they will be ready to buy or to sell, ensuring that it is easy to put even large orders into the market without making a heavy impact on the price.

S**mall outside speculators**. These are individuals who either try to be informed on developments in the petroleum sector, and on that basis, try to anticipate where its price will go, or who simply gamble on the direction of the price movement. As a group, they tend to lose money on the exchange, although some do quite well.

L**arge outside speculators**. This group includes, for example, managed funds (which consist of many small speculators who have put their funds together and recruited a specialized money manager to decide on fund placements) and institutional investors (e.g. pension funds). These large speculators tend to be well informed, and are often willing and able to take large positions; as such, they are perfect counterparts for large trade users (hedgers) of the exchange.

A**rbitrators**. Arbitration is low-risk speculation. Imagine, for example, that a trading company notices that the Brent price on the IPE futures exchange is relatively high compared with the WTI price on the NYMEX exchange. He will buy NYMEX contracts and simultaneously sell contracts for the same amount on the IPE. If the price differential narrows, as anticipated, the trading company will close out its positions and make a profit.

Do I need to be in New York or London to use the futures market?

No. To use the futures market, you need information on its current prices and a "gateway" that allows you to buy and sell contracts on the exchange.

The exchange will do its utmost to distribute its price information. Yesterday's prices will be in the newspapers, and could be sent to you by fax. Current prices are reported on a real-time basis by Reuters and other information services, and also, for a small subscription fee, on the Internet. You can also phone your broker at any time to find out the latest prices (most brokers will make an effort to keep their clients well informed about happenings in the market).

Your gateway to the exchange will be a broker. Brokers are licensed intermediaries who are authorized to deal, on your behalf, on the exchange. They have to meet a number of strict criteria to be approved and have to follow an equally strict code of conduct in their relations with their clients, and their business is rigorously controlled to ensure they do not abuse their clients' confidence.

A broker works on a commission for each contract he buys or sells on behalf of his client; this commission is bilaterally negotiated. The client signs an agreement with the broker, in which, among other things, the financial arrangements between the broker and the client are laid out (for example, the client would have to deposit a certain sum of money in an account controlled by the broker to guarantee his transactions). Then, every time the client wants to buy or sell a certain number of contract, he phones his broker; the broker then phones his agent on the exchange floor – or in an electronic, computer-based trading system, inputs the order into a computer – and if the agent can place this order, confirms the transaction to his client (all this could take less than a minute). A broker can just do his best; he cannot be held liable if, for instance, in a period of strong market movements, he has difficulty in placing his customer's orders.

What exactly will I be trading when I use the futures market?

If you trade on the futures market, you trade a standard product, with standard quality specifications, standard delivery locations and procedures, and a standard delivery time. Your own product may be identical to that: you may wish to protect your production of standard crude oil which you sell through one of the ports where you can make delivery against a futures contract, and you plan to make delivery at the same time as the dates provided for in the futures contract. If this is so, the price of your product will behave exactly like the price of the futures contract, and you can use the futures market as a "perfect" risk management tool.

However, in practice, your product and your sales mechanism are likely to be different, in one way or the other, from those of the exchange's standard contract. If that is so, the price for your product may behave slightly differently from the futures price. The difference between the two prices is called the basis, and the risk you run that this price difference will worsen for you, when you are hedging, is called the basis risk. However, this basis risk is not all bad news. Yes, even if you have fully covered your risk exposure with futures contracts, you run the risk that you will make a loss because the prices for your product decline faster than the futures price. But on the other hand, if you analyse the way this price difference has behaved in the past, you may actually be able to improve your profit margin.

How does this work? The price that you get for your product in reality consists of two components: the world market price, and the basis, that is the premium or discount for your production in the delivery location that you are choosing. If one always sells for a fixed price, one has little choice: the two components have to be "fixed" at the same time. With a futures market, you can lock in an attractive world market price without having to accept an unfavourable basis, and lock in a good basis afterwards. This is possible by analysing the difference between the exchange and the spot price offered, and timing sales to when the basis has strengthened or the difference in prices is at it lowest.

Assuming the exchange and the spot price differ by a range of $1 to $1.5. On day 3, the basis was $1, much better than normal, so the hedger sells the physical product for $45 because he believes world prices will continue rising and simultaneously buys a futures contract at $46 a

barrel. On day 6 the hedger decides that the period of price increase is over and sells the futures contract for $50.5, gaining $4.5. The realized price is therefore $49.5. The next day prices crash and if he had sold on day 7 he would have received only $45.5. By selling on day 3 and simultaneously buying a futures contract that is then sold on day 7, the hedger realizes an effective price of $46.5. Remember, this improved marketing behaviour would be based on facts, on an analysis of normal price differences – it does not rely on some form of magic or perfect foresight.

