

# Global Economic Crisis

## Stagflationary Phase\*

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The Athenian, “The old saying is quite right: it is difficult to fight against two enemies, especially when they are fundamentally different”.

Plato, *The Laws*

### Abstract

The paper discusses the nature of the economic mechanism at work during the stagflationary phase of the on-going global crisis, over the period August, 2007-August, 2008. The analysis draws on the insights of both the structuralist and the mainstream macro models and suggests how in a multi-commodity world, characterised by sharp differences in the price/quantity adjustment process across various markets, policies based on the Taylor rule are likely to be inappropriate, if not seriously counterproductive.

### I. Introduction

After its robust performance during the period 2003-07, the world economy has since August, 2007 been experiencing adverse developments on several fronts (Tables A.1 and A.2). The crisis first surfaced in the US subprime mortgage market in the third quarter of 2007<sup>1</sup> and soon assumed a global dimension, encompassing both financial and real sectors. Indeed, the on-going troubles are the most serious the world economy has faced since the Great Depression in the 1930s.

The crisis has been characterised by a sharp slowdown in GDP growth, culminating in recessions in quite a few countries and rising unemployment and job losses practically everywhere. Indeed, over the last 17 months practically all analysts have been forced to make a

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<sup>1</sup> Initially the delinquency was mostly confined to subprime mortgages so that the associated turmoil was christened the subprime crisis. However, as we have noted in an earlier paper (Rakshit, 2007), it was really a misnomer: mortgage lending to subprime borrowers was not a major factor behind the crisis. Indeed, our reading has been confirmed by the collapse (and government bailout) of Fannie Mae and Freddie Mac which accounted for about half of the US mortgage lending, but confined themselves only to prime mortgages.

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series of downward revisions in their assessments and forecasts concerning the prospective performance of the world economy as also of the economies of particular countries (IMF, 2007, 2008, 2008a, 2008b). The more dramatic events hogging the media limelight during this period were the incessant, huge meltdown, first in the mortgage and then in other financial markets;<sup>2</sup> and the associated enormous losses and write-downs of banks,<sup>3</sup> string of bankruptcies and large scale rescue operations of tottering financial firms,<sup>4</sup> considered “too important to fail”. No less noteworthy was the massive and sustained injection of liquidity into the financial system from the very beginning of the crisis,<sup>5</sup> often in unorthodox ways,<sup>6</sup> by all major developed country central banks, apparently to little avail. The financial turbulence and the downturn in the real sector were compounded during August, 2007-August, 2008 by sharply rising inflation, especially of oil and other primary commodities.

The outbreak of the crisis and its manifestations over the last 17 months have brought to the fore a number of analytical and policy

<sup>2</sup> While a sizeable fraction of investment grade bonds including triple-A rated ones has sunk into the junk category, share holders have not been spared earlier. Between October, 2007 and October, 2008, share prices fell by 36.4 per cent in the USA, 44.2 per cent in the Euro Area, 45.4 per cent in India and 67.2 per cent in China.

<sup>3</sup> According to IMF (2008a), the write-down by financial firms between July, 2007 and September, 2008 was a massive \$760 billion, of which \$600 billion are accounted for by banks alone. In fact, the loss on account of the US mortgage debt alone is expected to reach \$1.4 trillion, way above the IMF’s earlier projection of \$945 billion made in April, 2008 (IMF, 2008).

<sup>4</sup> The most noteworthy of these financial distresses and rescues include (a) the bankruptcy of the mortgage lender Indy Mac in July, 2008 (the second biggest bank failure in the US history); of the fourth largest investment bank, Lehman Brothers, and of Washington Mutual (the largest bank failure so far), both in September, 2008; (b) the nationalization (partial in some cases) of the Federal National Mortgage Association (Fannie Mae) and Federal Home Loan Mortgage Corporation (Freddie Mac), the two government sponsored enterprises (GSEs) owning or guaranteeing nearly half of \$12 trillion US home mortgage debt; of American International Group, the country’s biggest insurance company; of Fortis, Dexia and ING, three continental insurance banking majors; of Landsbanki and Ghitmir, the second and third largest banks of Iceland; and of Britain’s Northern Rock, Bradford & Bingley, Royal Bank of Scotland (RBS), Lloyds and HBOS; and (c) state sponsored acquisition/takeover of Bear Stearns, Wall Street’s fifth-largest bank, by JP Morgan Chase; of Merrill Lynch, the 94 years old investment bank, by Bank of America; and of Wachovia, the fourth-largest US bank, by Wells Fargo, the biggest US bank on the West coast. With Morgan Stanley and Goldman Sachs opting to become commercial banks regulated by the Federal Reserve, the on-going financial turmoil has practically wiped out the much-heralded system of investment banking.

<sup>5</sup> Thus on 9 August, 2007, the ECB supplied €95 billion (\$160 billion) and an additional €108.7 billion over the next few days. At the same time the Federal Reserve conducted three emergency auctions totalling \$38 billion. Since then all major central banks have been providing regular liquidity support to the banking system on a massive scale: while between August, 2007 and the first week of November, 2008, the Fed’s injection totalled more than \$1 trillion, the infusion of other developed country central banks has also been substantial.

<sup>6</sup> The Federal Reserve has been the most innovative in this respect.

issues quite a few of which cannot be addressed adequately in terms of the ruling economic paradigm. The most important of these issues include the origins of the crisis in general and the role of the complex derivative instruments in particular; reasons behind the rapid and large scale contagion of the virus afflicting the US mortgage market; interaction between the financial and the real sectors; the possibilities and extent of “de-coupling” of developing economies from the developed ones; the economics of rising inflation with widening demand deficiency; and policies required at the national and supra-national level for a rapid resolution of the crisis as well as for strengthening the shock absorptive capacity of the global financial architecture. The issues are too complex to be dealt with adequately in a single presentation.<sup>7</sup> Hence we propose to be highly selective and choose an important and puzzling feature of the crisis, a close scrutiny of which, we believe, can yield interesting and robust analytical-cum-policy results.

Our focus in the present paper is on the issues related to the stagflation in the world economy between September, 2007 and July/August, 2008. The discussion in the rest of the paper is organised as follows. Section II highlights (a) some theoretical problems in making economic sense of the stagflationary phase of the world economy and the policy dilemma faced by central banks and governments; and (b) the need for a synthesis of the mainstream and structuralist macro models for throwing light on the economic mechanism at work during this period. In terms of this synthetic framework and relying on the data available as of now,<sup>8</sup> Section III seeks to advance an explanation of soaring oil prices, by far the most puzzling development over the stagflationary phase of the crisis. The analysis in Sections II and III paves the way for a discussion in the next section of the nature of the policy problems facing the authorities and for a critique of the Taylor rule as a guide to measures for macrostabilization.

## II. Global Stagflation: Macroeconomic Linkages and Policy Issues

The two most important features of the world economy during our reference period were (a) unabated deceleration of GDP growth with growing unemployment; and (b) sharply rising inflation. While the global growth is reckoned to have fallen from 5.0 per cent in 2007 to 3.7 per cent or less in 2008 (Table A.1), the decline in (year-on-year) growth between Q<sub>3</sub>, 2007 to Q<sub>3</sub>, 2008 amounted to 1-2.5 percentage points in major economies. Over the period September, 2007-August, 2008, the increase in unemployment (in countries for which data are available) was in the range of 0.1 to 1.4 percentage points. At the same

<sup>7</sup> In the previous issue of this journal (Rakshit, 2008) we have however examined some of the issues including the roots of the crisis and the intertwinement of the real and financial factors.

<sup>8</sup> End December, 2008.

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time in practically all countries not only did (CPI) inflation rise above the central bank's targeted (explicit or implicit) rate, but there was also an acceleration of price increases until August/September, 2008; inflation has started abating since then, but even in November, 2008 remained<sup>9</sup> at a significantly higher level than that obtaining at the beginning of the crisis (Table A.2).

The widely accepted explanation of the economic downturn on the one hand and rising inflation on the other for a year or so runs as follows. The slide in the real sector is traced to the bursting of the US housing-cum-mortgage bubble and the global financial meltdown resulting therefrom. The increase in inflation is on the other hand attributed to the rising pressure in commodity markets in general and the oil and food markets in particular<sup>10</sup> (Tables A.1 and A.2). The factors responsible for the fuel price inflation are said to be the low elasticity of supply of crude oil (in the short and the medium run) and the high, energy-intensive growth of developing countries like China. The food price inflation was, however, due primarily to adverse climatic conditions. Irrespective of their sources and the underlying economic mechanism, the acute stagflationary tendencies in the world economy during this period were universally viewed as posing a serious policy dilemma for the authorities in almost all countries. While a monetary (or fiscal) squeeze to relieve the price pressure would tend to accentuate the economic slide, expansionary measures for providing a boost to aggregate demand, it was believed, could not but add fuel to the inflationary fire both directly and through inducing inflation expectations.

The aforesaid dilemma cast a long shadow over the policies pursued by the authorities during the stagflationary phase of the crisis. The focus of these policies was (a) to tackle the serious log-jam in the inter-bank money market characterising the crisis from its inception; and (b) to avoid systemic troubles because of possible runs on banks or failure of big financial institutions. For facilitating the flow of credit all major central banks have, from the very beginning of the crisis, been injecting huge funds in the banking system<sup>11</sup> through a variety of devices, both orthodox and unorthodox.<sup>12</sup> Apart from providing liquidity on a

<sup>9</sup> Barring the USA and China among major countries.

<sup>10</sup> After its jump from *minus* 0.9 per cent in August, 2007 to 25.1 per cent in September, 2007, the oil price inflation reached its peak at 98.5 per cent in June, 2008, started declining thereafter, and became negative in October, 2008 (Table A.2). The food price inflation, already double digit by Q<sub>4</sub>, 2007, started rising sharply from March, 2008, peaked in May, 2008, but remained at a fairly elevated level up to September, 2008. The course of the CPI inflation was similar, though less dramatic. In OECD countries, the CPI inflation started increasing from 1.9 per cent in August, 2007 to 4.8 per cent in July, 2008 before coming down slowly to 4.5 per cent in September, 2008. Emerging market economies (EMEs) also had similar experience, but at their heights the CPI inflation rates were often double digit and the elevated rates persisted for a longer period (Table A.2).

<sup>11</sup> See fn. 5.

<sup>12</sup> Thus in the USA, contrary to the long-standing practice, (a) central bank loans were available for an extended period, up to three months in some cases;

massive scale, central banks (supported by respective governments) also stepped in to prevent bankruptcy of quite a few financial firms.

The interesting thing to note in this context is that, despite the worsening financial and real sector scenario during the first year of the crisis, in no country, other than the USA, policy makers deemed it prudent to implement expansionary fiscal measures. Even in the USA, the fiscal stimulus package, announced on 13 February, 2008, was one-off and at \$170 billion quite paltry for a \$14-trillion economy. What is no less important to appreciate, measures implemented by central banks during this period were palpably inadequate to arrest, let alone reverse, the unremitting economic slide. In fact, with the exception of the US Federal Reserve and the Bank of England (BOE), other central banks did not consider it advisable to cut policy rates to provide a boost to the economy (Table A.3). Some, e.g., the European Central Bank (ECB), Bank of Japan, as also the central banks of China, India, Brazil and Russia actually raised the rates during our reference period. Even the Federal Reserve and the BOE had kept the policy rates unchanged for more than five months, until 8 October, 2008, when in a coordinated move they along with the ECB cut their rates by 50 basis points. The reason behind raising the policy rate or keeping it unchanged in the face of widening output gap was rising inflationary pressure: central banks were extremely reluctant to lose their reputation as an inflation hawk. It was only when inflation had come down significantly (and the danger of the economy sliding into recession loomed large) did the central banks start pursuing a cheap money policy.

Despite the unanimity among economists regarding the serious dilemma the monetary and fiscal authorities faced during the stagflationary phase of the crisis, there are reasons to believe that the dilemma was more apparent than real. The common misperception in this regard seems to be due to an inadequate appreciation of the limits of the ruling macroeconomic paradigm in analysing the economic forces at work over this period and drawing appropriate policy conclusions. Hence arises the need for going into some basics of stagflation.

#### *Some Analytics of Stagflation*

It is useful to start with the widely prevalent perception relating to factors behind the stagflationary tendencies in the global economy. As we have seen, while the GDP slowdown is attributed to demand deficiency caused by the bursting of the housing-cum-mortgage bubble and its rapid contagion, the rise in inflation is traced to excess demand conditions in the markets for food and petroleum. Such a view, though common, is not in consonance with the ruling economic paradigm.

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(b) the loans were advanced against a much wider range of collateral instruments including asset backed commercial papers (ABCs); and (c) the liquidity support was provided not only to commercial banks, but to other distressed financial institutions (e.g., investment banks and insurance companies) as well.

