

Wrap-up Discussion

1. Michael Dooley¹

The unifying theme of the conference has been that the inflationary effects associated with changes in commodity prices depend on the more fundamental shocks that drive commodity prices. Moreover, since changes in prices of oil and other commodities are relative price shocks they do not cause inflation. In contrast, central banks can cause inflation and they respond to real shocks, so it is necessary to understand central banks' reactions to changes in relative prices. In looking at any historical episode three sets of issues must be resolved. First, what caused the change in the relative prices of commodities and how did this affect other real variables? Second, how did this combination of real changes influence nominal price setting behaviour? And finally, how did the monetary authorities react to these economic developments?

The central empirical regularity confronted by conference participants is that recent commodity price increases have not yet been associated with increases in inflation rates. If we accept the conventional wisdom that oil shocks did generate inflation in the past, it follows that something in the long path from relative price changes to inflation has changed. The list of possibilities is a long one and the papers prepared for the conference provide an excellent summary of the more plausible candidates.

A generic explanation for a circuit breaker between commodity price changes and inflation is that real responses are muted because recent commodity price changes are, and are expected to be, temporary. Commodity price shocks could be less persistent for a number of reasons. The paper by Jeffrey Frankel and Andrew Rose makes two important points in this regard. First, the run-up and collapse in oil and other commodity prices in 2008 and the recent rebound are unusual in that they seem to be responding to a common macro shock. Second, the real macro shocks that would generate permanent changes in commodity prices do not seem to be having very powerful effects in the recent episode. In particular, changes in expected world GDP growth or changes in real long-term interest rates do not seem to have played an important role recently.

They do, however, find that speculation and monetary policy seem to have played important roles. To me this raises the possibility that something has changed, either in the structure of commodity markets or in the private sector's reaction to expected inflation, that has made commodity prices more volatile. For example, the bandwagons suggested by Jeffrey and Andrew are by definition transitory.

The recent behaviour of oil and other commodity prices has revived a very old debate about the role of speculation and the structure of markets in determining

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prices in these markets. A new twist on an old story is that a new class of ‘index investors’ is now indirectly participating in commodity futures markets. The facts are that investment banks offer institutional and other investors funds for which the return is indexed to a popular index of commodity prices. The investment bank then hedges its short fund exposure by rolling over long positions in commodity futures markets. As investors that would not have been willing or able to participate directly in commodity futures markets are attracted to index funds, the proximate result is upward pressure on commodity futures prices. This is not exactly a general equilibrium result, but since I am now a market participant I will try to put some respectable clothing on the idea.

My conclusion is that an important change in the rules of the game did lead to the entry of a new class of speculators into commodity markets. Moreover, this change in market structure has generated, and will continue to generate, much more volatility in commodity prices. An intriguing possibility is that the inflationary effects of swings in commodity prices will be reduced in this more volatile market structure.

Some fundamentals of speculation

Jeffrey and Andrew’s paper uses the simple but powerful Hotelling model to link spot prices, futures prices and inventories. Suppose some group of investors receives new information that demand for oil will grow more rapidly if China continues to grow at 10 per cent per annum. They bid up the futures price to the expected future spot price. The spot price also rises as storage becomes profitable and oil is withheld from the market. The effects on spot and futures prices are the same as if the speculator had purchased and stored spot oil. The spread between spot and futures prices depends on financing costs and the cost of storage, both of which, in turn, are an increasing function of market interest rates and the volume of storage.

How much oil has to be withheld from the spot market to move the spot price? If demand in the short run is inelastic, not much. This is where the peculiarities of the world oil market start to intrude on a simple story. Once oil is pumped out of the ground where can it be stored? We have up-to-date numbers on inventories of crude oil and products but it is difficult to interpret these data. The striking aspect of the inventory data is that it is very stable. In particular, it does not look like the stock of inventories varies over time to smooth prices except for seasonal variations.