Table 9. Seven-day oil prices in exchange and spot market (assumed values for illustration)

Day	Exchange price $/bbl	Spot price $/bbl
1	44	42
2	45.5	44
3	46	45
4	47	45.5
5	49.5	47
6	50.5	47.5
7	47.5	45.5

Are there other problems in using the exchange?

Yes. There are two important pitfalls:
You need to be sure why you are using the exchange. Decisions which, when taken, looked good may still result in lost opportunities. This should be accepted by the company's decision makers.
You need to invest in skills and systems. Skills, because the better one understands the futures market, the better opportunities one has. Systems, because like any other activity where money is involved, there is a potential for abuse.

If you can always predict where the market is going, you do not need to manage your risks on a futures market (but then again, you do not need to bother at all about having or working in an oil company; you can simply become very rich as a speculator). Of course, hindsight is always perfect: there will always be people who say "why did you do this, you should have known where prices were going". It is imperative that when using a futures market, one knows why one is doing so, or in other words, that decisions be accepted as sound ones even if, at the end, it turns out that other decisions would have been better. To give two examples:

You are able to buy crude oil at, what you think, is a good price. As you do not want to lose this opportunity, you decide to sell refined products, for example petrol futures to "lock in" the currently attractive petrol price. But as it happens, petrol prices improve even more: rather than the good profit you locked in, you could have made a very good profit. But could you have afforded the risk that prices would go down?

As an integrated petroleum products producer, with your own oilfields, you know what product prices you have to realize in order to make your refinery operations profitable. You also need this profit, as you have planned to expand your operations in the second half of the coming year, and so you need the cash flow. In the months preceding the budget year, and the first few months of that year, you are able to lock in prices that will give you the required cash

flows. But prices move further up, and you have forgone this profit opportunity. But could you have afforded price declines, which would have squeezed your cash flow and would have sabotaged your investment plans?

So, using a futures market always has an opportunity cost. But remember, you never know where the market is going: instead of this opportunity cost, you could have made a very real financial loss by not using the futures market. What matters is that you have achieved your objectives: you obtained attractive prices, reached your budget, locked in your processing or trading margin, and so on.

So, what about skills and systems?

Futures contracts are relatively new instruments providing many opportunities, of which those people with the best skills will be able to make the most. However, company managers should never just rely on such individuals. They need to put good systems in place to ensure that if a trader makes mistakes, or deliberately departs from the company's policies, losses can be contained within bounds acceptable to the company. This is neither very cumbersome nor very complex, but it does require deliberate policy action before the risk management programme starts, and then, a vigilant attitude towards the actual use of the futures market. In recent years, several manuals have been written on this subject. One, available from UNCTAD (Commodities Branch, UNCTAD, Palais des Nations, 1211 Geneva 10, Switzerland; fax: 41 22 907 0047) is entitled "Company control and management structures: The basic requirements for a sound use of market-based risk management instruments".

Appendix 4

PRACTICAL INTRODUCTION TO USING OPTIONS FROM THE VIEWPOINT OF GOVERNMENTS OF OIL-EXPORTING AND OIL-IMPORTING COUNTRIES

SOME KEY QUESTIONS ANSWERED

What are options?

Options are like insurance contracts. They provide protection without forgoing the opportunity to benefit from price improvements. For instance, a producer could be protected against price declines, but still make extra profits if prices increase. This type of protection, of course, also has a cost. While the cost of a futures contract is, in effect, the "opportunity cost" of forgoing the opportunity to benefit from price improvements, for an option one pays a premium. As in the case of insurance, the better the level of protection, and the longer the period of protection, the higher the premium. Options are without doubt useful instruments.

You can buy put options, which give the right (but not the obligation) to sell futures contracts at a given price (the "strike price") on or before the date of expiration of the option contract; or you can buy call options, which similarly give the right to buy futures contracts. Put options provide protection against the risk of price falls, while call options protect against the risk of price increases. Options are structured with an expiration or maturity date. They are termed American or European, not with reference to the location of either the option or the exchange that trades them but according to the way they are exercised. In the American option your rights can be exercised at any time up to expiration, while the European type allows rights to be exercised only on the expiration date itself. After the expiration date the rights of the holder no longer exist and the unused option is said to have expired or lapsed.

Where are options traded?

Option contracts are traded actively on exchanges alongside futures contracts. However, for options trade to be possible, trade in futures contracts needs to be very active, and each liquidity should be present quite a few months forward. While it is possible in the future, one cannot just introduce options in the initial stages of a futures exchange.

How are options used?

