1. Executive Summary

OEF has regularly provided scenario assessments of the economic impact of a wide range of risks to the global outlook from financial market volatility to banking crises to country studies to threats arising from less economy-based disturbances such as earthquake damage and the impact of health scares like the UK's foot and mouth outbreak and Asia's SARS attack of 2003.

We began monitoring the avian flu outbreak in Asia in 2004 and have examined the possible consequences of a human flu pandemic. Clearly, the threat of a human flu variant developing from Avian flu is now serious and such a flu virus could pose a severe risk to human life. Even compared to previous scenario experience, the potential impact of a pandemic flu appears massive, should it occur in a virulent form. There are several key features of the economic scenarios that are worth highlighting especially as they may not be well covered in healthcare industry analysis. This commentary provides some indication of current analysis and the risk assessments made by OEF.

Key points are:

- Economic threats must be seen as substantial – and short-term costs in particular look likely to be larger than "healthcare industry" assessments might suggest.
- Importantly, the risks may be large even if actual case numbers are small – indeed panic alone might instigate a chain reaction in key sectors, especially travel and tourism, which would impose heavy economic penalties.
- Comparison with the SARS experience is useful here – but other historic comparisons may be of little help as economies have changed so much, becoming more sensitive to volatile demand factors, which most likely swamp the direct economic impacts on labour and loss of life in the short term.
- The sectors that would be most immediately impacted are those in which discretionary consumer spending plays the biggest role – travel and tourism and leisure activities, for example, where expenditure can plummet.
- SARS revealed the scale and speed of the consumer/tourist response to even a limited outbreak – Asia's economic losses were large with a loss in regional GDP of about $20billion in 2003.
- A flu outbreak would almost inevitably be global and this not only multiplies up the losses around the world but would add a large "trade multiplier effect" as well – so the costs would be more than a simple multiple of SARS.
- A likely minimum economic cost of a serious global pandemic flu outbreak would be some 1% of world GDP – about $400billion at current rates.
- Under reasonable assumptions over the duration, attack rates and mortality rates of a flu pandemic, the annual cost could easily rise to more than 5% of world GDP - representing losses of about $2 trillion per annum.

2. OEF Commentary on Avian Flu and Economic Impact Assessments

Avian Flu threats mount

Clearly in discussing the potential impact of Avian Flu we must distinguish between:

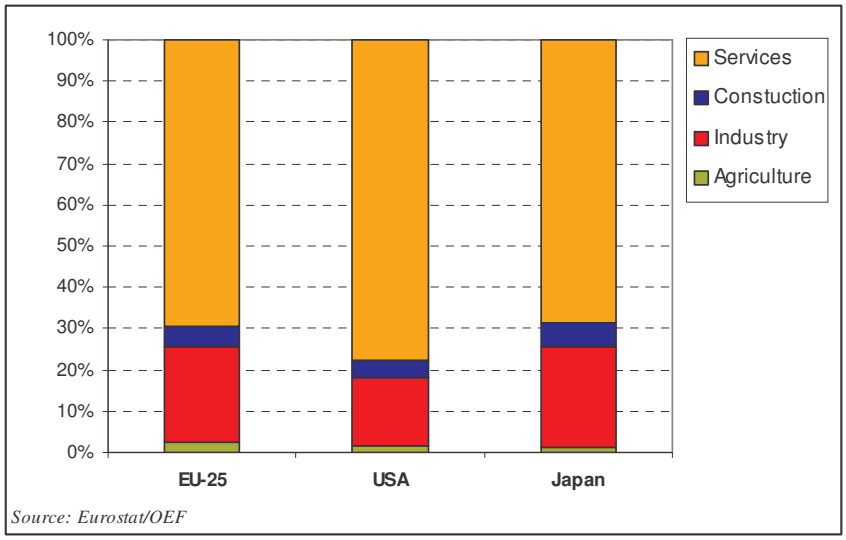
- Avian flu impacts based on bird flu rather than a human-to-human flu pandemic: these impacts are certainly not negligible given the scale of the poultry farming industry worldwide and likely agricultural trade disruption. This is especially onerous for less developed economies such as Turkey and Romania, as it has been for Thailand and Vietnam;
- Impacts on travel and tourism and other discretionary spending which can respond rapidly to any perceived threat: as we know from SARS, such economic losses can be very large even if human cases and death rates remain very low - and impacts could escalate sharply, either regionally or globally, on any visible sign of increased cases and deaths;
- A human-to-human flu pandemic with large numbers of cases and deaths: the potential scale of any such pandemic is unknown and cannot be accurately estimated even using historic evidence - the mortality rate is particularly uncertain but clearly critical in any assessment. However, the rise in the economic impact of increasing numbers of cases may not be linear – the impacts on global services trade and consumers are likely to be very heavy even on fairly low cases/deaths and these reactions alone may be enough to force a global recession.