Why not? My conjecture is that the almost infinitely larger stock of oil still in the ground has a much lower storage cost relative to oil above ground. It seems very likely that oil producers have an underground inventory strategy. Producers’ Hotelling strategy rests on two simple and intuitive ideas. First, oil in the ground has to provide about the same yield as alternative financial assets. Second, and more important, the price of oil cannot rise to the choke price, a level where no one wants it, while the swing producer still has oil in the ground. I am quite sure this is how dominant producers think about their pricing and inventory problem. Other producers with 5 to 10 years of oil remaining want the highest price the swing producer will tolerate. This makes negotiations within the Organization of the

Petroleum Exporting Countries (OPEC) difficult and constrains the swing producer from reacting as quickly as it might want to.

Those who blame index speculators for recent swings in oil and commodity prices tell the following story. The United States Congress, in legislation that was supported by most economists and the Administration, effectively removed restrictions for participation in energy futures markets in December 2000. The argument was, and is, that restrictions limit the ability of legitimate hedging and sharing of risk. With deregulation, a large group of amateurs entered the oil and other commodity markets. In particular, after 2006, index positions grew rapidly as new investors were sold on the idea that commodities are an 'asset class' like US equities, and that they offered fair rates of return and some diversification.

What index investors did not understand is that their bid for forward positions could not be met by an increase in the stock of above-ground oil. There is of course lots of oil underground and I think what investors have in mind is that they are buying a claim on this underground oil, the stock of which is very large relative to the bid of this new class of investors. The problem is that underground oil cannot be purchased and delivered to satisfy a short position in the near-date futures market. It follows that the long index speculator position must be offset by a naked short speculative position.

Economists tend to believe that this is not a problem because stabilising speculation will accommodate this long index position. Market participants believe that other speculators will get in front of a large, predictable flow of bids for futures contracts, but they will require a large risk premium to do so. Oil producers could have arbitrated the spot-forward spread but no one else could, simply because they had no place to put above-ground inventories. So for a short time all this new demand fell on a stock of oil above ground that was already owned by market participants that were long in crude oil because they planned to turn it into products. These participants watched as prices went up and had good reason to hold on to their positions.

The net result of this market structure is that spot oil prices rose to levels that are inconsistent with the swing producer's optimal price path. Oil at US\$150 a barrel encourages innovation and generates the risk that they will be left with oil in the ground that can only be sold at a much lower price. They could have entered the futures market directly but this risks a political reaction to manipulating the market. Their alternative was to increase production and eventually force spot prices down.

So commodities are an asset class but one that is (eventually) dominated by producers. Producers manage inventories below ground to minimise departures from their desired price path. The imperfect but politically acceptable control variable is current output. The swing producer could also participate in the futures market but normally does not do so. In this environment there is little economic incentive to invest in above-ground storage facilities in order to profit from short-run price fluctuations. The swing producer does that already.

So we have a problem, but is it a problem for public policy? Clearly we do not want commodity prices to be distorted by index speculators. They will eventually learn to buy oil companies with reserves rather than oil futures but that could take a

while. More hopeful is the idea that there are other ways to arbitrage the spot-forward spread that is now an unusual feature of some commodity markets. A steep futures curve means that selling futures and buying anything highly correlated with the spot commodity is a profitable strategy. Currencies such as the Australian dollar are an obvious possibility. Hedge funds may be willing to absorb the basis risk generated by this strategy and restore market efficiency.