An exporting country wishing to hedge its budget revenues for the month of November, even in the face of possibly falling prices, may pay the upfront option premiums to sell December WTI crude oil at $25 on or before 31 July. Buying put options will lock in prices at $25 and the exporter will be able to exercise its right to sell crude oil futures at that price even when the market price is lower. The seller of put options would have to make up for the difference in prices to the buyer. When prices rise above the strike price, the exporter may choose to rescind its rights and participate in upward market prices at the loss of premium paid. Table 10 provides a summary of results for an exporter for a hypothetical transaction of one barrel when prices rise or fall.

Table 10. Effective revenue from a hypothetical transaction for an exporter

	Case A Prices decrease	*Case B* Prices increase
31 July futures price for December contract	$25	$25
Futures price for December contract on 1 November	$24	$28
Gain or loss on options	$1.04	0
Option price	$0.12	$0.12
Revenue from options	$0.92	($0.12)
Cash market revenue	$24	$28
Effective revenue	$24.92	$27.88

An importing country wishing to protect its planned budget expenditure on crude oil imports in November in the face of the risk of rising oil prices may choose to pay the upfront premium to buy December Brent crude oil at $25 on or before 31 July. Buying a call option will lock in the price level at which purchases can be made while still participating in price declines. When the market price is above the exercise price, the seller is obliged to sell the required amount of crude oil futures specified by the contract. The buyer can also allow the option to expire when the market price is lower than the exercise price and buy directly from the market, incurring only the loss of premium. For both puts and calls the buyers of the options gain rights while the sellers of options incur potential obligations. Table 11 provides a summary of results for an importer for a hypothetical transaction of one barrel when prices rise or fall.

Table 11. Effective revenue from a hypothetical transaction

	Scenario A Prices decrease	*Scenario B* Prices increase
31 July futures price for December contract	$25	$25
Futures price for December contract on November 1	$24	$28
Gain or loss on options	0	-$3.02
Option price	$0.12	$0.12
Revenue	($0.12)	$2.90
Market price	$24	$28
Effective revenue	$24.12	$25.10

Options can be tailor-made over-the-counter (OTC), and based on any market (e.g. Brent crude oil, Nigeria Bonny Light) or purchased in regulated futures exchanges and based on the underlying futures contract traded at the same exchange. With OTC-type options the strike

price, expiration and premium are all subject to negotiation. This limits their tradability as compared with standardized exchange options but increases their versatility.

A popular tailor-made hedging strategy used to reduce the downside risk of oil prices is the collar, which consists of a long put plus a short call. The collar guarantees that the oil price always lies between two levels and also reduces the cost of premium paid for by the hedger. When prices fall the hedger is protected by the put, but the collar loses the protection it offers when prices appreciate above the call strike. Here, the buyer exercises the right to buy and is sold the asset at the agreed upon price or paid the difference between the asset market price and the lower call strike price. When the underlying asset price is between put and call strike price none of the parties exercise their option. There are many ways of structuring a collar, depending on the risk profile of the hedger, and it is even possible to create a costless collar where the money collected from selling calls completely pays for buying puts. This is feasible because at any given time there is a range of strike prices quoted that covers option values. Therefore, for any put option strike price establishing a seller's floor there is a corresponding call option strike price that would establish a purchaser's ceiling. Box 9 explains how a collar is constructed.

Box 9. Constructing a collar

The cost of a premium can be reduced by combining the sale of options with the purchase of options necessary for hedging risk. For example, if an oil exporting country wants to buy options for hedging against a decline in the price of oil below $16 a barrel, it can buy put options on oil with an exercise price of $16 and at the same time sell call options on oil with an exercise price of, say $24. A part or the entire premium cost for the put options can be recovered by the sale of call options. It is important to note, however, that the country effectively gives up a part of the upside potential of its future oil revenues by selling the call options. … The sale of call options implies trading future profit opportunities for the immediate revenue from option premiums. Therefore, proper risk assessment is critical when selling options.

ource: Klaassens.[81]

[81] Klaassens S. Managing commodity price risk in developing countries.

Appendix 5

PRACTICAL INTRODUCTION TO USING SWAPS FROM THE VIEWPOINT OF GOVERNMENTS OF OIL-EXPORTING AND OIL-IMPORTING COUNTRIES

SOME KEY QUESTIONS ANSWERED

What is a swap?

Oil swaps are financial instruments that allow buyers and sellers of crude oil and petroleum products to exchange their differing exposures to long-term price risk over a specified period. In a swap there is no exchange of physical oil, but the paper transactions guarantee the user a fixed price for an agreed volume. It means that although the buyer or seller is insulated against market risks, the potential gain when market prices become favourable is lost to the swap provider.

How does a swap work?

“In a traditional oil price swap, there are two elements; a sales hedge for, say a producer; and a purchase hedge for the end-user of oil. The financial intermediary that is providing fixed prices to both sides uses the risk taken on from each party to offset the other.

