

# Policies to Cope with Volatility of Oil Prices: Oil Importing Countries

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## Oil Price Volatility is Everywhere and Everpresent

SD of return of log prices (approximately average percentage change) – US\$ prices.

	Jan 86 – Dec 99	Jan 00 – Dec 03	Jan 04 – Dec 07
WTI daily	0.026	0.027	0.021
WTI weekly	0.044	0.046	0.035
WTI monthly	0.087	0.082	0.071
Gasoline monthly	0.095	0.124	0.117
Jet kero monthly	0.089	0.089	0.091
Heating oil monthly	0.083	0.090	0.080
Diesel monthly	0.078	0.089	0.087
Residual fuel oil monthly	0.093	0.098	0.090
Propane monthly	0.074	0.119	0.079

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## Importance of Oil Price Volatility

- For governments that are net oil importers:
  - Ratio of value of net oil imports to GDP (either both in US\$ or both in local currency)
- For households that consume oil products:
  - Ratio of direct and indirect expenditure on oil products to total expenditure.

For both, volatility matters more at higher oil prices

[In Ghana and Kenya volatility in local prices was slightly higher than in dollar prices for crude and products over 1986 -2007]

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## Policies for Oil Importing Countries

1. Policies to shift risk to another party:
  - Hedging (to NYMEX)
  - Security stocks (to government)
  - Price smoothing formula and oil fund (to government)
2. Policies to reduce importance of volatility
  - Reduce oil use by fuel switching
  - Reduce oil use through oil/energy intensity reduction

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## Hedging

- Findings of study from 1986 to 2006:
  - In period of steady price increases volatility could have been reduced by hedging program BUT, because futures prices persistently underestimated actual price outcomes (78% of months post 2004), a regular sell hedger would have lost money relative to selling spot: a buy hedger would have saved money.
- Hedging efficiency was often below 70% indicating the presence of substantial basis risk.
- Margin calls could have been substantial for sell hedgers

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## Security Stocks and Price Hikes I

- Some governments purchase oil and then store it with a view to releasing it onto market only at times of crisis. Such a crisis could include a price spike as well as actual physical disruption.
- Costs depend on oil price at time of purchase, storage costs and interest costs on money tied up
- Benefits depend on release policy – amount and trigger price

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## Security Stocks and Price Hikes II

Results of simulating economy consuming 1 million bbl/month with 3 months maximum cover and maximum monthly purchase 1 million bbls: January 2000 – March 2007

Monthly release (bbl)	150,000	250,000	250,000
Max. buying price (\$)	35	35	30
Selling price (\$)	65	65	70
Final cost to government (\$million)	1.9	-7.2	-1.0
Benefit to consumers (\$million)	5.2	8.7	2.3
Months release	7	7	4
End of period stock (million bbl)	1.95	1.25	2.0

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## Security Stocks and Price Hikes III

- In a period of rising prices, the larger the stock release the greater the benefits, but increased risk of exhausting stocks before a further price increase.
- Simulation of period 1986 -1999 produced a large cost to government exceeding benefits to consumers by a factor of three.
- By cutting off price peaks the scheme reduces volatility as well as lowering prices paid.

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## Price Smoothing Schemes I

- Smooth prices to consumers by subsidizing when international price is above some target level, and tax (or reduce subsidy) when international price is below a certain level. This can be financed through a dedicated fund (Chile) or through the government budget. Aim to be self financing over the long run.
- Target price is usually a moving average of past (and futures) prices with high and low prices set in a band around this figure.

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## Price Smoothing Schemes II

Costs of Scheme per Barrel for 3 Month Moving Average Target  
Price: 1987 -2007

Band width	Cumulated cost per bbl (\$)	SD of returns
0 %	132	0.050
± 10 %	37	0.062
± 15%	26	0.070
∞ (no intervention )	0	0.078

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## Price Smoothing Schemes III

- Even when there is no long run trend in oil prices the oil “fund” can remain in deficit for lengthy periods (“arc sine rule”).
- During period of steady climb in oil prices all moving averages (even using futures prices) would have required increasing funding from government as trigger price failed to keep up with actual price.

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## Oil Intensity and Diversification I

- In 2006 some 25% of countries had oil cost share in GDP of more than 10% indicating vulnerability to further price rises (as in latter half of 2007 and early 2008)
- Although oil intensity (bbl per unit of real GDP) has decreased in many countries, for a substantial number this increased towards end of period exacerbating effects of oil price increase

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## Oil Intensity and Diversification II

- Fuel diversification was low for many countries – in 2005 some 22 (out of 181) countries depended entirely on oil and 60 countries had a share of oil in energy greater than 0.75.
- The Herfindahl-Hirschman diversity index measured over 6 fuels was greater than 0.75 for 48 countries. By contrast some European countries and the USA had values between 0.2 and 0.3.

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## Oil Intensity and Diversification III

- Many countries are looking to other fuels with lower prices and possibly lower volatility to reduce their vulnerability to both, but a dash for coal has powerful adverse environmental effects.
- Policies to reduce energy (and oil) intensity include transport related (traffic management in urban centers, fuel economy standards) and power related (demand reduction, improving power sector efficiency) actions.

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