2. John C Williams²

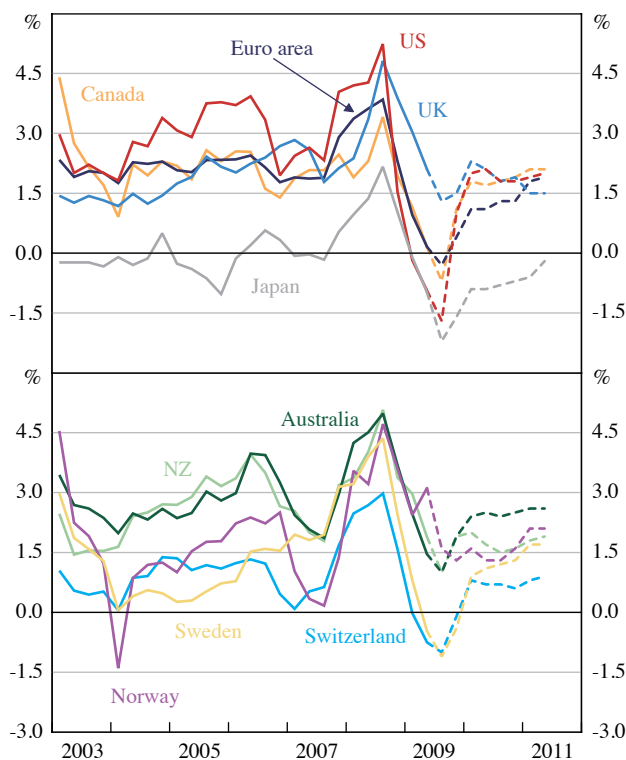
Five years ago, the topic of this conference was ‘The Future of Inflation Targeting’. Despite the apparent success of the inflation-targeting central banks at maintaining low and stable inflation, many participants at that particular conference expressed the concern that inflation targeting had not yet truly been ‘battle-tested’ in a sufficiently adverse macroeconomic environment. Glenn Stevens summed up the prevailing sense of caution at the time, saying ‘... an issue for the future is how well we will cope with supply shocks when they come’ (Stevens 2004, pp 290–291). The tumultuous events since then have provided such a test, yielding valuable lessons for central banks, whether they follow a strategy of inflation targeting or not. The papers in this year’s conference address a number of key issues related to how well central banks have weathered these storms.

Soaring oil and other commodity prices from 2004 through mid 2008 provided one critical test of inflation targeting and other monetary policy strategies. The dramatic movements in commodity prices have left their imprint on headline inflation rates over the past several years. The solid lines in Figure 1 shows headline consumer price inflation rates along with the most recent consensus forecasts for a number of economies. Headline inflation rates peaked in mid 2008 and then plummeted as commodity prices collapsed and the global recession intensified.

Although the one-two punch of commodity price shocks and the global financial crisis and recession have caused inflation rates to rise well above desired levels and then to fall rapidly, into negative territory in many economies, inflation expectations have remained remarkably well anchored in major industrialised economies. The dashed lines in Figure 1 show the most recent consensus forecasts for headline consumer price inflation. In all cases, private forecasters expect inflation to return to near the inflation targets for inflation-targeting countries (as described by Kuttner 2004) or near historical norms in non-inflation-targeting countries by early 2011. Indeed, longer-run inflation expectations have remained very stable in these countries throughout the past five years. Figure 2 shows consensus long-run inflation forecasts for the same set of industrialised economies included in Figure 1.

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Figure 1: Headline Inflation
Year-ended