"In this example, the producer wants to sell 3-million barrels of US domestic crude over a 3-year period at a fixed price and the end-user wants to buy the same volume. The producer hedge involves a fixed price of $20 a barrel, and the consumer hedge is set at $20.254. The 25c gap gives the swap provider the income to cover the costs and risks involved, and also earn a return on the transaction.

"In the producer hedge, it is agreed that semi-annual payments will be made on one-sixth of the volume, or 500,000 barrels. In every period, the financial intermediary contracts to pay the producer $10 million, which is the value of the 500,000 barrels of crude due for that period at the fixed price of $20 a barrel. The producer contracts to pay the intermediary the value of the same 500,000 barrels but at a price indexed directly to the average of floating oil prices of the market in which the producer sells oil. This is not difficult for the producer because over the period, its oil is selling as usual in the physical market completely independent of the swap agreement. At the end of the 6-month period, only the difference between these two amounts is actually exchanged between the producer and the financial intermediary.

"Thus, at the time of the first settlement, if the floating oil market price averages just $18 a barrel for the period, the producer is contracted to pay the financial intermediary only $9 million ($18*500,000). Because only the differences are exchanged, the producer receives $1 million from the financial intermediary, covering the drop in the oil market to $2 below the producer's $20 price floor.

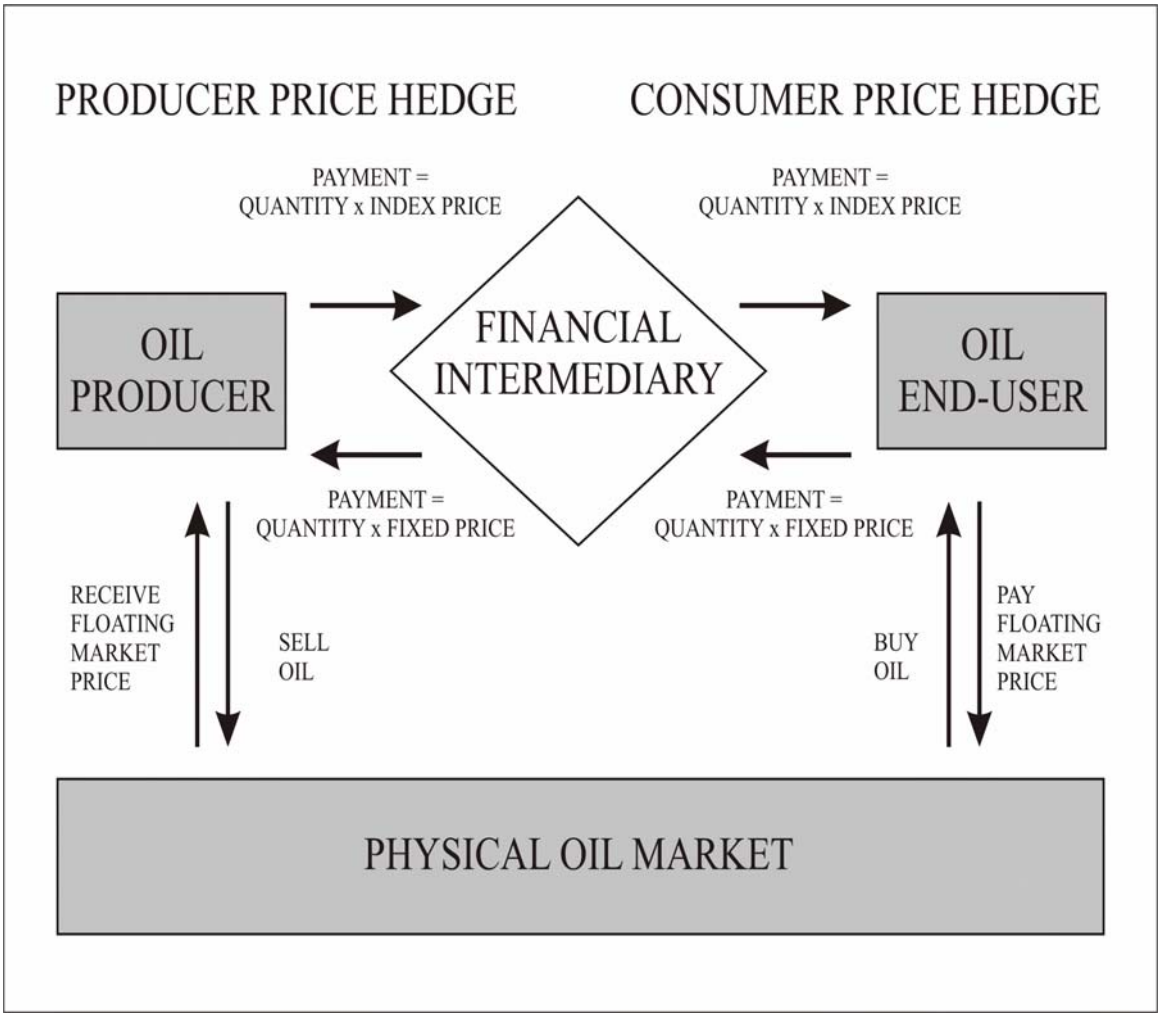
"In the next period, if the oil market index price averaged $21, the payments would be reversed, since the value of the producer's contracted payment would rise to $10.5 million ($21*500,000), requiring him to pay the financial intermediary $500,000. Because the producer's higher earnings in the physical oil market exceeded the $20 price floor, the benefit of that gain is passed on to the intermediary, which thereby maintains the fixed price level.