Assessments made of poultry farming and associated losses across Asia so far already suggest a sizeable impact from bird flu over 2004-2005. Thailand is the most obvious example, with exports that had been worth some billion dollars per year now decimated. The generally strong economic performance over this period has masked the negative effects, however, and human cases have been rare. Outbreaks in Turkey and Eastern Europe will impact on rural economies in these countries although agriculture is not such a large part of the European economy as a whole (or the US and Japan, as shown in the chart below).

More critical for all countries is the potential impact on services, particularly travel and tourism, a global industry worth some $1.5 trillion, near 4% of world GDP. Unlike the impact of the SARS outbreak, bird flu has so far failed to threaten tourist perceptions and dent sector performance, although a number of other factors, notably terrorist threats, have damped enthusiasm in some parts of Asia. If the rising threat of a human flu outbreak starts to create a panic attack similar to that seen during the SARS outbreak, travel, tourism and leisure industries will all suffer another bad hit and this may include other continents as well as Asia.

A virulent human-to-human flu would inevitably spread rapidly around the world - few would doubt this (even if restrictions were quickly imposed on movements of people and goods). Numbers of cases as a % of the population (or “gross attack rates” to sound militaristic) could be substantial (anywhere from 10 to 50%) but, of course, the most critical factor would be mortality rates, which are guesswork at this point. Human flu cases in Asia have seen very high mortality rates – of the order of 50% - but most assessments of flu mortality rates suggest very much lower death rates (a “normal winter flu” death rate seems to be about 1 in 500 cases, for example).

Figure 1: Sectoral mix of the EU25, US and Japanese economies



How do we assess the likely numbers and costs of a human flu outbreak? We will look at some estimates available from previous OEF studies, for example on SARS (2003 and 2004 studies), and from other sources and attempt to provide some indication of the likely scenarios that may emerge.

The "classic" health study approach (for example Meltzer, Cox and Fukuda)

This type of assessment covers

- Health care type costs – usually in some detail – however, these are typically a very small part of total quoted "losses" (eg under 20%).
- Valuations of loss of life - the most important losses arise in these studies because they attribute a large value to each loss of life based on the discounted present value (PV) of lost income – this is not the same as an annual GDP loss estimate (although it is a valid costing for some purposes, especially insurance type assessments and personal views of the value of preventative measures).

This approach provides a quite detailed basis of assessment for health care costs but the largest part of the estimated loss is due to the figure used to value loss of life, which is not the same as an estimated GDP loss per annum. Compared to the annual GDP loss, the "loss of life" cost is inflated as it uses the discounted present value of "life time" earnings (cumulating future income losses). On the other hand, because other important economic impacts are not incorporated in such studies, the estimated "loss" might be considered too low. And it takes no account of the heavy economic costs that a panic might create even on very low numbers. To weigh up these issues we will examine the estimates provided.

Case numbers and mortality rates and comparison with "normal" flu

As Metzler et al provide a range of "scenario" estimates based on the % of population infected ("gross attack rates"), we can use these as a benchmark for assessing potential cases, deaths and costs.

However, firstly, we note that each year there are winter flu outbreaks and that UK assessments suggest a "normal" annual death rate of some 12000 people. Assuming a mortality rate of 1 in 500 cases reported (a death rate of 0.2 – in-line with averages implied in the Metzler study), this suggests about 6 million cases of flu reported per annum, a gross attack rate of about 10% of the UK population.

Applying these UK rates to the US (population about 6 times larger) implies a "normal" year might see flu deaths of 60,000 out of some 30 million flu cases (which coincides with the Metzler-based estimate for a 10% attack rate as indicated in scenario A in the table below).

The arrival of a "new flu" must therefore be put in this context. We will assume a "new flu" implies additional cases beyond the "normal" rate. The additional cases would have to be of the order of 10% plus of the population to be seen as sizeable and distinguishable from "normal" flu. There is also a significant chance that a "new flu" would have a higher death rate, serving to raise its profile versus the "normal" winter flu round.