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An explanation of the general price level or inflation in terms of some sector-specific excess demand is contrary to the mainstream economic paradigm.

In the textbook economic theory there is a basic difference between factors governing GDP and the general price level (P) on the one hand and those determining relative prices along with inter-sector allocation of resources on the other. The former forms the subject matter of macroeconomics and the latter is treated in microeconomic theory. According to the consensus macroeconomics that has emerged out of the debate between the Keynesians and neoclassicals over the last three to four decades, a deficiency of aggregate demand, whatever be its source, will tend to reduce output and employment as also the general price level in the short run. The opposite will be the effect of an increase in aggregate demand.

Under the economic mechanism outlined above excess demand in the market for some product raises its *relative price*, but not the general price level, remembering that an increase in the relative price of a good necessarily implies a corresponding fall in the price of other goods. Hence an explanation of the general price level or inflation in terms of some sector-specific excess demand is contrary to the mainstream economic paradigm. As per this paradigm, if the slide in the global economy was due to growing *aggregate demand deficiency* (as is widely acknowledged), the shortfall of supply in the food or the oil market cannot be a valid explanation of rising inflation in this phase of the crisis.

The perceptive reader must have noted that the foregoing argument relates to the behaviour of a closed economy, of which the global economy constitutes the most important if not the only example. For an open economy however an increase in prices of imported articles like foodgrains or mineral oils is likely to be stagflationary. The reason is that such an increase causes an upward shift of the aggregate supply curve along with a fall in aggregate demand.<sup>13</sup> The former is due to passthrough of the rise in petroleum prices or to an upward adjustment (generally imperfect) of money wages to changes in the cost of living index. On the other hand, the adverse impact on aggregate demand arises primarily from the fact that the demand for food and oil is inelastic and a rise in their prices widens the trade deficit and sets in motion a negative foreign trade multiplier. This is reinforced by the hardening of interest rates with a rise in the general price level.<sup>14</sup> It is in terms of such an analytical framework that the stagflation in the USA and Europe following the oil price shocks in the 1970s is generally sought to be explained (Blinder, 2008).

For explaining the stagflationary experience at the global level, the mainstream framework requires substantial modification. Unlike in

<sup>13</sup> In terms of the textbook AD-AS model, while AS shifts upward, AD shifts to the left. Under such shifts, GDP declines, but the change in P is not unambiguous. See Rakshit (2007) for the macroeconomic impact of a rise in petroleum prices in an open economy.

<sup>14</sup> At any given level of output, a higher general price level implies a higher interest rate and hence a lower aggregate demand.



the open economy models considered above, oil and food prices are not exogenous for the global economy. Hence it is not clear why a positive demand shock or a negative supply shock in (say) the oil market should raise all nominal prices; such a shock could as well have led to a fall in other nominal prices, with prices of petroleum falling less than that of other goods. Nor is it possible to say anything regarding the impact of the shock on aggregate demand without considering the income distributional consequences of the shock and the relative marginal propensities to spend of the gainers and the losers. What is most important, even though the (sector-specific) shock might have led to excess demand in some markets, in view of the widening (global) output gap, the mainstream macro model would predict a downward drift of the general price level, not its accelerated increase for a year or so. As per such models it is only when the fall in the full employment (NAIRU<sup>15</sup>) output due to shocks in the agricultural or the oil sector is larger than the decline in aggregate demand resulting from the meltdown in the housing and financial markets<sup>16</sup> that the world economy would be afflicted with stagflation—a condition that clearly did not hold during our reference period.

For an adequate explanation of the economic consequences of sectoral and aggregate demand or supply side shocks we need to have a synthesis of the structuralist<sup>17</sup> and the mainstream macroeconomic perspectives. Under the structuralist hypothesis, prices of foodgrains, minerals and other primary articles are flexible and market clearing even in the short run, but those of industrial products<sup>18</sup> are sticky and set on a cost-plus basis. Thus while there is near instantaneous adjustment of product prices to changes in demand or supply in the primary sector, the adjustment in the manufacturing sector is as in the consensus macro model. An important implication of such a dual adjustment process is that, macroeconomic analysis in terms of aggregate demand and aggregate supply may often be inappropriate, especially when the primary sector constitutes a significant part of the economy. Hence arises the need for examining the interaction between (a) the agricultural (including the mineral) sector where prices are fully flexible; and (b) the industrial sector, characterised by cost-plus pricing. This in fact is the hallmark of structuralist models, designed for studying the macro behaviour of developing economies.

In the context of the sharply rising prices of primary products in relation to that of other goods over the period August, 2007-August, 2008, one can hardly overemphasize the relevance of the structuralist

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<sup>15</sup> The acronym for non-accelerating inflation rate of unemployment.

<sup>16</sup> So that the global output gap turns negative.

<sup>17</sup> The structuralist approach was initiated by Kalecki (1976) and has been used extensively in studying macroeconomic problems of developing countries. See Taylor (1983) and Rakshit (1982 and 1989) in this connection.

<sup>18</sup> As also of services. Throughout the paper we would club all non-primary production activities in the industrial sector.

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framework in any discussion of the stagflationary phase of the present crisis. The mainstream models, let us remember, have been developed keeping in view the major structural features of advanced economies. In such economies the primary sector is relatively unimportant and may be abstracted from without making the theoretical construct irrelevant. But this is certainly not true for the world economy, especially for examining the sources of commodity price inflation and the interaction between the primary and other sectors at the global level. Hence for an explanation of the trends in world GDP and prices the structuralist closed economy model appears useful as a first approximation: not only does primary production still account for a significant part of world output, but the only example of a closed economy as of now is the global economy! Let us see how far the model throws light on the behaviour of world GDP and prices during the period under investigation.

#### *Demand and Supply Side Shocks*

The source of the growth slowdown over the reference period was undoubtedly the bursting of the US housing bubble and the accompanying financial meltdown that impacted negatively on both investment and consumption. Were this the only source of the crisis, the short- (to medium-) term outcome would have been a slowdown of (or negative) GDP growth along with disinflation or decline in the general price level. In view of the dualistic adjustment process referred to earlier and of the fact that the aggregate demand deficiency originated in fixed investment and consumption demand in the richest parts of the world,<sup>19</sup> the output loss might be expected to be larger in the secondary and the tertiary sectors than in the primary sector. However, *a la* the structuralist logic the fall in the general price level would have been driven mostly by mineral and agricultural prices than by the prices of other goods. Thus though the slowdown might have originated in the non-primary sector (especially finance and construction), there would be a *rise* in *relative* prices of industrial goods and services (even while their absolute prices would tend to decline). Indeed, the major part of the fall in nominal prices of industrial goods would be due to the reduction in their cost on account of the direct-cum-indirect use of oil and agricultural raw materials in the production process.<sup>20</sup>

The above line of analysis suggests that under the structuralist framework the demand deficiency originating in the secondary and the tertiary sectors cannot account for surging commodity prices driving the northward movement of the general price level. For an adequate explanation of this phenomenon we need to consider operation of factors directly related to the markets for primary goods. The most

<sup>19</sup> So that the bulk of the cutback in demand was for industrial goods and services.

<sup>20</sup> The decline in money wages with rising unemployment and the fall in the cost of living would also contribute towards the downward drift of the general price level.



important of these were agricultural products and crude oil. So far as the former is concerned, the overwhelming factor driving their prices was the poor harvest due to adverse climatic conditions in 2007-08. The consequences of such a supply side shock, structuralist models suggest, are invariably stagflationary. The demand deficiency in the industrial sector due to the fall in farmers' and agricultural labourers' demand for non-farm products is reinforced by (a) the cutback in consumption of non-farm products as prices (both relative and absolute) of foodgrains and other agricultural goods rise;<sup>21</sup> and (b) the rise in the general price level causing stringency in the credit market.<sup>22</sup> The important point to note in this connection is that, despite the decline in demand for non-agricultural goods, their prices rise along with a fall in their output. The reason lies in the prevalence of cost-plus pricing in this sector: the increase in prices of non-agricultural goods is driven by the rise in the cost of production as prices of agricultural raw materials go up and/or nominal wages rise, albeit imperfectly, due to the increase in the consumer price index. In terms of the structuralist line of reasoning, consequences of the two adverse shocks, one originating in the US housing and financial markets and the other arising from a harvest failure, would thus generally be stagflationary.<sup>23</sup> To summarise, while the supply side shock in the market for agro-products tended to aggravate the problem of demand deficiency due to the bursting of the housing-cum-mortgage bubble, differences in the nature of price adjustments in the markets for farm and industrial goods ensured that the general price level tended to rise despite the economic slowdown.

The inflationary impact of the adverse agricultural supply shock during 2007-08 was magnified by the food policy pursued by a number of nations. In response to the sharp rise in food prices,<sup>24</sup> governments of many developing countries not only prohibited export of foodgrains but also provided food subsidy in order to reduce the incidence of poverty and ward off serious disaffection among the

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<sup>21</sup> Recall that prices of these goods are generally both price- and income-elastic.

<sup>22</sup> At any given level of output, a rise in the general price level leads to a tightening of the credit market and hence tends to reduce aggregate demand. The fall in relative prices of industrial products, it is true, raises their demand by big farmers (who are net suppliers of agricultural goods). However, the possibility of such terms-of-trade effects outweighing the demand debilitating impact of a harvest failure on the non-agricultural sector is mostly a theoretical curiosity (Rakshit, 1982).

<sup>23</sup> Remembering that money wages and prices in industries are relatively sticky and driven mostly by costs of production.

<sup>24</sup> In the midst of the accelerating rise in food prices in the first half of 2008, the larger demand for food driven by higher income in developing countries like China and India, was often cited as an important factor behind the serious price pressure. There is no doubt that (a) fairly rapid reduction in poverty in these countries added to the demand for foodgrains and (b) the problem was compounded by the growing demand on the part of the middle and high income households for meat, poultry and other superior food items which are much more land intensive than cereals or pulses. However, the operation of these factors was incremental and cannot account for the jump in food price inflation during our reference period.

The role of developed-country policies in stoking the fire of food price inflation was perhaps much more significant. Thanks to huge direct and indirect subsidies provided by the governments of these nations, there was large scale diversion of maize, soyabean and other crops for production of ethanol.

populace. This strengthened the price pressure in the global food market in two ways. First, the subsidy tended to augment food consumption, which, given the higher income elasticity of the demand for food in poorer nations, could be quite significant.<sup>25</sup> Second, the increased supply of foodgrains in low-price exporting countries at the expense of that in high-price importing ones would also contribute towards hardening of food prices, remembering that the demand for food is more (price) elastic in developing countries. The role of developed-country policies in stoking the fire of food price inflation was perhaps much more significant. Thanks to huge direct and indirect subsidies provided by the governments of these nations, there was large scale diversion of maize, soyabean and other crops for production of ethanol. This, coming on top of the poor harvest, sent food prices surging over the period August, 2007-August, 2008. However, the subsidy on bio-fuel and the large scale diversion were themselves responses to the sharply rising oil price inflation during this period. Hence arises the need for tracing its roots, especially since oil prices doubled in less than a year and seem to have played a major role in driving inflation in the general price level both directly and indirectly, through the passthrough effect on administered prices and enlargement of excess demand in the food market.

### III. Resolving the Oil Price Puzzle

The hardening of oil prices while the global economy was experiencing growing demand deficiency and many countries were heading towards (if not already in<sup>26</sup>) recession, constitutes a conundrum: the slide in aggregate demand might be expected to reduce oil prices,<sup>27</sup> remembering that they are market clearing and (unlike in the agricultural sector) there was no major negative supply shock in the oil market during our reference period. Indeed, as per the structuralist logic, the rising demand deficiency should have led to a fall in the *nominal* as also the relative price of oil. The situation was however quite the reverse. The oil price inflation (in nominal terms) surged from *minus* 0.9 per cent in August, 2007 to a mind-boggling 98.5 per cent in June, 2008, and despite a deceleration thereafter remained exceptionally high over the next two months, at 79.9 per cent in July and 61.1 per cent in August (Table A.2). Inflation rates in relative prices of oil

<sup>25</sup> Note that the subsidy amounts to an increase in household income; but since the amount available at the subsidised price is rationed, there is no substitution effect.