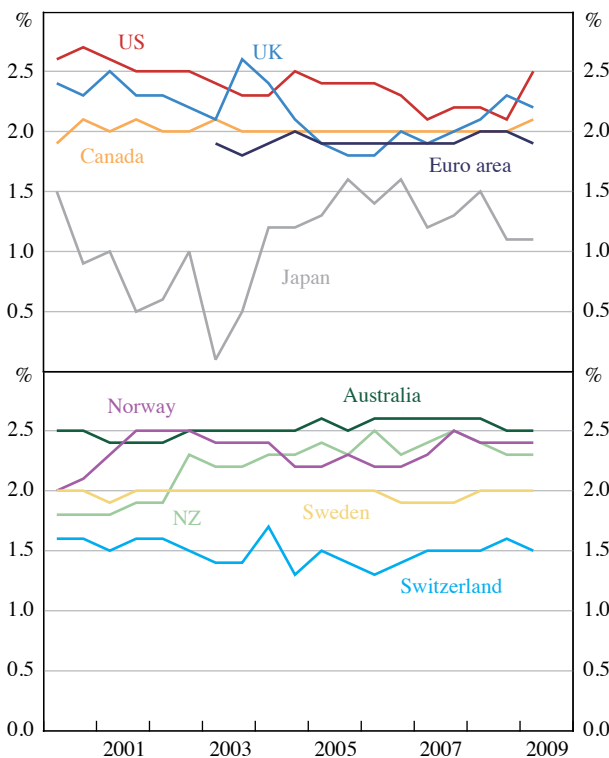


Note: Dashed lines are forecasts

Source: Consensus Economics

Inflation expectations have remained well-anchored even as central banks have taken aggressive actions to stimulate economic growth during the recent global downturn. As discussed in Williams (2009), central banks in most major industrialised economies reduced overnight interest rates to near zero in late 2008 or early 2009. In addition, several central banks have undertaken unconventional monetary policies aimed at stimulating growth. Evidently, inflation-targeting and non-inflation-targeting central banks have demonstrated the flexibility to stabilise economic activity while maintaining well-anchored inflation expectations. Indeed, the anchoring of expectations has likely provided central banks with greater willingness to respond aggressively to the global downturn.

In summary, many inflation-targeting and non-inflation-targeting central banks have coped well with extremely large supply and demand shocks over the past five years. The papers in this conference provide valuable insights into why this has been the case. In particular, the papers by Robert Anderton *et al*, Christiane Baumeister, Gert Peersman and Ine Van Robays, and Lutz Kilian show that over the past two decades, oil supply shocks have had only transitory effects on

Figure 2: Long-run Inflation Expectations

Note: 5–10 year Consensus Economics forecasts; from biannual surveys taken in April and October

Source: Consensus Economics

inflation rates. Christiane, Gert and Ine’s paper also documents that responses to oil supply shocks differ across economies, with a key difference being the magnitude of second-round effects on wages and non-energy prices.

What explains the relatively benign responses of inflation to oil supply shocks found in these papers? A number of factors are assuredly at work, including fiscal and monetary policy regimes, the subject of the papers by Graciela Kaminsky, and César Calderón and Klaus Schmidt-Hebbel, respectively. Importantly, the better anchoring of inflation expectations in the past 20 years has likely played a significant role in explaining the absence of second-round effects of oil price shocks on wages and other prices. For example, Orphanides and Williams (2007) show that well-anchored inflation expectations mute and shorten the response of inflation to supply shocks. The paper by Pierre Siklos provides valuable information on the behaviour of various measures of inflation both across and within economies.

That leaves the question of how monetary policy *should* respond to oil supply shocks in order to both contain inflation and keep inflation expectations well-anchored. The papers by Lutz and Christiane, Gert and Ine provide an intriguing answer: do

nothing. Both papers find that the nominal short-term interest rate barely responds to a sizable oil supply shock, based on a sample starting in the mid 1980s. Evidently, the countervailing influences of weaker output and higher inflation resulting from an oil price increase are nearly offsetting as far as monetary policy-making is concerned. Of course, this evidence does not imply that such passivity is the optimal policy response, but it does suggest that such a response is consistent with the favourable behaviour of inflation following oil supply shocks, such as we have witnessed over the past two decades in the United States.

This finding – that the interest rate does not respond to oil supply shocks – poses some difficulties for the communication of monetary policy decisions. Some members of the public might wonder why the central bank is doing nothing while inflation soars, fearing a return to the high inflation of the past. For this reason, at times of large supply shocks, it is especially important for the central bank to reinforce its commitment to low inflation. The use of core measures of inflation and/or inflation forecasts is an important tool in public communication of the rationale for policy actions (or *inactions*). But, both of these approaches have their shortcomings. The paper by Francesco Ravazzolo and Shaun Vahey makes an important contribution in this regard by developing better methods to forecast inflation in the presence of large relative price shocks.