UK scenarios	**"normal" winter flu**	**"new flu" outbreak**
Cases	**10% gross attack rate**	**20-25% assumed?**
	6m	**12-15m ?**
Deaths	**12,000**	**50,000 ?**
Mortality	**1 in 500 cases**	**1 in 250?**
Implied deaths as % population	**0.02%**	**0.08%**

UK officials have been quoting an estimated possible death toll of 50000 for a pandemic "human bird flu": this would imply a gross attack rate of more than 40% using the "1 in 500" death rate assumption – but if the mortality assumption is, in fact, about double this rate, then 50000 deaths might be based on an assumed gross attack rate of 20-25%. The latter estimate appears to be the basis of the UK assessment (and others) and applying a similar estimate to the US might indicate case numbers of some 60-75 million with around 300,000 deaths. This is a rather worse prognosis than that made by Metzler et al, which is based on deaths of about 150,000 for a gross attack rate of 20-25%.

Taking the figures provided by Metzler et al (and rounding these for convenience), we can roughly estimate the numbers for scenarios A, B and C in the table below.

Flu multipliers based on "health care analysis" (Metzler et al)			
Scenario	**A**	**B**	**C**
% of population infected (gross attack rate)	**10%**	**15%**	**30%**
For US (base population approx 300m)			
Cases	**30m**	**45m**	**90m**
Deaths (1 in 500 cases)	**60000**	**90000**	**180000**
Total Cost (*)	**$48bn**	**$71.5bn (0.6% GDP)**	**$143bn**
of which:			
Cost based on deaths only and	**$40bn**	**$59.5bn**	**$119bn**
Costs excl deaths (medical costs, days income lost etc)	**$8bn**	**$12bn (0.1% GDP)**	**$24bn**

(* in 1995 constant US$ terms, estimates from the Metzler et al study)

The estimate for a 10% gross attack rate is a proxy using the Metzler figures (which appear to be linear – that is if case numbers double, then other figures double too). Given the problem identified with the death valuation method used, it may be most useful to identify the "health care" costs assessed in Metzler et al, possibly applying these costs within an economic assessment based on the estimated loss in GDP per annum.

In addition, Metzler et al indicate costs for vaccination programmes based on assumed costs per vaccinee ranging from about $20 up to $62. To simplify this assessment, we could estimate that the cost of a full vaccination programme for the US (100% of population) might range from $20 per person to $100 per person, thus total vaccine programme costs would be of the order of $6bn to $30bn. These figures can be readily compared with the costs in the table above. In particular, looking at costs excluding death valuations, then even on this narrow measure of costs, vaccine programmes look attractive. Including sensible estimates of the annual GDP loss must make such programmes even more attractive on any cost/benefit analysis. Also on a personal or insurance-linked view of risks/benefits (and in this case using the Metzler style death valuations is appropriate), vaccines are relatively affordable and attractive, Private demand would be high in the case of a flu outbreak (or the risk of one). Clearly the problem here is not really the vaccine costs per se (and affordability) but their lack of availability. For a "new flu" type, a vaccine would not be immediately available and, even after development, supplies would need to be built up (suggesting rationing of treatments). In this sense, the Metzler arguments over vaccine cost trade-offs do not appear very relevant to the problem.

Annual GDP impacts rather than cumulative lifetime income losses

The economic costs of a flu pandemic should be assessed based on total GDP losses per annum although the Metzler estimates for the health care costs could be retained and used as part of the overall economic cost analysis. We especially highlight that GDP losses may be high even if case and death numbers are low or virtually non-existent (not a scenario covered by the Metzler-type analysis) as this high-profile risk impacts heavily on tourist and consumer sentiment in a similar fashion to SARS.

Although this may seem a harsh judgment, on an annual GDP basis, the direct "loss of life" impact on economies will not be very large, especially not compared to other short-term impacts. However, over the long run, we may assume that a loss in population of (for example) 1% may cause a loss in annual potential output and thus GDP in the range 0.5-1% per annum (depending on the flexibility of labour force participation rates, under-employment conditions in each country and the possibility of raising the productivity of remaining workers). Over the long term, these losses will cumulate to a similar figure to that quoted for the PV of loss of life quoted in the Metzler study.

If case numbers became substantial, there would also be an impact from workforce shortages in the short term, reflecting the percentage of workers off sick. Roughly, a 20-25% attack rate might imply an average shortfall of 1% in the labour force over one year (based on a disruption of about 2 weeks per case).

The dominant impact on GDP, however, will be demand-side reactions led by scared consumers. The threat of a serious contagious disease outbreak will rapidly lead to cutbacks in discretionary spending, particularly for travel and tourism and other leisure expenditure – which have all become much larger shares of GDP than they were 20-30 years ago (and a lot more than was the case during the Spanish Flu of 1918-1919). Short-term disruptions could create impacts worth several % of GDP, for which a recent indicator may be the SARS outbreak of 2003.