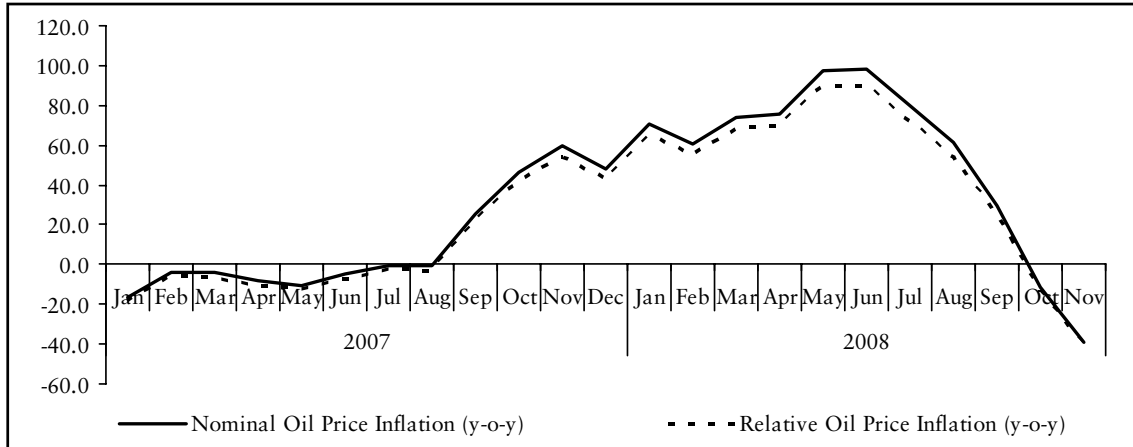
<sup>26</sup> According to the National Bureau of Economic Research (NBER), the US economy, the largest in the world, entered the recessionary phase as early as Q<sub>4</sub>, 2007.

<sup>27</sup> In fact, this is exactly what happened during the downturn of the global economy in the early 1990s (following the financial upheaval in Japan, the Nordic countries and a few other nations); in 1997-98 (during the East Asian Currency Crisis); and in 2001-02 (when the bursting of the dot-com bubble sent shock-waves through the global economy).

were similar, peaking at 100 per cent in June, 2008 and still clocking as much as 80 per cent and 50 per cent respectively over the next two months (Table A.4). The unusually close correspondence between the nominal and the real (y-o-y) oil price inflation over the reference period, highlighted in Chart 1, suggests that an explanation of the oil price inflation has to be sought primarily in the interplay of factors governing the relative price of oil. Indeed, the correspondence also underlines the relevance of the structuralist analytical framework in making economic sense of the stagflationary phase of the crisis, even though at a cursory glance the balance of evidence seems to go against the predictions of the framework.<sup>28</sup> As a first step towards a resolution of the issues involved in this regard, let us consider some major features of the demand and supply conditions of the oil market.

Under competitive conditions the temporal behaviour of the (relative) price of oil will depend on demand and supply side factors and their changes over time.<sup>29</sup> The most important determinant of the magnitude of the impact of these changes on oil prices is the price elasticity of the demand for and the supply of oil: the lower the numerical values of these elasticities, the greater would be the rise in oil prices following an adverse supply shock or an increase in demand. On the

CHART 1  
 Nominal and Relative Oil Price Inflation



*Note:* The relative oil price (defined as the ratio of nominal oil price to the CPI) inflation is for OECD countries. However, the temporal behaviour of relative oil prices, as shown in Table A.4, was nearly identical during this period for all major countries, both within and outside the OECD.

*Source:* Federal Reserve Bank of St. Louis' Website; OECD's Website.

<sup>28</sup> Relating to the behaviour the global economy and prices, with no adverse supply shock in the oil market.

<sup>29</sup> The factors include GDP, tastes and preferences, installed capital in the oil sector, technology, etc., which govern the shape of the short-term demand and supply schedules (ignoring pure speculation). This implies use of partial equilibrium analysis and may be justified if the importance of the feedback effect (of a change in oil prices) from other sectors of the global economy is second order.

Given the low price-responsiveness of both demand and supply, their shifts tend to have a disproportionately large effect on petroleum prices. The most important reason behind shifts in demand is the change in income due to operation of cyclical, secular or random factors.

12

basis of the available estimates of the price elasticity of the demand for gasoline,<sup>30</sup> Hamilton (2008) estimates the short-term elasticity of demand for crude oil to be about -0.125 and the long-term elasticity in the range of -0.25 and -0.375. These estimates are by no means robust, but there is a consensus that (a) the short-term price elasticity of demand is significantly less than 1 (in absolute terms) in all economies; and (b) the elasticity is less in developed than in developing countries.<sup>31</sup> Since the gestation lag of investment in oil is very long, the short-term price elasticity of supply also tends to be quite low: the price responsiveness of production in the short run varies positively with the excess capacity of existing wells; but the elasticity even with a moderately wide gap between the potential and the actual output is still deemed to be significantly short of unity.<sup>32</sup>

Given the low price-responsiveness of both demand and supply, their shifts tend to have a disproportionately large effect on petroleum prices. The most important reason behind shifts in demand is the change in income due to operation of cyclical, secular or random factors, though sharp variations in weather conditions, e.g., an exceptionally bitter winter or an unusually hot summer, may also cause large changes in the demand for petroleum products. The shift of the other blade of the pair of scissors may generally be traced to net addition to capacity;<sup>33</sup> natural calamities like hurricanes; political turmoils or subversive activities; and major changes in the structure of the market.<sup>34</sup>

The factors considered above affect the demand of users of oil or its (short-term) costs of production. Expectations relating to the future price of crude oil may also affect its current price. If oil prices are expected to rise sharply, refineries and other manufacturers require-

<sup>30</sup> The short-term elasticity of demand for gasoline is found to be around -0.25, while the long-term elasticity lies between -0.5 and -0.75.

<sup>31</sup> Primarily because of the Marshallian law of "the importance of being unimportant": expenditure on oil as a proportion of income is significantly less in the former group of countries.

<sup>32</sup> A major problem of estimating the elasticity of supply of oil arises from the fact that the Organisation of Petroleum Exporting Countries (OPEC) controls a substantial part of the world output of crude oil: in 2007 OPEC-10 (excluding Angola and Iraq from OPEC-12) produced about 36.7 per cent of world production, of which Saudi Arabia alone accounted for 12.1 per cent. This could induce OPEC to fix production targets on the basis of its monopoly power and thus make the concept of market supply or its elasticity inapplicable. It appears however that OPEC is not an effective cartel. Its individual member countries consistently exceed the targets set for them. It has also been observed that until recently Saudi Arabia used to adjust its production to changes in crude oil prices. Anyway, the elasticities of supply, estimated from the observed short-term changes in output and prices have always been significantly less than unity either due to oligopolistic behaviour of the OPEC (or Saudi Arabia) or/and the sharply rising marginal cost of production from the existing wells.

<sup>33</sup> While past investments (at the expiry of their gestation lag) add to capacity and improvements in technology lead to a higher recovery rate, depletion of reserves of mature wells tends to reduce the production potential.

<sup>34</sup> e.g., the formation of the OPEC in the early 1970s.

ing crude oil for their production will be prone to add to their stocks.<sup>35</sup> Big producers may also cut back on their production to take advantage of the enlarged gap between the future and current prices, remembering that in the case of oil there is a possibility of substitution between the present and future output. However, while speculative activities can produce large volatility in oil prices, unlike in the stock market their impact is not generally overwhelming or sustainable except in the very short run. The reason is that (a) the oil market is dominated by *flow* demand and supply;<sup>36</sup> (b) high risk aversion of producers and users of oil tends to preclude pure speculation on their part; and (c) costs of storing and carrying oil are very high.

Let us see how the broad characteristics of the oil market summarised above help in explaining the behaviour of petroleum prices over the reference period. The first point to note in this connection is that, though there was growing aggregate demand deficiency causing a sharp economic slowdown and some OECD countries were in, or on the brink of, recession by Q<sub>3</sub>, 2008, the global GDP still rose during this period. With a positive income elasticity of demand, this would cause a rightward shift of the demand schedule and give rise to the possibility that such a shift played a none-too-insignificant role in pushing up oil prices. What is more important to recognise, the increase in demand is crucially affected by the wide differences in GDP growth and in income elasticities of demand for oil among different groups of countries. According to the estimates of Gately and Huntington (2002), over 1971-97 the average income elasticity of demand for 25 OECD countries was a lowly 0.55; but the elasticity was much larger, at 1.17, for eleven rapidly growing non-OECD countries, and fairly high, at 1.11, for oil exporting nations. No wonder, it is the latter groups of countries that have accounted for the major share of the incremental consumption of crude oil in recent years. Thus though the USA and Europe between them consume nearly 50 per cent of world oil output, during the period 2003-06 their contribution to the increase in global oil demand was less than 20 per cent, while China's share was nearly 33 per cent and Middle East countries' 17 per cent (Hamilton, 2008).

Table A.6, based on data presented in Table A.5, gives some back-of-the-envelope estimates of the impact of changes in world income on the global demand for oil, taking into account the differences in growth rates and income-elasticities of demand between the OECD and the non-OECD countries.<sup>37</sup> Because of data limitations the

<sup>35</sup> They may also buy oil futures to hedge against the risk of a sharp rise in oil prices. However, if market expectations are similar, given the level of current output, somebody has to hold additional stocks if expectations of a rise in prices in the future are to translate into an increase in spot prices.

<sup>36</sup> i.e., consumption and production of oil are very large in relation to both the stock of oil and its variation over time.

<sup>37</sup> And making some heroic assumptions because of the non-availability of some data. The notes to Table A.6 give the estimation procedure and the assumptions.

The increase in demand is crucially affected by the wide differences in GDP growth and in income elasticities of demand for oil among different groups of countries.

In both Q<sub>1</sub>, 2008 and Q<sub>2</sub>, 2008 there was an income-induced increase in demand for crude oil in the OECD as well as the non-OECD group of countries, the increase being much larger in the latter than in the former.

estimates are only for Q<sub>1</sub>, 2008 and Q<sub>2</sub>, 2008; however, they throw considerable light on the sources of oil price inflation. The relative oil prices, as already observed, were rising at a fast rate over the first half of 2008 and reached their peak in June, 2008. In both Q<sub>1</sub>, 2008 and Q<sub>2</sub>, 2008 there was an income-induced increase in demand for crude oil in the OECD as well as the non-OECD group of countries, the increase being much larger in the latter than in the former. Despite some year-on-year (y-o-y) increase in production in the two periods, the shortfall of the increase in actual output from the estimated rise in demand<sup>38</sup> amounted to 2.9 million barrels per day (mb/d) in Q<sub>1</sub>, 2008 and 2.4 mb/d in Q<sub>2</sub>, 2008 (Table A.6). Since the increase in production could have been due in part to the rise in prices, these shortfalls may be deemed to provide an underestimate of the excess demand arising from shifts in demand and supply schedules. However, for both 2007 and 2008 the price-elasticity of production estimated from the monthly data is found to be negligible and statistically insignificant so that the figures in column 10, Table A.6 may be regarded as a fair measure of the y-o-y increase in excess demand,<sup>39</sup> driven by demand and supply shifts. In view of the low price elasticity of both demand and supply, our estimates of excess demand, it appears, can account for the major part of the surge in oil prices.<sup>40</sup>

The shortfall of supply in meeting the demand for crude oil was aggravated by an increase in demand for inventories. Addition to stocks in Q<sub>1</sub>, 2008 (at 0.2 mb/d) amounted to 13.3 per cent of the y-o-y rise in the quarter's output; but in the context of depletion of stocks during 2007 (Table A.5), this does not appear unduly excessive. However, during Q<sub>2</sub>, 2008 inventory investment jumped to a stupendous 68.8 per cent of the y-o-y incremental output and contributed significantly to the oil price pressure. A rough and ready calculation, on the basis of the price elasticity of demand for OECD and non-OECD countries, as estimated in Table A.7, suggests that in the absence of addition to stocks oil prices during this quarter<sup>41</sup> would have been lower by around 25 per cent.

There are reasons to believe that the rise in inventory investment during Q<sub>2</sub>, 2008 (as also in July/August, 2008) was driven by expectations of a rise in future oil prices. Note that with a decline in both OECD and non-OECD GDP growth rates, the inventory was

<sup>38</sup> Reflecting the magnitude of the rightward shift of the demand schedule over the year.

<sup>39</sup> In the absence of stock changes to which we shall presently turn.

<sup>40</sup> Thus the price-elasticities of demand for OECD and non-OECD countries (Table A.7), estimated on the assumption that the difference between the actual demand and the estimated income-induced demand was entirely due to price increases, appear reasonable and are not significantly different from earlier estimates for developed and developing countries: the estimated elasticities (in absolute terms) are less than 0.1 and developing countries' demand are observed to be more price elastic than that of industrialised nations.

<sup>41</sup> Recall that prices peaked in this quarter.



considerably above what manufacturers of oil based products could be expected to require currently or in the near future. The role of speculation (resulting in larger inventory holding)<sup>42</sup> in the oil market during its booming phase is also suggested by the sharp rise in the amount of funds invested in the commodity index trading in general and energy index trading in particular.<sup>43</sup> Finally, the decline in oil output by 0.3 mb/d between Q<sub>1</sub>, 2008 and Q<sub>2</sub>, 2008 in the face of surging oil prices suggests an upward shift in big oil producers' expectations regarding the future prices.