"The consumer hedge works exactly the same way in assuring the financial equivalent of a fixed price to the end user, which, like the producer, carries on its normal physical oil market transactions. In the first period, the consumer would be contracted to pay the financial intermediary $10.125 million ($20.25*500,000), while the financial intermediary would be contracted to pay the consumer $9 million ($18*500,000). Since only the differences are exchanged, the consumer would pay the financial intermediary $1.125 million, i.e. the difference between actual market price levels and the budgeted price under the swap. The financial intermediary would use $1 million to pay the producer and earn $125,000 for its services. In the second period, the flows would be reversed, with the bulk of the gain received by the producer being passed on to the consumer, assuring both parties their respective fixed prices.

"The flow chart below shows the various contractual relationships that make up the traditional oil price swap agreement. In reality, the pieces don't usually fit together so neatly. To execute most swaps, the steps generally require more adept risk-handling and greater exposure by the financial intermediary."[82]

[82] Intercapital Commodity Swaps. The complete guide to oil price swaps. 6 December 1990.

Figure 3. Oil price swap



Box 10. illustrates how a swap may work in stabilizing the expected revenue of a producer for a budget in a fiscal year.

Box 10. Refiner and oil producer standard crude oil swap

Figure S1 illustrates an example of a standard crude oil swap. A refiner and an oil producer agree to enter into a 10-year crude oil swap with a monthly exchange of payments. The refiner (Party A) agrees to pay the producer (Party B) a fixed price of $25 per barrel, and the producer agrees to pay the refiner the settlement price of a futures contract for NYMEX light, sweet crude oil on the final day of trading for the contract. The notional amount of the contract is 10,000 barrels. Under this contract the payments are netted, so that the party owing the larger payment for the month makes a net payment to the party owing the lesser amount. If the NYMEX settlement price on the final day of trading is $23 per barrel, Party A will make a payment of $2 per barrel times 10,000, or $20,000, to Party B. If the NYMEX price is $28 per barrel, Party B will make a payment of $30,000 to Party A. The 10-year swap effectively creates a package of 120 cash-settled forward contracts, one maturing each month for 10 years.

So long as both parties in the example are able to buy and sell crude oil at the variable NYMEX settlement price, the swap guarantees a fixed price of $25 per barrel, because the producer and the refiner can combine their financial swap with physical sales and purchases in the spot market in quantities that match the nominal contract size. All that remains after the purchases and sales shown in the inner loop cancel each other out are the fixed payment of money to the producer and the refiner's purchase of crude oil. The producer never actually delivers crude oil to the refiner, nor does the refiner directly buy crude oil from the producer. All their physical purchases and sales are in the spot market, at the NYMEX price. Figure S2 shows the acquisition costs with and without a swap contract.

Figure S1: A standard swap

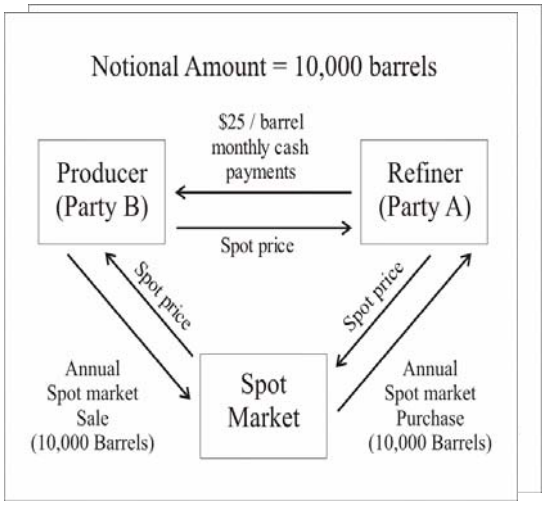
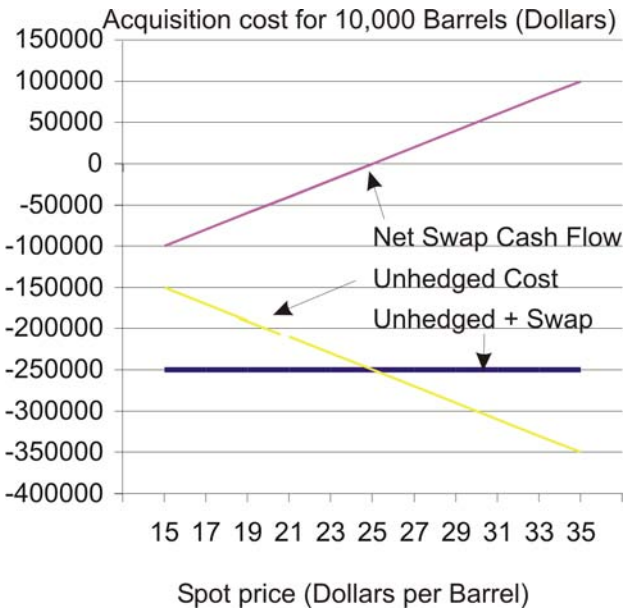