Alternative economic assessments

OEF's assessment of Asia's SARS losses pointed to a cost of at least half a percent of GDP (for the East Asia region), around $20 billion, with total business losses possibly running up to $60billion. Much of the loss was linked to a rapid decline in travel and tourism, a fast response sector that is now worth some $1.5 trillion per annum, nearly 4% of global GDP. Losses also rose sharply in leisure industries and retailing.

SARS was only a limited outbreak (in a few countries) in the second quarter of 2003 and the impact was thus quickly reversed in the second half of 2003. By implication, simply the plausible threat of a serious pandemic flu could damage economies by an average of as much as half a percent of GDP. An actual flu pandemic would probably last a minimum of 6 months (and may quite possibly stretch over two years, with recurrent waves, before dying out), with large case numbers. Mortality rates are only subject to speculation at this point but it is plausible to expect the rate to be higher than a "normal" flu outbreak.

It is therefore possible to consider a rough estimate of the costs of a fairly serious outbreak of pandemic flu as being a minimum of 1% of GDP in the first year – this is about the minimum impact that could be expected based on a pro rata extension of the SARS impact over half a year (rather than one quarter). For the global economy, this would imply a cost of almost $400bn, with about 30% in the US, 30% in Europe and 30% in Asia if cases were to be evenly spread.

An additional reason for costs to be higher in this case than simply the estimate based on multiplying up the SARS losses is that the more global the flu outbreak, the more this

escalates the trade multiplier effect of the initial demand losses. Multiplier effects are especially powerful in Asia because of the strong trade links and high share of trade in GDP (for both services and goods), therefore Asia may suffer the worst losses even if cases were to be widely spread outside the region.

Very severe reactions could cut virtually all global travel and tourism activity, implying an annualised global loss of some 4% of GDP from this sector alone (without accounting for obvious knock on impacts, via jobs and domestic spending etc). If attack rates were very high, consumer spending might suffer more cuts and there would be further impacts on goods trade and investment as well. Governments may attempt to offset some of these short-term reactions but policy changes tend to be lumbering and the scope might be constrained by financial pressures - and low versus the enormity of the task.

Given the losses estimated in demand and GDP, shortages of labour seem unlikely to be a concern or binding constraint even under quite heavy case numbers – firms would not need so many workers under such poor demand conditions. Increases in deaths might raise GDP losses in the short term, mostly due to the impact on sentiment and disruption effects. However, more importantly, higher death rates would curtail the GDP recovery over the long run, implying that *long-run cumulative costs* would be similar to the type of losses assessed by Metzler et al in the death valuations approach.

Global Flu multipliers based on OEF SARS-reaction estimates

	Global GDP loss	loss in current US $ bn
Minimum loss based on SARS comparison applied over 2 quarters of 1 year	**1%**	**$300-400bn**
Potential loss based on official estimates of cases/deaths Assumes 60-70% loss in services exports (includes most travel and tourism) and pro rata losses (based on SARS) in discretionary consumer spending	**4-5%**	**$1500-2000bn**
Impact of death rate in long term	**adds about 0.5% of GDP loss per 1% of of population lost on a per annum basis**	

The estimates quoted above are for the total global impact of a global pandemic. Clearly, if one region (say Asia) were more affected than another then losses would be skewed towards the most affected regions.

However, in examining economic costs per country, a major determining factor will be the scale of exports in GDP and more precisely the scale of tourism and other services exports in GDP (as the latter would be most immediately impacted while trade in goods is curtailed via all the demand impacts across the global economy).

In this sense, Asia is particularly vulnerable. Firstly, it is the area of origin of bird flu and likely case numbers in the area should a pandemic human flu break out might be large. Secondly because it has large tourism revenues and thirdly because overall exports are a large share of GDP. The impacts of SARS on economies such as Singapore and Thailand were large during the short SARS outbreak in spite of minimal cases numbers (none in Thailand) being seen here. In contrast, Malaysia and India appeared to get off lightly in 2003 with little perceived threat from SARS. In the case of a flu pandemic, cases would be widespread and virtually all countries would be touched.

Set against these estimates of substantial economic losses, vaccination programme costs and other treatment costs appear quite trivial but unfortunately these may not be available in time or may not prove useful/effective in the event of an outbreak. The twin problems of developing reliable, effective treatments and being able to produce such treatments quickly in sufficient numbers to rise to the challenge of a rapidly spreading infectious disease remain a serious challenge. It is the sense of impotence in the face of a potentially grave threat to the general population that particularly separates out pandemic flu from other classes of disease.

(FOR FURTHER INFORMATION ON THE SARS ESTIMATES, PLEASE REFER TO THE OEF REVIEW PAPER FROM 2004)