Despite the aforesaid evidence, speculation did not seem to constitute the basic source of petro-price inflation. As already noted, the speculative build-up of inventories or cut-back in production cannot account for the excess demand in the oil market in the first quarter of 2008 (or in the earlier quarter). Additions to stocks and reductions in output became significant only on Q<sub>2</sub>, 2008. Even in the absence of any inventory investment, there would have been a substantial excess demand in the oil market in both quarters (Column 10, Table A.6). However, had there been no decline in output in Q<sub>2</sub>, 2008 (Table A.5), the demand-supply gap, though not inconsequential, would have been somewhat less than in the earlier quarter. One cannot thus discount the role of speculation in accentuating the price pressure in Q<sub>2</sub>, 2008. Our overall perception is that, during the earlier quarter global oil prices were driven primarily by the fundamentals of demand and supply, with speculative activities gaining some importance only in the second quarter.

So far as the fundamentals are concerned, on the supply side they consisted of (a) declining capacity of mature oil fields in Norway, the UK, the USA, Mexico and quite a few other countries; and (b) inadequate investment during the 1990s and the early years of the new millennium when oil market remained depressed. In the context of the long gestation lag of investment in hydro-carbon, it is no wonder that global oil production has stagnated in recent years.

On the demand side of the oil market, despite the slowdown from Q<sub>4</sub>, 2007, global GDP growth remained fairly decent during its decelerating phase up to Q<sub>2</sub>, 2008. Again, since the major part of the increase in world GDP occurred in emerging market economies (including oil-exporting ones) whose income-elasticity of demand for hydro-carbon was more than twice that of advanced countries, the increase in the aggregate demand for oil was much larger than what the slowdown in world growth during this period might suggest.<sup>44</sup> The other factors

<sup>42</sup> As we have already noted, speculation can raise current prices only through additional inventory holding or a cut-back in output, both of which occurred in Q<sub>2</sub>, 2008.

<sup>43</sup> In a testimony before the US Senate in May, 2008, Michael Masters reckoned the funds allocated to the commodity index trading strategies to have risen from \$13 billion at the end of 2003 to \$260 billion in March, 2008. About 70 per cent of these funds were devoted to holding near-term future contracts in energy.

<sup>44</sup> The significance of the large difference in the income elasticity of demand between the two groups of countries is indicated by the fact that, with a

Our overall perception is that, during the earlier quarter global oil prices were driven primarily by the fundamentals of demand and supply, with speculative activities gaining some importance only in the second quarter.

There can thus be little doubt that the oil price inflation, by reinforcing the recessionary tendencies, hastened its own demise, especially since, faced with the policy dilemma during this phase, practically all countries were following either a neutral or a tight money policy.

contributing to the widening of excess demand were large subsidies provided by developing and oil-exporting countries to domestic users of petro-products including fertiliser. This also often involved penalties on producers of crude oil as they were forced to share a part of the subsidy. Since the *rate* of subsidy (or penalty) was larger at higher oil prices, these measures could not but have added to the inflationary pressure in the oil market when prices had been moving northward.

#### *Growth Slowdown and Feedback from the Oil Market*

Given the fact that the slowdown in the world GDP growth was due not to an adverse supply shock in the oil market, but to factors operating in the non-oil sector in general and the housing and the financial markets in particular, the feedback effect of the slowdown might be expected to moderate the (*aggregate*) demand side shock. However, an important implication of our analysis in the preceding sub-section is that, until October, 2008<sup>45</sup> the feedback tended to aggravate rather than moderate the problem of (aggregate) demand deficiency. Given the low price elasticity of demand for oil, the sharp increase in its relative price tended to produce a negative impact on the demand for other goods and services.<sup>46</sup> This negative impact was magnified by the income-redistribution effect, as (a) rising oil prices caused a shift in the distribution of world income in favour of oil-exporting, at the expense of oil-importing, countries;<sup>47</sup> and (b) the saving propensities of the former are much larger than that of the USA and Europe, which between them consume nearly half of world oil output. Again, the sharp rise in expenditure on energy imports of rapidly growing, oil-intensive developing countries like China and India, dampened their growth through the operation of a (negative) foreign trade multiplier, which in its turn tended to cause a slowdown in their domestic as well as import demand for industrial goods and services. There can thus be little doubt that the oil price inflation, by reinforcing the recessionary tendencies, hastened its own demise, especially since, faced with the policy dilemma during this phase, practically all countries were following either a neutral or a tight money policy.

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uniform elasticity of 0.55 (the same as OECD countries') the estimated shortfall of production from demand would have been 1.0 mb/d (instead of 2.9 mb/d) in Q<sub>1</sub>, 2008 and 0.6 mb/d (rather than 2.4 mb/d) in Q<sub>2</sub>, 2008. On the basis of the average of the price elasticities of demand in OECD and non-OECD countries, oil prices in Q<sub>1</sub>, 2008 and Q<sub>2</sub>, 2008 would then have been lower by 31.2 and 42.0 per cent respectively. Indeed, with the resulting muted price increase in Q<sub>1</sub>, 2008, the speculative addition to stock and the cutback in production in Q<sub>2</sub>, 2008 would also have been absent and the oil price inflation peaked at a significantly lower level and much earlier, most probably in Q<sub>1</sub>, 2008 itself.

<sup>45</sup> When the relative price of oil ultimately returned to the level prevailing in July/August, 2007 (Table A.4).

<sup>46</sup> For a given level of income.

<sup>47</sup> In view of the excess demand in the oil market despite the growth slowdown.

#### IV. Policy Dilemma: Appearance and Reality

Our analysis of the stagflationary phase of the global economy suggests that, the widely perceived dilemma faced by the governments and central banks was more apparent than real. The source of inflation during this period was entirely sectoral and these sectors (consisting primarily of agricultural goods and mineral oils) happened to be the ones where prices tend to adjust immediately and their passthrough affects prices of other goods. Such upward adjustments of the general price level because of sector-specific excess demand are entirely different from pure inflation, resulting from a negative output gap. The reason is that, as relative prices of oil and other goods<sup>48</sup> reach their equilibrium configuration, inflation dies out. It is only when *aggregate* demand exceeds the NAIRU level of output that excess demand, fed by rising inflation expectations,<sup>49</sup> can cause an accelerated increase in the general price level through a wage-price inflationary spiral.

A major problem policy makers often face in a situation of rising inflation is to discern whether the source of the increase in the general price level is a purely *sectoral* demand-supply gap or if the overall output gap is in fact negative, the reason being that an estimation of the gap is far from simple. Surging *relative* prices of some goods are no doubt indicative of their excess demand. But this can come about with or without a negative output gap. One reason for the difficulty is that, even when there is an *overall* excess demand, the main drivers of the increase in the general price level in the short run would be the sharper rise in the market clearing, compared with the administered, prices. Thus the fact that price increases of oil or other commodities are much steeper than that of industrial products or services does not preclude the prevalence of a negative output gap.

Again, a sluggish rise in productive capacity in the oil sector in relation to that in others can bring down the NAIRU growth path below its trend. The reason is that shortage of an essential intermediate input like oil tends to reduce productivity of labour (measured in terms of final goods) so that the full employment level itself is negatively impacted. Hence a slowdown in GDP growth from its trend level along with inflation fuelled by rising prices of petro-products need not signify the presence of a positive output gap.

Apart from the difficulty of identifying the sign of the output gap when prices are moving northward, there is another, and often deemed to be the more important, reason behind the policy makers' penchant for a dear money policy in an inflationary situation, irrespective of its roots. It is generally believed that a rising general price level

<sup>48</sup> Along with the general price level. As already indicated, under the new equilibrium, the general price level rises, as do the relative prices of oil and other commodities; but the levels of output and employment go down (in the absence of any policy intervention).

<sup>49</sup> With the expected inflation turning out to be less than the actual.

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The central banks' dilemma during the stagflationary phase of the present crisis is easy to appreciate in the context of the undoubted similarities between the 1970s' and the recent episode; but there are crucial differences between the two that made the pursuit of a neutral or hawkish monetary policy quite inappropriate.

together with the central bank's seeming unconcern (let alone the adoption of a lax monetary policy) itself tends to foster inflation expectations, lead to an enlargement of excess demand and trigger off a wage-price spiral. It has also been widely argued that the reputation central banks all over the world have acquired over the last two decades in keeping inflation exceptionally low has greatly facilitated the task of taming inflation. This reputation is liable to be lost and will be difficult to regain if the central bank is seen to permit an unabated rise in prices over a prolonged period. No wonder, all over the world inflation constitutes a major concern for policy makers and central banks in all countries are called upon (in some instances through legislation) to keep annual price increases within narrow limits.

Apart from the aforesaid considerations, the stagflationary experience of the 1970s has cast a long shadow over the economists' views on the imperatives of anti-inflationary policies. As in the recent episode, inflation in the 1970s was also led by petroleum price increases and was accompanied with a slide in the real sector. When central banks in developed countries tried to counter the declining trend in output and employment through monetary loosening, there was a rise in inflation, but no reversal of the economic slide. Since then central banks all over the world have turned inflation hawks, and their targeted inflation (explicit or implicit) as of now is 2 per cent in developed countries and in the range of 4-5 per cent in emerging market economies. In the context of the CPI inflation, driven by food and fuel prices, already exceeding the target rates of all central banks by December, 2007 and rising rapidly over the next 6-7 months, it is not surprising that during the stagflationary phase no central bank, barring the Federal Reserve and the Bank of England, cut the policy rate, and a quite a few, e.g., the Bank of Japan and the European Central Bank, actually raised the rates (Table A.3). Indeed, despite the sharply deteriorating conditions in respect of GDP, industrial production and unemployment (Table A.2), inflation concerns prevented even the Federal Reserve and the Bank of England from reducing interest rates for more than five months, until 8 October, 2008<sup>50</sup> (Table A.3). In developing countries like India central banks not only raised policy rates, but also imposed higher cash reserve requirements for commercial banks.

The central banks' dilemma during the stagflationary phase of the present crisis is easy to appreciate in the context of the undoubted similarities between the 1970s' and the recent episode; but there are crucial differences between the two that made the pursuit of a neutral or hawkish monetary policy over Q<sub>4</sub>, 2007-Q<sub>3</sub>, 2008 quite inappropriate. The most fundamental difference lay in (a) sources of the shocks,

<sup>50</sup> When the commodity price inflation had turned negative and the CPI inflation come down considerably.

giving rising to the stagflationary tendencies; (b) the state of the economy in general and the labour market in particular; and (c) the extent of globalization of the goods and financial markets. The oil price shock in the early 1970s occurred at a time when the developed countries had been enjoying a prolonged economic boom; the oil-intensity of final products was relatively high; the labour market was tight and workers had become accustomed to protect their real wages aggressively; and both trade and financial linkages among nations were not as strong or as extensive as they now are. Under these conditions, the sharp rise in relative prices of oil effected a substantial cut in the NAIRU levels of output and employment. The high oil intensity of output and low elasticity of substitution between oil and other inputs caused a steep fall in the marginal productivity of labour. This along with the stiff resistance to real wage cuts by workers implied that the new NAIRU equilibrium employment and output were at a much lower level than before, especially since cheap consumer goods from developing countries like China were not yet available on an extensive scale. It is no wonder then that, when central banks of developed countries persisted with a loose monetary policy, the result was a wage-price spiral along with a fall in output, *a la* the consensus macroeconomic theory.

So far as the current crisis is concerned, it was set in motion by the bursting of the housing boom along with meltdown in the mortgage and other financial markets. As already noted, the relatively lagged impact of this negative demand side shock on GDP growth of developing countries and the large differences in the oil-intensity between them and the OECD nations, tended to raise petroleum prices. Inflationary pressure was strengthened by the harvest failure; but the shock from this source was random and transitory. The crucial point to note in this connection is that, despite the rise in oil and food prices, there is strong evidence that the actual output, especially in developed countries, exceeded the NAIRU level during the period under consideration. Unlike in the 1970s, there was no wage-price spiral: with growing unemployment workers were willing to accept a cut in real wage rates. Indeed, despite the rapid rise in the cost of living index, money wages of both white and blue collar workers declined or did not show any noticeable increase. The conclusion is inescapable that in practically all countries, actual unemployment exceeded NAIRU by a substantial margin, leaving enough room for the authorities to pursue an expansionary policy.

But would not such a policy have generated inflation expectations and further fuelled the rate of price increases, one may legitimately ask? The crucial issue that needs to be addressed in this regard is the basis of such expectations. As we have argued elsewhere (Rakshit, 2007), since economic agents are rational and learn from experience, they should be able to (a) distinguish between an inflation arising in the process of adjustment of relative prices and that resulting

In practically all countries, actual unemployment exceeded NAIRU by a substantial margin, leaving enough room for the authorities to pursue an expansionary policy.