Figure S2 : Impact of swap on purchase costs



Source: Energy Information Administration.[83]

[83] http://www.eia.doe.gov/oiaf/servicerpt/derivative/pdf/srsmg(2002)01.pdf.

Appendix 6

CASE STUDIES ON RISK MANAGEMENT BY GOVERNMENTS AND PARASTATAL ENTITIES

Case study 1: Hedging budget revenue – The Texas example[84]

Summary

After a string of traditional methods had proved to be unsatisfactory to decision makers, the challenge was to discover other methods for alleviating risks. The case study illustrates how financial tools could be used in controlling budget revenues and expenditure when oil prices are volatile.

Introduction

Oil prices in the 1980s were highly volatile. The State of Texas earns 5 per cent of the value of each of the 720 million barrels produced in the State. Each dollar price increase above expected levels adds $ 36 million to government coffers, but as was illustrated in the 1986 price crash, the downside risks are also great. During the 1980s, the State of Texas operated a stabilization fund, but after 14 months of lower than expected prices, this fund ran into a deficit.

After continuing advice from external consultants, the departments of energy and finance decided to experiment with derivatives in paper trading to protect State royalty income, despite repeated opposition party warnings and a public outcry that trading financial instruments was tantamount to speculating with public funds.

Details of the hedging programme

Selling futures was ruled out despite the possibility of locking in revenues when prices fall because a short position was deemed to be too risky when prices rise. Therefore, the committee assigned to hedge by purchasing and selling options to which the treasury board that oversees the committee agreed. Furthermore, premiums are easily understood and there is a greater likelihood that citizens will be attracted to a hedging tool that offers assurance against adverse market conditions.

As a precaution the exposure at any one time was limited to $500,000, an equivalent of between 1,000 and 2,000 option contracts. This was estimated at a premium range of $0.25–$0.50 for out-of-the money puts at a 0.25 delta.[85] The value at risk is tax revenue calculated at 5 per cent of State oil production value, which is equivalent to hedging 2.3 million barrels per month.

Strategy 1: Option roll

[84] The case study is based on the Texas State risk management programme. The purpose of this case study is to explain how a Government can manage its exposure to volatile oil prices in the oil markets. It introduces the concepts of using financial instruments already discussed in this paper in a practical application.

[85] Delta is the change in value of the option for every dollar rise in the underlying futures contract price.

This strategy was executed by repeating buying and selling plain vanilla options. It involved purchasing 50 puts with 65–70 calendar days remaining until expiration and selling them four to five weeks later. The hedge was rolled over with the revenues from the sale, but sometimes it required additional funds to purchase 50 new puts. The strike price was determined by choosing puts with price sensitivity with respect to a small change in the price of underlying assets (delta) as near as 0.25 as possible. An option delta very near 0.5 is considered to be at the money and a delta nearing 1.0 is one that is deeply in the money. The choice of 0.25 was a guide that kept costs fairly low in the pilot programme.

Although the option roll was easy to explain and understand, the conditions outlined for implementing it were a little rigid as the paper trade showed, and for the hedge to be effective there needed to be more flexibility and judgment.

The option roll paper trade began with a purchase of 50 $21 November 1991 puts on 30 August for a premium of $0.24 per barrel. These were sold on 30 September for $0.02 per barrel, incurring a cumulative loss of $11,000. The loss had two causes: first, crude oil prices rose slightly, and second, the time value of the option declined substantially during the month the option was held. Losses of a similar magnitude were incurred in the following month, but then crude oil prices fell and the paper losses were recovered. After five monthly cycles, the trading programme netted a total of $28,000 or about $0.11 per barrel of crude oil that would have been hedged over the period (i.e. 50,000 barrels per month). A downturn in oil prices had changed the fortunes of the hedge but not before losses were experienced on the financial market when prices rose or stayed flat, thus giving no reason to exercise the option.