The flip side of the issue of how monetary policy should respond to oil and other commodity price shocks is the question of whether monetary policy is itself the source of commodity price fluctuations and other asset market booms and busts. For example, Taylor (2007) argues that deviations from the historical monetary policy rule fuelled the US housing boom earlier this decade. However, the papers in this conference suggest that such effects are relatively small. Jeffrey Frankel and Andrew Rose find no empirical evidence of effects of interest rates on commodity prices. Adam Cagliarini and Warwick McKibbin use a structural model of the global economy and show that while relative prices do respond to monetary policy, this channel cannot explain the magnitude of the wild swings in these prices over the past five years.

Finally, it is notable that all but one of the papers in this conference are purely empirical in nature. Of course, solid empirical research is essential to understanding these important issues. But, the design of monetary policy in the presence of relative price shocks also depends on theoretical concepts, such as the natural rates of output and interest, and the choice of which inflation measure to target. For example, the papers in this conference find that negative oil supply shocks lead to highly persistent decreases in real output in the United States, as well as the euro area, Japan and Switzerland. However, the empirical evidence does not tell us to what extent this decline reflects a reduction in the natural rate of output or an opening of an output gap. The effects of relative price shocks on natural rates are highly model-dependent. As shown by Natal (2009), with a Cobb-Douglas specification for household preferences and technology with respect to energy, the natural rate of labour hours is unaffected by a change in the relative price of oil. But, with a more realistic assumption of less short-run substitutability, the natural rate of labour hours falls in response to the shock. Similarly, Bodenstein, Erceg and Guerrieri (2008)

examine the optimal inflation rate to target in the presence of oil price shocks. Further development and synthesis of empirical and model-based research into these important issues is needed in order to inform the discussion of the optimal policy response to commodity and asset prices.

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3. General Discussion

The wrap-up presentations provoked debate on the role of speculation in the oil market and the role of monetary policy in responding to shocks to relative prices. Regarding speculation in the oil market, a number of participants doubted whether speculation had had a significant effect in driving the spot price of oil. First, it was suggested that if speculation played a substantial role, futures prices should predict future spot prices, but empirically this was not the case. Second, there is little evidence that inventories have increased to imply that speculation has contributed to the run-up in the price of oil. One participant suggested there is little evidence that large oil-exporting countries are attempting to manipulate the oil market through the adjustment of their inventories, that is, unexploited oil under the ground. Another participant noted that it is difficult to extend the speculative theory about oil price determination to other commodities such as natural gas that had also experienced a run-up in price. Michael Dooley responded by reiterating his argument that the interpretation of the results of existing econometric analysis was difficult because

the models supporting this work did not account for the strategic behaviour of the major oil producers.

A comment was made about the time scale of 2000 onwards chosen in John Williams' presentation of inflation expectations. It was suggested that it would be better if the analysis started in the early 1990s to be consistent with literature suggesting that the US Federal Reserve's implicit inflation target can be dated from then. John Williams agreed that the stability in long-run inflation expectations dates back to the 1990s. He remarked that the focus of his analysis was on the importance of the monetary policy regime and inflation expectations for both the direct and indirect responses of inflation to relative price shocks. He noted that the indirect response to changes in commodity prices appears to have become weaker over time and that it was important for policy to be designed to reduce indirect or second-round effects.

There was some discussion about the long-term view for commodity prices. One participant noted that real commodity prices had been falling since the 1700s, reflecting a long history of strong productivity growth in primary production relative to manufacturing. In this respect, the current experience was something of an anomaly. The question was whether productivity growth in primary production would reassert itself as the dominant influence, driving commodity prices back down. Michael Dooley responded by saying that whatever happened to the level of commodity prices, we should expect them to be more volatile given that structural change had made speculation in commodity markets easier. Even so, it was suggested that much like the shift from fixed to floating exchange rates, this extra volatility in relative prices would have only minor real effects. Another participant noted that, even if it were true that speculative activities have an effect on the price of commodities, fundamental factors would ultimately determine those prices.

There was also discussion on the evolution of monetary policy over the next half-decade as the global economic structure changes – in particular, how monetary policies should respond to global factors, such as those related to the emergence of China and India. John Williams suggested that, in the past, many US macroeconomists considered changes in global factors and the external environment to be of second-order importance, but he could see that this could well change in the future.