Macroeconomic logic suggests that contractionary policies are called for only if the inelastic supply of oil reduces the NAIRU output below the actual level, not when prices are rising due to excess demand in the oil market even though the economy is characterised by a shortfall of aggregate demand.

20

from an overall excess demand situation;<sup>51</sup> (b) discern an output gap when it is large enough; and (c) appreciate the need for an expansionary policy for closing the output gap.<sup>52</sup> There would no doubt be an upward shift in their short-term inflation expectations in line with the speed of price adjustments (via the passthrough) in other markets; but that should not be a matter of concern. Given the fact that the actual unemployment is above the NAIRU,<sup>53</sup> a rise in the expected rate of inflation would not induce labourers to quit jobs or cause a wage-price spiral.<sup>54</sup> In other words, an expansionary policy in the presence of an output gap (whatever be its source) provides a free lunch to the economy: output and employment go up, but there is no permanent increase in the rate of inflation. Note that even in the text-book case of an output gap, expansionary measures cause temporary inflation through a rise in the price level.<sup>55</sup> Inflation driven through a rise in petroleum prices due to a decline in slack in the economy is basically no different from the text-book case. Indeed, a rise in prices and short-term inflation expectations facilitate a relatively rapid closing of the output gap by inducing households to prepone their purchase of durable consumer goods<sup>56</sup> and firms to quicken the implementation of their investment plans.

The more contentious issue that arises in this context relates to the relatively inelastic supply of oil and speculation in the oil market. The important point to note in this context is that, speculative activities, not based on fundamentals, may produce volatility, but cannot cause a sustained rise in the price level or the rate of inflation. The major problem concerning the oil market arises from the long gestation lag of investment and its high risk due to large imponderables affecting the long-term demand for and supply of petroleum products. However, there is no evidence to suggest that such sluggish supply response and uncertainty caused a secular rise in inflation or relative prices of crude oil.<sup>57</sup> Anyway, macroeconomic logic suggests that contractionary policies are called for only if the inelastic supply of oil reduces the NAIRU output below the actual level, not when prices are rising due to excess demand in the oil market even though the economy is characterised by a shortfall of aggregate demand.

<sup>51</sup> i.e., they would know that the rise in inflation was purely temporary.

<sup>52</sup> In other words, since under these conditions economic agents do not regard the central bank to have raised its targeted inflation rate, the dynamic inconsistency problem, *a la* Kydland and Prescott (1977), would not arise.

<sup>53</sup> Implying that the actual real wage rate at the prevailing employment exceeds the acceptable minimum rate to workers at the margin.

<sup>54</sup> Some decline in labour supply occurs if the expected rise in (temporary) inflation and the associated fall in real wages induce workers to substitute future by current leisure. However, the fall occurs only when workers' choice is optimal to begin with.

<sup>55</sup> Recall the effect of a rise in aggregate demand in the text-book aggregate demand–aggregate supply model.

<sup>56</sup> At a given level of permanent or life-time income.

<sup>57</sup> In fact, the real price of oil in December, 2008 was not significantly higher than that prevailing in 1972.



### *Taylor Rule: Uses and Abuses*

Reliance on output gap alone for initiating monetary (or fiscal) policies is however not without its perils. The main difficulty, as already noted, lies in identifying whether there is in fact an output gap and if so, what its magnitude is. Policy makers generally estimate the full employment path of an economy by fitting a trend line to the time series data for actual output levels. The reason is that, according to the consensus macroeconomic theory departures of actual output from the full employment growth trajectory due to cyclical or other factors will be automatically reversed. Hence the gap between the trend and the actual output levels is taken to provide a reasonably good measure of the output gap (positive or negative) and can be used as a crucial indicator for adoption of contractionary or expansionary policies. However, the full employment output in the short or even the medium run may differ significantly from the estimated trend, based on past data. Large scale harvest failure, an adverse supply shock in the market for oil or some other crucial input, serious disruptions in the transport/communication network—all can cause a fall in the economy's short-term production potential and make the estimated output gap a misleading guide to anti-cyclical policies. Again, apart from bursts of path-breaking technical innovations (like the internet or the mobile phone), outsourcing, breakdown of tariff-barriers, labour/product market reforms or other efficiency enhancing structural changes create over the medium run a significant break in the full employment growth path from its past trend.

The foregoing analysis points to the danger of serious inflation or deflation and substantial welfare loss when macroeconomic policies are based solely on estimates of the output gap: the economy is then likely to experience high price pressure or large underutilisation of resources for quite a while before the estimated trend path, thanks to the operation of the (neo-classical) price-wage adjustment mechanism, ultimately reflects the currently prevailing economic fundamentals.<sup>58</sup> Hence arises the need for supplementing the estimated output gap with some other indicator of overheating or slack in the economy.

The obvious candidate for this role, in the context of the consensus macro model, is the ongoing rate of inflation. Since the model views the short-term output to be primarily demand driven and the price level to rise at a faster rate for a larger aggregate demand in relation to the NAIRU GDP, inflation itself can serve as a reasonably good indicator of the (negative) output gap. One operational advantage of using this indicator is that, apart from the possible, large margin of error in estimates of full employment output, GDP data are available only with a lag of about one quarter or more in most countries; but inflation is easily observable and the time lag in its estimate is much shorter.<sup>59</sup>

<sup>58</sup> Unless these fundamentals have changed in the meanwhile.

<sup>59</sup> For effectiveness of anti-cyclical policies, timely intervention, it cannot be overemphasized, is often of the essence.

Reliance on output gap alone for initiating monetary (or fiscal) policies is however not without its perils. The main difficulty lies in identifying whether there is in fact an output gap and if so, what its magnitude is.

The Taylor rule provides a rough and ready guide to central banks relating to how they should set their policy rates in response to inflation and the estimated output gap.

Finally, preventing inflation from being too high or too low is widely deemed as a desirable policy objective by itself: while high inflation tends to create distortions in the economic system, under a negative or near-zero inflation rate rapid adjustment of relative prices (in response to random shocks) would be difficult, remembering that money wages and prices of some goods are sticky in the downward direction.<sup>60</sup> Hence policy makers should not only seek to avoid the output gap as far as possible, but also to keep the actual inflation close to its 'optimal' (target) rate.<sup>61</sup> It is in this context that the Taylor rule (Taylor, 1993) provides a rough and ready guide to central banks relating to how they should set their policy rates in response to inflation and the estimated output gap.

The change in the interest rate, the rule stipulates, should be a weighted average of the gap between the actual and the NAIRU levels of output<sup>62</sup> and that between the current and the targeted inflation. The weights depend on the relative importance the central bank attaches to avoiding an output gap (positive or negative) and "excessive" inflation (or deflation). An important advantage of following the rule is that, the damage due to wrong estimates of the output gap is liable to be limited and the economy will over time move towards the full employment equilibrium with inflation close to its target rate. Thus consider the case where from an initial equilibrium,<sup>63</sup> the economy experiences a rise in inflation along with a fall in actual output such that the central bank, as per the Taylor rule, raises the interest rate. If there is an underestimation of the output gap and the increase in inflation is purely transitory, the rise in interest rates would widen the output gap.<sup>64</sup> The resulting fall in inflation<sup>65</sup> and the rise in the (estimated) output gap ensure a reversal from the tight to loose money policy so that the departure of output from the full employment level and of inflation from its target rate would be contained within reasonably narrow limits. Given such a prospective, it is not difficult to appreciate the neutral or the hawkish policies pursued by most central banks during the stagflationary phase of the current crisis.

<sup>60</sup> If relative prices are to adjust, but the general price level is to remain unchanged, increases in money prices of some goods need to be balanced by decreases in other prices. In the presence of downward rigidity of some prices, adjustment of relative prices to the equilibrium configuration is easier, if the general price level is permitted to rise over time, albeit at a moderate rate so as not to produce distortions.

<sup>61</sup> Under the mainstream macroeconomic theory a given NAIRU growth path may be associated with a higher or lower rate of increase in the general price level depending upon whether the central bank keeps its injection of liquidity into the system at a larger or a smaller rate. Hence the scope for choosing an appropriate rate of inflation.

<sup>62</sup> i.e., the estimated output gap with a negative sign.

<sup>63</sup> With a zero output gap and the actual inflation equalling the targeted rate.

<sup>64</sup> Note that given the output gap, a one percentage point rise in inflation calls for, under the Taylor rule, a rise in the policy rate by more than 100 basis points so that the real rate of interest goes up.

<sup>65</sup> As the impact of transitory factors tapers off and the output gap gets bigger.

However, our analysis of the factors driving inflation and GDP over the period Q<sub>3</sub>, 2007–Q<sub>3</sub>, 2008 suggests the need for some major modifications in the Taylor rule. The reason lies primarily in the fact that the rule is tailored for a single-commodity world<sup>66</sup> where (a) the impact of a demand or a supply shock on the general price level and the NAIRU does not depend on whether the shock occurs in the primary or other sectors; and consequently (b) adjustments in relative prices are of little macroeconomic consequence in the short run. In reality, inflation, as we have demonstrated, can very often be a by-product of adjustments in relative prices in response to purely sector-specific shocks that need not affect the overall full-employment output.<sup>67</sup> That observance of the Taylor rule in such an economy is generally counter-productive may be illustrated with a simple example, incorporating the essential features of the global economy over the crisis period.

Suppose there is a rise in the productive capacity of the non-oil, but not of the oil-sector.<sup>68</sup> The implication is that, the NAIRU output has registered an increase, but the short-run full employment equilibrium will be characterised by (say) a significantly higher relative price of petroleum than before.<sup>69</sup> Consider now a situation where an aggregate-demand shock causes the actual increase in output to fall short of that in the NAIRU output. Given the stickiness (especially in the downward direction) of money wages and mark-up pricing of manufactured goods and services, the output gap, even if substantial, would on its own fail to cause a downward drift of the general price level in the short run. At the same time the enhanced demand for oil would cause a sharp rise in its price which, through the passthrough effect, magnified by upward adjustment of money wages,<sup>70</sup> tends to raise the general price level. If there is no policy intervention, the rise in the general price level would widen the output gap further through a hardening of

<sup>66</sup> As we have already observed, this may be a relatively harmless abstraction for developed countries where production in the primary sector is of not much significance.

<sup>67</sup> In fact, as we have noted elsewhere (Rakshit, 2009), in an economy with a non-insignificant primary sector, the problem of estimating the output gap “is compounded by differences in both the phasing and the amplitude of crop cycles and (non-agricultural) business cycles and by the way the latter is affected by the former. The result is that the trend obtained from the time series of *aggregate* output may not indicate full employment output in any period. What is more important to appreciate, it is the output gaps in the two sectors separately, not their total, that are crucial for framing policies”. (Rakshit, 2009, p. 39)

<sup>68</sup> Due (say) to large past investments in the former, but not in the latter.

<sup>69</sup> Over time the relative prices will come down as investment goes up in the oil sector at a faster rate (than in other sectors) and search for substitutes of oil and for modes of raising energy efficiency is intensified. This, our earlier analysis and the history of oil prices suggest, would generate a disinflationary process in the medium run.

<sup>70</sup> As consumer goods prices go up due to the rise in oil prices. Recall that even in the presence of an output gap money wages rise, though at a slower rate, with an increase in the cost of living.

However, our analysis of the factors driving inflation and GDP over the period Q<sub>3</sub>, 2007–Q<sub>3</sub>, 2008 suggests the need for some major modifications in the Taylor rule. The reason lies primarily in the fact that the rule is tailored for a single-commodity world.

When the source of inflation is a demand-supply gap in the market for primary products, sticking to the Taylor rule is liable to cost the economy dear in terms of lost output and employment.

interest rates. Over time however the economy moves toward the NAIRU equilibrium with no inflation.<sup>71</sup>

Now consider the economic consequences of setting the policy rate according to the Taylor rule. This involves an increase in the real rate of interest and hence enlargement of the output gap (on top of what occurs under a neutral policy stance). Such enlargement might be expected to reduce the inflationary pressure and prompt the central bank to effect a corresponding reversal in the policy rate. However, operation of the passthrough and the impact of interest rate changes are generally long-drawn so that the Taylor rule would call for a continuation, if not further tightening, of the dear money policy for quite a while. This is likely to cause (with a lag) a steep slide of the economy—something a cutback in interest rates at that stage cannot easily or quickly arrest. Thus when the source of inflation is a demand-supply gap in the market for primary products, sticking to the Taylor rule is liable to cost the economy dear in terms of lost output and employment.