Table 12. Impact of an option hedge

DATE	ACTION	SIZE	CONTRACT	STRIKE PRICE	PREMIUM	ASSET FUTURE PRICE	DOLLAR PROCEEDS	PROFIT/LOSS
30.08.92	BUY	50	NOV '92 PUT	21	0.24	22.14	-12000	
30.09.92	SELL	50	NOV '92 PUT	21	0.02	22.23	1000	-11000
30.09.92	BUY	50	DEC '92 PUT	21	0.21	22.13	-10500	
31.10.92	SELL	50	DEC '92 PUT	21	0.01	23.37	500	-21000
31.10.92	BUY	50	JAN '93 PUT	22	0.22	23.15	-11000	
29.11.92	SELL	50	JAN '93 PUT	22	0.68	21.48	34000	2000
29.11.92	BUY	50	FEB '93 PUT	20	0.25	21.31	-12500	
31.12.92	SELL	50	FEB '93 PUT	20	0.99	19.12	49500	39000
31.12.92	BUY	50	MAR '93 PUT	17	0.24	19.12	-12000	
31.01.93	SELL	50	MAR '93 PUT	17	0.02	18.9	1000	28000
31.01.93	BUY	50	APR '93 PUT	18	0.35	19.06	-17500	

Recommendations

This trading strategy may be shifted towards shorter times to expiration, and shorter holding periods if staff can effectively read the market, thus cutting down on losses. It is designed for very volatile periods where wide price swings occur monthly and suggests an active monitoring of, and participation in, the financial market to ensure that losses are not severe.

Strategy 2: Using swaps

The second hedging strategy is to swap cash flow obligations, but a major decision had to be made on when to enter into an agreement that would be suitable. On the basis of State calculations, a feasible level of swap was deemed to be $21. A cursory glance at the historical oil prices shows intuitively that prices have fallen below $21 more than they have risen in the past few months; therefore, the State would have been a net recipient of revenues if a swap had been agreed on. However, the forward curve indicates that the market will be in contango

Strategy 2:(continued)
with little or no backwardation in the out months, and so the swap may well be agreed on at a higher level at the conception of the idea.

So, in this example, the Government could enter into a two-year swap agreement with a financial institution to hedge up to 20 per cent of its current production at a fixed price of $29.50/barrel. If the variable oil price is quoted as $25 for a given month (i.e. the average price for the month), the Government could receive $4.50/barrel, but Country A has to reimburse the financial institution the difference when prices rise above $29.50.

Strategy 3: A collar strategy

The third strategy suggested the use of options in combination to set a floor and ceiling for oil prices, but with the ability to participate in upward prices retained. It involved selling an out-of-money call to finance the purchase of an out-of-the-money put and a long out-of-the-money call. The collar was established to hedge 50,000 barrels of production.

Market timing was considered very important in this strategy. The short call and the long put position in the collar were closed out rather than being allowed to expire. From September 1991 to April 1993, 21 collars were purchased, of which 14 cost nothing or generated a positive cash flow. Overall, the revenues generated from the collars added $27,500.

Between the period from September 1991 to April 1993, the 21 collars traded generated revenues of $241,500, equivalent to a return of $0.24 per barrel for the 20 months of trade. The crude average price rose from $20.73 to $20.97. Using this collar hedging strategy would have yielded $10 million in extra State tax revenue.

Table 13 shows how trading was conducted with this strategy.

Table 13. Impact of a collar strategy

DATE	ACTION	SIZE	CONTRACT	STRIKE PRICE	PREMIUM	$$ PROCEEDS	P/L	CUMM. TRAD P/L	NET P/L	DELTA
02.03.92	SELL	50	JUNE '92 CALL	19	0.49	24500				32
02.03.92	BUY	50	JUNE '92 PUT	18	0.36	-18000				32
02.03.92	BUY	50	JUNE '92 CALL	20	0.2	-10000	-3500	116000		32
01.04.92	BUY	50	JUNE '92 CALL	1.13	1.13	-56500				32
01.04.92	SELL	50	JUNE '92 PUT	0.08	0.08	4000				32
01.04.92	SELL	50	JUNE '92 CALL	0.47	0.47	23500	-29000	87000	84300	32
01.04.92	SELL	50	JULY '92 CALL	0.32	0.32	16000				29
01.04.92	BUY	50	JULY '92 PUT	0.36	0.36	-18000				29
01.04.92	BUY	50	JULY '92 CALL	0.13	0.13	-6500	-8500	78500		29
05.05.92	BUY	50	JULY '92 CALL	0.49	0.49	-24500				26
05.05.92	SELL	50	JULY '92 PUT	0.07	0.07	3500				26
05.05.92	SELL	50	JULY '92 CALL	0.17	0.17	8500	-12500	66000	63300	26
05.05.92	SELL	50	AUG '92 CALL	0.63	0.63	31500				29
05.05.92	BUY	50	AUG '92 PUT	0.32	0.32	-16000				29
05.05.92	BUY	50	AUG '92 CALL	0.27	0.27	-13500	2000	68000		29
10.07.92	BUY	50	AUG '92 CALL	0.71	0.71	-35500				26
10.07.92	SELL	50	AUG '92 PUT	0.14	0.14	7000				26
10.07.92	SELL	50	AUG '92 CALL	0.24	0.24	12000	-16500	51500	48800	26