Much more serious could be the longer-term, growth debilitating effect of using a Taylor-type rule of thumb. Note that in the case considered above, jacking up interest rates when inflation is driven by oil prices implies that adjustment of relative prices to their equilibrium configuration is abruptly cut short by forcing the economy to operate below its full employment level.<sup>72</sup> The result is a lowering of the economy's long-term growth potential in two ways. First, investment in oil and its substitutes is reduced below what is required for rapidly removing the imbalance in the country's capital structure.<sup>73</sup> Second, when the central bank is prone to raise the policy rate for curbing inflation irrespective of whether it is due to an overall or purely sectoral excess demand, rational economic agents "would lower their expectations regarding the economy's average capacity utilisation over business cycles" (Rakshit, 2007). This would act as a damper on investors' plans for fixed capital accumulation. Both these factors taken together cannot but have a negative impact on the country's medium and long-term economic growth.

Our analysis strongly suggests the need for distinguishing between the sources of price increases while formulating anti-inflationary policies. No less important is it to supplement the usual estimates

<sup>71</sup> Were all prices market clearing and adjustments in output and employment instantaneous, the economy would not suffer from the output gap and inflation following the shock.

<sup>72</sup> Keeping oil prices artificially low (as happens in countries like India) is more distortionary: it reduces short-term "full-employment" output (due to misallocation of resources) and makes the composition of investment suboptimal (Rakshit, 2007).

<sup>73</sup> The imbalance refers to the fact that, given the aggregate capital stock, a reallocation of capital in favour of the oil sector would raise the country's NAIRU levels of output and employment. A rise in the relative price of oil tends to remove this imbalance over time by stimulating investment in energy relatively to that in other sectors.

of the output gap<sup>74</sup> with other indicators of over- or under-heating of the economy, e.g., changes in the index of industrial production; money and real wages of common labour; unemployment; and imports and their composition.<sup>75</sup> During the stagflationary phase of the crisis all these indicators would have underlined the problem of growing demand deficiency in practically all countries, especially the industrialised ones.

The other and more contentious issue highlighted in our discussion refers to the central bank's response to inflation irrespective of its nature and source. Thus though central banks in developed countries were aware of the growing output gap since Q<sub>3</sub>, 2007 and of the fact that the rise in inflation was due solely to excess demand in markets for foodgrains and petroleum, they continued to abide by the Taylor rule. The rationale of the rule, let us recall, lies in (a) preventing a wage-price spiral, as price increases tend to erode real wages; and (b) avoiding the distortionary costs of inflation. But these considerations should not have prevented the pursuit of an expansionary policy even though it would have led to a faster rise in prices and a further lowering of real wages. The important point to note in this context is that, when there is an output gap, a fall in real wages (driven by an increase in aggregate demand) is helpful in closing the gap, but does not lead to a price-wage spiral. Again, when the increase in the general price level is due to shocks in the market for primary products, but the output gap is positive, inflation (as already emphasized) is a necessary process of adjustment of relative prices and cannot but be transitory. Hence policies, *a la* the Taylor rule, would entail costs in terms of both reduced output and employment, as also distortions in allocation of resources.

In general use of Taylor rule is much more problematic for a developing economy. In industrialised nations the rule would emit wrong signals only in some exceptional cases; but in developing countries (with a non-insignificant primary sector) measures based on such a rule are more often than not liable to be counter-productive. Unfortunately, while the on-going crisis has prompted serious rethinking on many aspects of the conventional macroeconomic wisdom,<sup>76</sup> there is not much discussion on the efficacy of the Taylor rule, especially for emerging market economies.

<sup>74</sup> For a developing country like India we have examined elsewhere (Rakshit, 2009) some major limitations of these estimates and the policy based on them.

<sup>75</sup> While an increase in imports is generally a signal of growing aggregate demand, the same would not be true if the increase is in petroleum or other primary products.

<sup>76</sup> e.g., the relative superiority of monetary and fiscal policies in dealing with business cycles; the nature of financial regulation; reform of the global financial system; and macroeconomic policy coordination among nations.

Unfortunately, while the on-going crisis has prompted serious rethinking on many aspects of the conventional macroeconomic wisdom, there is not much discussion on the efficacy of the Taylor rule, especially for emerging market economies.

**TABLE A.1**  
**World Macro-Economic Profile: 2001-09**

Country	Subject	Units	2001	2002	2003	2004	2005	2006	2007	2008**	2009**
World			2.2	2.8	3.6	4.9	4.5	5.1	5.0	3.9 (3.7)	3.0 (2.2)
Advanced economies			1.2	1.6	1.9	3.2	2.6	3.0	2.6	1.5 (1.4)	0.5 (-0.3)
Euro area	GDP, at constant prices	(Y-o-Y)	1.9	0.9	0.8	2.1	1.6	2.8	2.6	1.3 (1.2)	0.2 (-0.5)
Emerging and developing economies			3.8	4.8	6.3	7.5	7.1	7.9	8.0	6.9 (6.6)	6.1 (5.1)
Developing Asia			5.8	6.9	8.2	8.6	9.0	9.9	10.0	8.4 (8.3)	7.7 (7.1)
World			4.2	3.5	3.7	3.6	3.7	3.6	4.0	6.2	4.6
Advanced economies			2.1	1.5	1.8	2.0	2.3	2.4	2.2	3.6	2.0 (1.4)
Euro area	Inflation, average consumer prices	(Y-o-Y)	2.4	2.3	2.1	2.1	2.2	2.2	2.1	3.5	1.9
Emerging and developing economies			7.7	6.8	6.6	5.9	5.7	5.4	6.4	9.4 (9.2)	7.8 (7.1)
Developing Asia			2.8	2.1	2.6	4.1	3.8	4.2	5.4	7.8	6.2
World	Commodity Price Index includes both Fuel and Non-Fuel Price Indices	Index, 2005=100	58.3	58.3	65.0	80.5	100.0	120.7	135.0	185.3	176.2
	Growth rate	(Y-o-Y)	-7.88	0.04	11.57	23.74	24.25	20.71	11.81	37.28	-4.91
World	Crude oil (petroleum), Simple average of three spot prices (APSP); Dated Brent, West Texas Intermediate, and the Dubai Fateh	Dollars per barrel	24.3	25.0	28.9	37.8	53.4	64.3	71.1	107.3	100.5
	Growth rate	(Y-o-Y)	-13.8	2.5	15.8	30.7	41.3	20.5	10.7	50.8 (40.2)	-6.3 (-31.8)
World	Commodity Food and Beverage Price Index includes Food and Beverage Price Indices	Index, 2005=100	79.0	83.2	88.3	99.4	100.0	110.3	126.9	164.5	154.7
	Growth rate	(Y-o-Y)	-3.0	5.2	6.1	12.6	0.6	10.3	15.1	29.6	-5.9
World			21.5	20.9	21.1	22.0	22.5	23.2	23.5	23.5	23.6
Advanced economies			20.8	19.9	19.9	20.5	21.0	21.4	21.2	20.7	20.2
Euro area*	Real Investment	Percent of GDP	21.0	20.0	20.1	20.4	20.8	21.6	22.1	22.2	21.8
Emerging and developing economies			24.5	25.0	26.0	27.3	27.3	28.2	29.3	29.7	30.4
Developing Asia			30.1	31.2	33.8	35.9	37.3	37.9	38.1	39.2	39.7
World	Trade volume of goods and services	Y-o-Y growth	0.3	3.5	5.4	10.7	7.6	9.3	7.2	4.9 (4.6)	4.1 (2.1)
Advanced economies			-0.8	-0.8	-0.7	-0.6	-1.1	-1.3	-0.9	-1.0	-0.6
Euro area	Current account balance	Percent of GDP	0.1	0.7	0.6	1.2	0.5	0.3	0.2	-0.5	-0.4
Emerging and developing economies			0.6	1.1	1.9	2.4	4.1	4.9	4.1	4.1	2.9
Developing Asia			1.5	2.4	2.7	2.6	4.0	5.9	7.0	5.4	5.2

\*Gross capital formation at market prices; Source: National Statistical Office. EuroStat. Primary domestic currency: Euros.

\*\*IMF's World Economic Outlook (WEO) Oct. 2008 Projection; and the figures in bracket are the revised projections of WEO update (Nov. 06, 2008).

Source: International Monetary Fund (IMF), World Economic Outlook Database, October 2008.



**TABLE A.2**  
**Macro Variables of Major Countries and Country Groups: 2007-08**

*Y-O-Y growth rate, except the unemployment rate*

		<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
<b>2007</b>													
<b>World</b>	GDP	5											
	Spot Oil Price (in US\$/Barrel)**	54.6	59.3	60.6	64.0	63.5	67.5	74.2	72.4	79.9	86.2	94.6	91.7
	Spot Oil Price Inflation	-16.7	-3.8	-3.7	-8.2	-10.5	-4.9	-0.3	-0.9	25.1	46.4	59.4	47.9
	Commodity (all) price Inflation***	23.5	19.5	23.4	21.1	13.3	20.3	15.7	15.8	21.3	19.9	15.7	15.6
	Food Price Inflation***	17.3	15.5	17.0	15.8	15.7	25.7	23.1	29.7	41.9	35.3	30.8	38.1
<b>OECD— Total</b>	GDP	2.7		2.5		2.4		2.3		2.9		2.6	
	CPI (All) Inflation	2.1	2.2	2.5	2.4	2.4	2.3	2.1	1.9	2.3	2.9	3.4	3.4
	CPI (Food) Inflation	2.5	3.0	3.4	3.8	3.6	3.6	3.5	3.4	3.6	4.3	4.7	5.0
	IIP	2.6	3.2	2.8	2.3	2.8	2.4	3.1	3.2	3.0	3.3	2.8	2.3
	Unemployment rate	5.8	5.7	5.7	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.5	5.6
<b>US</b>	GDP	1.3		1.8		2.7		2.8		2.8		2.3	
	CPI (All) Inflation	2.1	2.4	2.8	2.6	2.7	2.7	2.4	2.0	2.8	3.5	4.3	4.1
	CPI (Food) Inflation	1.7	2.9	3.4	3.9	4.4	4.6	4.6	4.7	4.7	4.7	5.4	5.6
	IIP	0.9	1.6	1.3	1.4	1.5	1.4	1.7	1.6	2.2	1.9	2.5	2.0
	Unemployment rate	4.6	4.5	4.4	4.5	4.5	4.6	4.7	4.7	4.7	4.8	4.7	5.0
<b>Japan</b>	GDP	3.4		2.3		2.7		1.9		2.0		2.0	
	CPI (All) Inflation	0.0	-0.2	-0.1	0.0	0.0	-0.2	0.0	-0.2	-0.2	0.3	0.6	0.7
	CPI (Food) Inflation	-0.4	0.0	1.0	0.8	0.3	-0.5	0.3	-0.7	0.0	1.1	1.1	1.1
	IIP	3.1	3.9	3.2	1.1	3.8	2.4	2.1	4.4	3.0	3.9	1.9	2.3
	Unemployment rate	4.0	4.0	4.0	3.8	3.8	3.7	3.6	3.8	4.0	4.0	3.8	3.8
<b>Germany</b>	GDP	3.7		2.5		2.0		2.4		2.6		1.7	
	CPI (All) Inflation	1.9	1.9	2.1	2.1	2.1	2.0	1.9	2.0	2.6	2.6	3.4	3.2
	CPI (Food) Inflation	3.1	2.5	2.6	3.4	2.4	2.8	2.9	3.2	3.2	5.8	6.7	7.0
	IIP	6.3	6.8	7.9	5.2	6.2	6.0	5.5	6.3	6.8	6.8	4.5	5.4
	Unemployment rate	8.9	8.7	8.6	8.6	8.5	8.4	8.4	8.3	8.2	8.1	8.0	7.9
<b>Euro area</b>	GDP	3.2		2.6		1.9		2.6		2.1		2.1	
	CPI Inflation	1.8	1.8	1.9	1.9	1.9	1.9	1.8	1.7	2.1	2.6	3.1	3.1
	IIP	3.4	4.1	4.2	3.0	2.9	3.0	4.0	4.0	3.7	4.3	3.0	1.7
	Unemployment rate	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.4	7.3	7.3	7.3	7.2
	Exchange rate <sup>†</sup>	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
<b>UK</b>	GDP	2.9		3.0		2.4		3.3		1.7		2.9	
	CPI (All) Inflation	2.7	2.8	3.1	2.8	2.5	2.4	1.9	1.7	1.7	2.0	2.1	2.1
	CPI (Food) Inflation	4.0	4.4	5.6	6.0	4.9	4.8	2.8	3.0	3.7	4.7	4.8	5.4
	IIP	0.3	-0.5	-0.9	0.4	0.9	0.8	0.8	0.3	-0.3	1.4	0.6	1.0
	Unemployment rate	5.5	5.5	5.5	5.4	5.3	5.3	5.3	5.3	5.2	5.1	5.0	5.1
<b>India</b>	GDP	9.7		9.3		5.7		8.8		5.5		8.4	
	CPI (IW) Inflation	6.7	7.6	6.7	6.7	6.6	5.7	6.5	7.3	6.4	5.5	5.5	5.5
	IIP	11.6	11.0	14.8	11.3	10.6	8.9	8.3	10.9	7.0	12.2	4.9	8.0
	Exchange rate <sup>†</sup>	44.3	44.2	44.1	42.0	40.8	40.9	40.4	40.8	40.2	39.4	39.5	39.5
	<b>Brazil</b>	GDP	5.1		6.0		4.9		5.4		4.6		6.1
CPI Inflation		2.7	3.1	3.1	3.4	4.0	4.9	4.9	4.9	4.9	4.6	4.6	4.4
IIP		2.7	3.0	4.6	5.4	4.2	7.5	5.3	7.6	7.2	9.0	7.0	6.3
Exchange rate <sup>†</sup>		2.1	2.1	2.1	2.0	2.0	1.9	1.9	2.0	1.9	1.8	1.8	1.8
<b>Russia</b>		GDP	7.7		8.0		8.4		7.4		10.8		9.3
	CPI Inflation	8.2	7.6	7.4	7.6	7.8	8.4	8.7	8.6	9.4	10.8	11.5	11.9
	IIP	6.6	6.8	8.3	6.1	5.1	9.8	10.6	3.4	3.6	4.2	6.1	5.6
	Exchange rate <sup>†</sup>	26.5	26.3	26.1	25.8	25.9	25.9	25.5	25.7	25.2	24.9	24.4	24.6
	<b>China<sup>®</sup></b>	GDP	11.1		11.9		5.6		11.5		6.5		11.2
CPI Inflation		2.2	2.7	3.3	3.0	3.4	4.4	5.6	6.5	6.2	6.5	6.9	6.5
Exchange rate <sup>†</sup>		7.8	7.7	7.7	7.7	7.7	7.6	7.6	7.6	7.5	7.5	7.4	7.4

... continued on following page

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>2008</b>													
<b>World</b>	GDP	3.7*											
	Spot Oil Price (in US\$/Barrel)**	93.0	95.4	105.6	112.6	125.4	133.9	133.4	116.6	103.9	76.7	57.4	41.0
	Spot Oil Price Inflation	70.3	60.9	74.3	76.0	97.6	98.5	79.9	61.1	30.0	-11.1	-39.3	-55.3
	Commodity (all) price Inflation***	23.1	32.7	38.1	29.3	26.3	27.9	27.9	18.7	7.0	-14.4	-23.3	-30.5
	Food Price Inflation***	45.3	57.0	66.7	63.0	58.7	56.7	55.0	39.4	19.3	-1.4	-9.8	-18.3
<b>OECD— Total</b>	GDP	2.5											
	CPI (All) Inflation	3.5	3.5	3.6	3.5	3.9	4.4	4.8	4.7	4.5	3.7	2.3	
	CPI (Food) Inflation	5.2	5.0	5.1	5.7	6.0	6.5	7.2	7.1	6.8	6.5	6.2	
	IIP	3.3	2.7	1.7	2.1	0.7	0.3	-0.1	-1.7	-3.4	-4.8		
	Unemployment rate	5.7	5.7	5.8	5.8	6.0	6.0	6.1	6.3	6.3	6.4	6.5	
<b>US</b>	GDP	2.5											
	CPI (All) Inflation	4.3	4.0	4.0	3.9	4.2	5.0	5.6	5.4	4.9	3.7	1.1	0.1
	CPI (Food) Inflation	5.8	5.1	4.7	5.9	5.8	6.1	7.1	7.5	7.6	7.5	7.0	6.6
	IIP	2.5	1.6	1.5	0.4	0.2	-0.1	-0.7	-2.0	-6.2	-4.5	-5.5	
	Unemployment rate	4.9	4.8	5.1	5.0	5.5	5.6	5.8	6.2	6.2	6.6	6.8	7.2
<b>Japan</b>	GDP	1.4											
	CPI (All) Inflation	0.7	1.0	1.2	0.8	1.3	2.0	2.3	2.1	2.1	1.7	1.0	
	CPI (Food) Inflation	0.5	1.4	1.8	2.2	2.6	4.2	4.1	3.4	3.3	3.6	4.2	
	IIP	3.0	4.2	0.5	0.7	2.2	0.0	1.4	-4.7	-2.2	-6.7	-12.8	
	Unemployment rate	3.8	3.9	3.8	4.0	4.0	4.1	4.0	4.1	4.0	3.7	4.0	
<b>Germany</b>	GDP	2.7											
	CPI (All) Inflation	2.9	3.0	3.3	2.6	3.1	3.3	3.3	3.1	2.9	2.4	1.4	1.1
	CPI (Food) Inflation	7.2	7.4	8.2	7.1	7.5	7.1	7.4	6.9	6.1	4.3	2.0	1.9
	IIP	5.9	5.1	4.3	6.1	1.7	2.1	0.3	1.5	-2.0	-3.9		
	Unemployment rate	7.7	7.6	7.4	7.4	7.4	7.3	7.2	7.1	7.1	7.1	7.1	
<b>Euro area</b>	GDP	2.1											
	CPI Inflation	3.2	3.3	3.6	3.3	3.7	4.0	4.0	3.8	3.6	3.2	2.1	1.6
	IIP	3.2	2.8	1.3	3.8	-0.2	-0.4	-1.2	-1.1	-2.6	-5.3		
	Unemployment rate	7.2	7.2	7.2	7.3	7.4	7.4	7.5	7.5	7.6	7.7	7.8	
	Exchange rate#	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.7
<b>UK</b>	GDP	2.3											
	CPI (All) Inflation	2.2	2.5	2.4	3.0	3.3	3.8	4.4	4.8	5.2	4.5	4.1	3.1
	CPI (Food) Inflation	6.1	5.6	5.5	6.6	7.9	9.5	12.2	13.1	11.4	10.1	10.6	10.4
	IIP	0.3	1.1	0.3	0.1	-1.7	-2.0	-1.9	-2.7	-2.9	-5.2	-6.9	
	Unemployment rate	5.1	5.1	5.2	5.2	5.4	5.5	5.7	6.1	6.1	6.5	6.7	
<b>India</b>	GDP	8.7											
	CPI (IW) Inflation	5.5	5.5	7.9	7.8	7.8	7.7	8.3	9.0	9.8	10.5	10.5	
	IIP	6.2	9.5	5.5	6.2	4.4	5.4	7.4	1.4	4.8	-0.4	2.4	
	Exchange rate#	39.4	39.8	40.3	40.7	42.3	42.9	42.7	43.1	45.7	48.9	49.1	48.8
	<b>Brazil</b>	GDP	6.1										
CPI Inflation		4.2	4.1	4.3	4.5	5.4	5.8	6.0	6.4	6.5	7.0	6.9	6.2
IIP		7.9	5.8	3.7	7.1	4.1	7.5	6.3	4.6	6.8	1.2		
Exchange rate#		1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.8	2.3	2.3	2.4
<b>Russia</b>		GDP	8.7										
	CPI Inflation	12.6	12.7	13.3	14.3	15.1	15.2	14.7	15.0	15.1	14.2		
	IIP	4.8	4.0	7.3	8.0	7.1	1.6	1.4	6.6	5.8	1.3		
	Exchange rate#	24.6	24.5	23.7	23.5	23.7	23.6	23.4	24.2	25.4	26.5	27.3	28.1
	<b>China<sup>@</sup></b>	GDP	10.6										
CPI Inflation		7.1	8.7	8.3	8.5	7.7	7.1	6.3	4.9	4.6	4.0	2.4	
Exchange rate#		7.2	7.2	7.2	7.0	7.0	6.9	6.8	6.9	6.8	6.8	6.8	6.9
* IMF (WEO, November 6, 2008 update) Projection. ** West Texas Intermediate. *** Based on the <i>Economist</i> Commodity Price (Dollar) Index. # per US \$. @ All the data are taken from <i>Economist</i> . Source: Central Statistical Organisation, Govt. of India; Bureau of Economic Analysis, USA; OECD Website; <i>Economist</i> ; IMF website; Fed. Reserve Bank of St. Louis' website.													

TABLE A.3  
 Major Central Banks' Key Policy Rates

<i>Date</i>	<i>Target Rate</i>	<i>Date</i>	<i>Target Rate</i>
<b>US: Federal Funds Rate</b>			
3-Jan-06	4.25	22-Jan-08	3.5
31-Jan-06	4.5	30-Jan-08	3
28-Mar-06	4.75	18-Mar-08	2.25
29-Jun-06	5.25	30-Apr-08	2
18-Sep-07	4.75	8-Oct-08	1.5
31-Oct-07	4.5	29-Oct-08	1
11-Dec-07	4.25	16-Dec-08	0.0-0.25
<i>Source:</i> Fed. Reserve Bank of New York's website.			
<b>UK: Official Bank Rate</b>			
3-Aug-06	4.75	7-Feb-08	5.25
9-Nov-06	5	10-Apr-08	5
11-Jan-07	5.25	8-Oct-08	4.5
10-May-07	5.5	6-Nov-08	3
5-Jul-07	5.75	4-Dec-08	2
6-Dec-07	5.5		
<i>Source:</i> Bank of England's website.			
<b>ECB: Main Refinancing Operation Minimum Bid Rate</b>			
8-Mar-06	2.5	13-Jun-07	4
15-Jun-06	2.75	9-Jul-08	4.25
9-Aug-06	3	8-Oct-08	3.75
11-Oct-06	3.25	6-Nov-08	3.25
13-Dec-06	3.5	4-Dec-08	2.5
14-Mar-07	3.75		
<i>Source:</i> ECB's website.			
<b>Bank of Japan: Uncollateralized Overnight Call Rate</b>			
2006	0.275	Apr-08	0.522
Aug-07	0.498	May-08	0.527
Sep-07	0.675	Jun-08	0.572
Oct-07	0.524	Jul-08	0.519
Nov-07	0.52	Aug-08	0.516
Dec-07	0.459	Sep-08	0.544
Jan-08	0.508	31-oct. 08	0.3
Feb-08	0.512	19-Dec-08	0.1
Mar-08	0.641		
<i>Source:</i> Bank of Japan's website			

... continued on following page

Date	Reverse Repo Rate	Repo Rate	Date	Reverse Repo Rate	Repo Rate
<b>India</b>					
24-Jan-06	5.5	6.5	12-Jun-08	6	8
9-Jun-06	5.75	6.75	25-Jun-08	6	8.5
25-Jul-06	6	7	30-Jul-08	6	9
31-Oct-06	6	7.25	20-Oct-08	6	8
31-Jan-07	6	7.5	1-Nov-08	6	7.5
31-Mar-07	6	7.75	6-Dec-08	5	6.5
Source: RBI's website.					
Date	Rate	Date	Rate		
<b>Russian Federation: Refinancing Rate</b>					
26-Dec-05	12	29-Apr-08	10.5		
26-Jun-06	11.5	10-Jun-08	10.75		
23-Oct-06	11	14-Jul-08	11		
29-Jan-07	10.5	12-Nov-08	12		
19-Jun-07	10	1-Dec-08	13		
4-Feb-08	10.25				
Source: Central Bank of Russia's website.					
<b>Brazil: SELIC* Rate Targets</b>					
19-Jan-06	17.25	19-Jul-07	11.5		
09-Mar-06	16.5	06-Sep-07	11.25		
20-Apr-06	15.75	18-Oct-07	11.25		
01-Jun-06	15.25	06-Dec-07	11.25		
20-Jul-06	14.75	24-Jan-08	11.25		
31-Aug-06	14.25	06-Mar-08	11.25		
19-Oct-06	13.75	17-Apr-08	11.75		
30-Nov-06	13.25	05-Jun-08	12.25		
25-Jan-07	13	24-Jul-08	13		
08-Mar-07	12.75	11-Sep-08	13.75		
19-Apr-07	12.5	30-Oct-08	13.75		
07-Jun-07	12				
* 'SELIC' is the acronym of the Portuguese phrase meaning <i>Special System of Clearance and Custody</i> .					
Source: Central Bank of Brazil.					
<b>China: Benchmark 1 year Lending Rate</b>					
	6.84	Oct. 09, 08	6.93		
Aug. 21, 07	7.02	Oct. 29, 08	6.66		
Sep. 14, 07*	7.29	Nov. 26, 08	5.58		
	7.47	Dec. 22, 08	5.31		
Sep. 15, 08**	7.2				
*This was the fifth rise during the year.					
** This was the first cut in rates after Oct. 04.					
Source: Different Newspaper Reports.					