Case study 2: Hedging a procurement budget

Introduction

The government State Transport Corporation (STC) is relied on as the safest, most reliable and most affordable transportation system in the country. STC has a fleet of 200 buses covering 12,000 kilometres daily, and serving major cities and towns in the country. The buses consume 8.9 million gallons of diesel oil annually. Storage capacity at the depot is minimal.

Each year the Government allocates a fixed amount for procuring fuel supplies even though the transport budget has been exceeded in the past few years because of high oil prices. STC's inability to pass on costs to passengers has forced senior managers to look for solutions. The traditional way out would be a cost-cutting scheme that involves decreasing services and laying off staff. An alternative is to resort to using financial tools.

Ahead of the next board meeting, senior managers were busily polishing their argument for starting a hedging programme, knowing very well that even though the idea had been brought up in the early 1990s, it had been overwhelmingly rejected.

But this time the majority of the board surprisingly did not offer any resistance to starting a risk management programme. Those who had doubt compromised for a less risky programme using swaps. The consensus was to hedge no more than 50 per cent of STC's fuel needs using swaps. The treasury department was charged with investigating basis risk before any form of agreement was entered into with several banks that had approached the transport agency in search of new business. STC's fuel purchasing contracts was based on No. 2 diesel fuel from the Platts Oilgram at various locations. After running regression of price movements of No. 2 diesel fuel on Platts against price movements of No. 2 fuel oil on NYMEX, it was found that there was a close correlation between these two fuels. It was therefore decided that the swap contract would be tied to the No. 2 fuel oil at NYMEX at a quarterly settlement with a chosen counterparty from a bidding process. Sometimes the winner was sidestepped to reduce STC's overall credit risk in respect of any single institution.

Hedging programme administration

The administration of swaps at STC was relatively simple. One analyst was assigned to track the underlying changes of No. 2 fuel oil and the Platts index in the physical contract. No stringent controls were imposed on the analyst. Information obtained was transferred to the accounting department to record transactions. The analyst monitored the market on a daily basis, analysing basis risk and checking the cost calculations used in reaching the quarterly settlement.

Hedging programme details

The financial agreement was modelled on a master agreement governing payments to counterparty, issues of default, authority to execute a swap and court jurisdictional issues. It was easy to agree on the terms of the swap with five financial institutions that qualified for negotiations on a swap agreement.

Hedging programme details (continued)

The process by which STC enters a swap agreement starts with the board approving a budget package for the year ahead specifying requirements and the ceiling amount budgeted for procuring fuel. With this information the treasury department sets out to determine the maximum price at which the swap can be executed with the successful financial institutions. The swap price is arrived at taking into account the basis risk, taxes and delivery charges subtracted from the budgeted amount; expressed mathematically, [Budgeted amount per gallon A – Basis Risk B – Taxes C] = Swap Price D.

In other words, the swap is executed only if the budgeted amount is above the swap price plus the variables. The financial analyst therefore tracks swap prices on a daily basis until STC's target price is reached. At this stage a call is made to eligible counterparties and bids are taken over the phone. As mentioned earlier, the lowest bidder wins and confirmation is immediately sent by fax. Formal documents are expected to be signed shortly afterwards.

STC carried out its hedging in multiple increments to take advantage of sudden sharp downturns in the market, as well as helping to minimize financial default. The strategy worked well as the second swap was executed when oil prices had dropped from the previous month. In all, 30 per cent of fuel supplies were hedged between the months of September and December using two contracts of NYMEX No. 2 fuel oil and one of Platts to determine the floating price. Although the basis weakened significantly with the Platts index and caused losses, the overall hedge was deemed successful as the treasury department purchased all its fuel requirements within budget.

The following year the treasury department increased its hedge to cover all of its fuel requirements. Four financial institutions were used to execute six year-long swaps tied to NYMEX No. 2. STC secured a price that corresponded to the budgeted price. The unfavourable variance was paid for by the international institutions at a price tied to No. 2 fuel oil on the NYMEX futures market. It enabled STC to offset the higher physical purchase price with payments received from financial institutions. However, STC was obliged to make payments to financial institutions when the physical purchase price dropped below the fixed swap price. This was already provided for in the budget and payment was effected without any problem. STC's objective was achieved with minimal administrative costs.