**TABLE A.4**  
Relative Price Index of Oil for Different Countries/Groups of Countries

<i>Oil Price Index*/CPI*</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
<b>2007</b>												
OECD	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.3
US	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.2
Japan	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.3
Germany	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.2
Euro	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.2
UK	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.2
India	0.8	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.2	1.3	1.3
Brazil	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.2
Russia	0.8	0.8	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.2
<b>2008</b>												
OECD	1.3	1.3	1.4	1.5	1.7	1.8	1.8	1.5	1.4	1.0	0.8	
US	1.3	1.3	1.4	1.5	1.7	1.8	1.7	1.5	1.4	1.0	0.8	0.6
Japan	1.3	1.3	1.5	1.6	1.7	1.8	1.8	1.6	1.4	1.0	0.8	
Germany	1.3	1.3	1.4	1.5	1.7	1.8	1.8	1.6	1.4	1.0	0.8	0.6
Euro	1.3	1.3	1.4	1.5	1.7	1.8	1.8	1.6	1.4	1.0	0.8	0.5
UK	1.3	1.3	1.4	1.5	1.7	1.8	1.8	1.5	1.4	1.0	0.8	0.5
India	1.3	1.3	1.4	1.5	1.7	1.8	1.7	1.5	1.3	1.0	0.7	
Brazil	1.3	1.3	1.4	1.5	1.7	1.8	1.7	1.5	1.3	1.0	0.7	
Russia	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.4	1.2	0.9		
* Base Month: August, 2007.												
Source: Federal Reserve Bank of St. Louis' Website; Websites of Concerned Statistical Departments/Central Banks of Different Countries; OECD's Website.												

**TABLE A.5**  
**Global Oil Demand—Supply Scenario (in million barrels per day)**

	2005	2006	1Q07	2Q07	3Q07	4Q07	2007	1Q08	2Q08	3Q08	4Q08	2008	1Q09	2Q09	3Q09	4Q09	2009
<b>OECD Demand</b>																	
North America	25.6	25.4	25.7	25.4	25.5	25.5	25.5	24.8	24.5	23.8	23.6	24.2	23.9	23.9	23.8	23.8	23.8
Europe	15.7	15.7	15.2	14.9	15.4	15.6	15.3	15.2	14.9	15.3	15.5	15.2	15.0	14.6	15.2	15.3	15.0
Pacific	8.6	8.5	8.9	7.9	7.9	8.7	8.3	8.9	7.8	7.5	8.3	8.1	8.6	7.7	7.5	8.2	8.0
Total OECD	49.8	49.6	49.8	48.2	48.8	49.9	49.2	48.9	47.2	46.6	47.4	47.5	47.5	46.2	46.5	47.3	46.9
<b>Non-OECD Demand</b>																	
FSU	3.9	4.1	4.1	3.9	4.2	4.3	4.1	4.1	4.1	4.4	4.4	4.2	4.2	4.2	4.4	4.5	4.3
Europe	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.8
China	6.7	7.2	7.3	7.7	7.5	7.6	7.5	7.9	8.0	8.1	7.9	7.9	8.2	8.2	8.1	8.3	8.2
Other Asia	8.8	9.0	9.2	9.3	9.1	9.4	9.3	9.6	9.6	9.1	9.3	9.4	9.7	9.7	9.3	9.5	9.6
Latin America	5.1	5.3	5.4	5.6	5.7	5.7	5.6	5.7	5.9	6.0	5.9	5.9	5.9	6.1	6.2	6.1	6.1
Middle East	6.0	6.2	6.4	6.5	6.7	6.4	6.5	6.7	7.0	7.3	6.8	6.9	7.0	7.3	7.6	7.1	7.2
Africa	2.9	3.0	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.0	3.1	3.1	3.2	3.2	3.1	3.2	3.2
Total Non-OECD	34.2	35.5	36.4	36.9	36.9	37.3	36.9	37.9	38.5	38.6	38.2	38.3	39.1	39.5	39.5	39.5	39.4
<b>Total Demand<sup>1</sup></b>	<b>84.0</b>	<b>85.1</b>	<b>86.2</b>	<b>85.1</b>	<b>85.7</b>	<b>87.2</b>	<b>86.0</b>	<b>86.8</b>	<b>85.7</b>	<b>85.2</b>	<b>85.6</b>	<b>85.8</b>	<b>86.6</b>	<b>85.7</b>	<b>86.0</b>	<b>86.8</b>	<b>86.3</b>
<b>OECD Supply</b>																	
North America	14.1	14.2	14.4	14.4	14.2	14.1	14.3	14.2	14.1	13.6	13.9	14.0	14.1	13.9	13.9	14.2	14.0
Europe	5.6	5.2	5.2	4.9	4.7	5.0	5.0	4.9	4.8	4.5	4.6	4.7	4.5	4.1	4.0	4.2	4.2
Pacific	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.7	0.7	0.7	0.7	0.7
Total OECD	20.3	20.0	20.2	19.9	19.5	19.8	19.8	19.7	19.5	18.8	19.3	19.3	19.4	18.8	18.6	19.1	19.0
<b>Non-OECD Supply</b>																	
FSU	11.8	12.2	12.8	12.7	12.8	12.8	12.8	12.8	12.9	12.6	12.7	12.8	13.1	13.1	12.9	12.9	13.0
Europe	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
China	3.6	3.7	3.7	3.8	3.7	3.7	3.7	3.8	3.8	3.8	3.9	3.8	3.9	3.9	3.9	3.9	3.9
Other Asia	2.7	2.7	2.7	2.6	2.6	2.7	2.7	2.7	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.7	2.7
Latin America	4.3	4.4	4.4	4.4	4.3	4.2	4.3	3.9	4.0	4.1	4.1	4.0	4.3	4.3	4.3	4.3	4.3
Middle East	1.8	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5
Africa <sup>2</sup>	3.7	3.9	2.6	2.5	2.5	2.6	2.6	2.6	2.6	2.7	2.7	2.6	2.7	2.7	2.7	2.7	2.7
Total Non-OECD	28.0	28.8	27.9	27.8	27.7	27.7	27.8	27.6	27.6	27.5	27.8	27.6	28.3	28.4	28.2	28.1	28.2
Total Non-OPEC <sup>3</sup>	50.4	51.2	50.5	50.3	49.7	50.1	50.1	49.9	49.7	48.9	49.8	49.6	50.5	50.1	49.6	50.1	50.1
Non-OPEC excl. Angola <sup>2</sup>	48.7	49.2	50.0	49.8	49.2	49.7	49.7	49.9	49.7	48.9	49.8	49.6	50.5	50.1	49.6	50.1	50.1
<b>OPEC</b>																	
Crude <sup>4</sup>	29.7	29.7	30.4	30.2	30.7	31.6	30.7	32.4	32.2	32.4							
NGLs	4.5	4.6	4.7	4.7	4.8	4.8	4.8	4.8	4.9	5.0	5.2	5.0	5.3	5.5	5.7	5.9	5.6
Total OPEC	34.2	34.3	35.1	35.0	35.4	36.4	35.5	37.2	37.1	37.4							
OPEC incl. Angola <sup>2</sup>	36.0	36.3	35.6	35.5	36.0	36.8	35.9	37.2	37.1	37.4							
<b>Total Supply<sup>5</sup></b>	<b>84.7</b>	<b>85.5</b>	<b>85.6</b>	<b>85.2</b>	<b>85.2</b>	<b>86.5</b>	<b>85.6</b>	<b>87.1</b>	<b>86.8</b>	<b>86.3</b>							
<b>Notes:</b>																	
1. Measured as deliveries from refineries and primary stocks, comprises inland deliveries, international marine bunkers, refinery fuel, crude for direct burning, oil from non-conventional sources and other sources of supply.																	
2. With effect from Oil Market Report (OMR) of 16 January 2008, Ecuadorean production will be reclassified within OPEC and excluded from the Non-OPEC and Latin America totals, for the period December 2007 onwards. Angolan production is classified within OPEC and excluded from the Non-OPEC and Africa totals, for the period January 2007 onwards. Secondary aggregates allow comparison with previous year totals by including Angola and Ecuador within OPEC retroactively.																	
3. Non-OPEC supplies include crude oil, condensates, NGL and non-conventional sources of supply such as synthetic crude, ethanol and MTBE. No allowance is made in the non-OPEC forecast for exceptional events which have, at certain times historically, reduced non-OPEC supply by 300-400 kbd on an annual basis.																	
4. As of the March 2006 OMR, Venezuelan Orinoco heavy crude production is included within Venezuelan crude estimates. Orimulsion fuel remains within the OPEC NGL & non-conventional category, but Orimulsion production will reportedly cease from January 2007.																	
5. Comprises crude oil, condensates, NGLs, oil from non-conventional sources and other sources of supply.																	
<b>Source:</b> International Energy Agency website (OMR, released on December 11, 2008).																	



TABLE A.6  
Estimates of Excess Demand for Oil in Q<sub>1</sub>, 2008 and Q<sub>2</sub>, 2008  
(Million barrels per day)

(All the changes and growth rates are Y-o-Y)

	<i>Estimated change in Demand (DD) for OECD due to change in income alone</i>	<i>Actual change in OECD DD</i>	<i>Estimated change in DD for non-OECD countries due to change in income alone</i>	<i>Actual change in non-OECD DD</i>	<i>Estimated change in world DD due to change in income alone</i>	<i>Actual change in world DD</i>	<i>Difference</i>	<i>Change in total world oil production</i>	<i>Shortfall of Production from DD (6)-(9)</i>	<i>Change in Inventory</i>
1	2	3	4	5	6 (2+4)	7	8 (7-6)	9	10	11
2008-Q1	0.7	-0.9	3.7	1.5	4.4	0.6	-3.8	1.5	2.9	0.2
2008-Q2	0.5	-1.0	3.6	1.6	4.0	0.6	-3.4	1.6	2.4	1.1
<i>memo item:</i>	<i>OECD income growth rate (%)</i>		<i>Estimated income growth rate of Non-OECD Countries (%)</i>		<i>Presumed OECD income elasticity of DD for oil</i>		<i>Presumed Non-OECD income elasticity of DD for oil</i>		<i>Global GDP Growth</i>	
1	2		3		4		5		6	
2008-Q1	2.51		8.90		0.55		1.15		4.33	
2008-Q2	1.85		8.39		0.55		1.15		3.71	
<i>Note:</i>	<p>1. Estimated change in DD due to change in income is calculated on the basis of presumed income elasticities for both the groups, their GDP growth rates for 2008-Q1,Q2 and the actual demand for oil for these groups in 2007-Q1,Q2.</p> <p>2. The countries taken here as non-OECD countries are Argentina, Brazil, China, India, Indonesia, and Russia. The GDP growth rate of this group is estimated as an weighted average of their individual GDP growth rates while their weights are calculated on the basis of their share in global GDP at current prices.</p> <p>3. The percentage share of OECD countries in global GDP at current prices is 71.82 and that for the major non-OECD countries group (which is here assumed to be the representative of the total non-OECD) is 15.69 according to the IMF's projection for 2008.</p> <p>4. Due to rounding off of figures, the constituent items may not add up to the totals.</p>									
<i>Source:</i>	International Energy Agency's website; IMF's website; OECD's website.									

TABLE A.7  
Price Elasticity of Demand for Oil

(All the changes and growth rates are Y-o-Y)

	<i>OECD</i>	<i>Non-OECD countries</i>			
2008-Q1	-0.05	-0.09			
2008-Q2	-0.04	-0.06			
<i>memo item:</i>	<i>OECD income growth rate (%)</i>	<i>Estimated income growth rate of Major Non-OECD Countries (%)</i>	<i>Presumed OECD income elasticity of DD for oil</i>	<i>Presumed Non-OECD income elasticity of DD for oil</i>	<i>% Change in Relative Oil Price</i>
1	2	3	4	5	6
2008-Q1	2.51	8.90	0.55	1.15	66.25
2008-Q2	1.85	8.39	0.55	1.15	85.56
<i>Note:</i>	<p>1. Price elasticity of demand for oil is estimated on the basis of presumed income elasticities for both the groups, their GDP growth rates for 2008-Q1,Q2, percentage change in demand for oil and the percentage change in relative price of oil. Here we assume, abstracting from all the other factors, only income and prices affect the demand for oil.</p> <p>2. For GDP growth rate of non-OECD countries, see note 2 in Table A.6.</p> <p>3. Relative price of oil for the OECD countries is taken as a proxy for the world where relative price of oil is defined as the ratio of oil price index to the CPI (base: August, 2007).</p>				
<i>Source:</i>	International Energy Agency's website; IMF's website; OECD's website; Federal Reserve of St. Louis' website.				

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