
B M O N E S B I T T B U R N S R E S E A R C H

An Investor's Guide to Avian Flu

SPECIAL REPORT
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Mike Miller, CFA

INTRODUCTORY COMMENTS

An investment research report on Avian Flu? I have to admit that this seemed like an odd idea to me. Worse, I was concerned that it might seem to be inflammatory on one hand, without meaningful investment implications on the other hand. Experience has taught me that extreme outcomes are rare; that forecasts based on consensus expectations are often more close to the truth than those based on outside probabilities. But investing involves more than forecasting the most likely outcome. Investing requires the consideration of all probable risks. While your investment strategy should largely reflect your base case forecast for the future, it should also be able to withstand the occasional shock to global financial markets.

A well thought out investment strategy process should reflect upon “what would happen if scenarios.” After all, making money in bull markets can be quite easy. But keeping your gains by avoiding imprudence will serve you well over the long haul. Imprudence in investing often reflects greed or carelessness. It also reflects the fact that most of us dismiss the risks that could lead to significant downturns in the value of the investment assets we own. As a result, investors can become too comfortable. It can become all too easy to let the risk level of your investment strategy creep higher by increasing equity exposure versus fixed income alternatives, employing margin debt, adding to lower quality, higher risk securities versus blue chip investments and becoming highly concentrated in a single sector (energy or financials?) or in a few stocks that have been major winners in your portfolio.

In my view, it is worthwhile to stop and consider an “outside risk” that might really impact your portfolio. The odds are that an Avian Flu

pandemic (or a flu pandemic based on some other flu strain) won't happen anytime soon. But it might. And investing is a long term game. We invest over a multiple decade time horizon. As a result, we must consider what could happen at any point during that investment journey. Don Coxé and Sherry Cooper discuss how a potential flu pandemic could pose a significant "outside risk" to the health of not only the population but also the equity markets and the global economy. They provide a well-documented thesis that health safety issues can from time to time conspire to undermine confidence.

With respect to assessing the odds of a flu pandemic, we are simply not epidemiological experts and therefore could not even begin to make an educated guess. Don and Sherry lay out the groundwork as to why there is a material risk related to Avian Flu spreading among humans. There is great uncertainty about the likelihood of this occurring. And I emphasize that we are in no position to suggest that it will occur; only that it is a risk. What I believe is less uncertain is that investor confidence is quite high today. Long term interest rates are very low. Risk premiums are very low for riskier assets like high yield corporate debt. Many investors are employing leverage either directly or through hedge funds.

If investor confidence were to plunge due to a flu pandemic, terrorism or a global financial crisis, I believe that many investors would curse themselves for having reached too far for modestly superior returns at the expense of taking on a significantly greater risk of loss of capital during a market panic. I recommend reading Don and Sherry's thoughts on this topic with an open mind and then taking the time to complete a risk review of your portfolio strategy. The aim in investing is not to avoid risk; it is instead to ensure that you are managing risk prudently in order to fulfill your long-term investment objectives. Market panics occur unexpectedly almost by definition. They occur because confidence has been undermined for any number of reasons. Whether the cause is the Avian Flu or something else entirely, it always makes sense to have a prudent degree of balance in portfolios to help you ride out the storms that can occur in investment markets.



Donald G. M. Coxe

GLOBAL PORTFOLIO STRATEGY

The Known Knowns, The Known Unknowns, And the Unknown Unknowns of H5N1: A Report for Investors

After months of researching the evidence that the disease called Avian Flu could be The Big One, we have concluded that investors could benefit from an up-to-date report about this threat to humanity and the global economy.

We have touched on the subject in the two most recent issues of *Basic Points*. Meanwhile the evidence that the world could be facing its first highly-lethal pandemic since 1918 has been accumulating rapidly.

There has been extensive coverage in the media, but most of that comes in the inside pages and talks of bird deaths in remote places in Asia or of great progress in developing vaccines. We have learned, from discussions with many investment professionals, that they tend to skip past these stories.

Moreover, even when the story makes Page 1, the reports tend, in our view, to give the reader a false sense of the nature of the risks.

Simply put, experts, including the World Health Organization (WHO), fear an outbreak of a lethal pandemic of flu. It could break out anytime within the next few months or years in Asia and spread across the world. They are adamant that the question is not if, but when. If the disease were as vicious as the Influenza Pandemic of 1918, deaths worldwide could reach or exceed 50 million, even if a successful vaccine were developed and distributed.

This would be the first pandemic since East Asia became integrated into the global economy. The new globalism that has become one of the

greatest sources of strength for the world's financial and commodity markets would become their greatest vulnerability.

This report summarizes the information available to date, and discusses the aspects investors should consider. It is structured according to Donald Rumsfeld's useful tripartite division of factors for analysis. It is not meant to be alarmist, making the case for prudence, not panic. We recommend clients read our work now, and then retain this publication against the possibility that reports from Asia suddenly tell of a breakout of a human epidemic of Influenza A (H5N1) there. (Asia already has a full-blown epidemic among birds—wild and domestic; if it is hit with a human epidemic, even in just one or two communities, then a global pandemic would probably be only days away.)

When that happens, financial markets could prove as vulnerable as unvaccinated humans.

We strongly hope this report will prove to have discussed a catastrophe that never happened, and that the experts' foreboding will prove to have been misplaced.

But, as Warren Buffett commented on his reinsurance companies' exposure to 9/11, one can't claim credit for being a Noah unless one makes provision for an ark.

Another reason we have chosen to publish this report is that we wish to encourage people in the business community to actively involve themselves in trying to convince governments, health care systems and the community at large to accept the inevitability of pandemics, to plan properly for the response, and then to spend the money needed to bring those programs to reality. Like earthquakes or terrorist attacks, the timing of pandemics cannot be accurately predicted. But the experts—WHO and leading public agencies and research organizations globally—are virtually unanimous that another is coming some time soon, and the world is woefully unprepared.

SARS—which was nowhere near as dangerous as a lethal flu—should have been a lesson about our vulnerability to new infectious viruses and the lack of resources in health care systems and the business community to cope with epidemics. Regrettably, the world relapsed quickly into complacency, and is almost as collectively unprepared now as it was when a new kind of flu ravaged Spain in 1918.

The New Killer Flu

The World Health Organization has officially certified that the disease known as Influenza A type H5N1 is now endemic among birds and animals in Asia. That means, WHO asserts, that for at least the next decade, there must be continuous monitoring, response and mitigation (control measures including education, vaccination, and changes to animal husbandry and food production). It also means that each outbreak must receive appropriate emergency response to prevent a global pandemic.

There are, to date, no vaccines proven to protect against this relatively new virus, and it is doubtful that standard vaccine manufacturing processes will be able to deliver a sufficient number of doses of any product that will be effective.

Only nine nations have the capacity to produce flu vaccine on a commercial scale. The US learned last year that it has to rely on foreign flu vaccine manufacturing facilities even for its annual production of flu shots. There is only one large-scale US plant, operated by Sanofi-Pasteur.

That facility is also working on the development of a new cell culture process for producing a vaccine for H5N1. This experimental technique would reduce the current total dependence on chicken egg-based vaccine production techniques that have worked quite effectively for fifty years. That process, which typically takes 4-6 months, can probably not be speeded up for a pandemic, and is dependent on the availability of sufficient supplies of eggs—which may not be the case in a pandemic.

Problem: H5N1 is a new kind of challenge, because it is up to 100% lethal for chickens—living and in embryos. “Normal” flu viruses, when injected into chicken eggs, produce antibodies that, when killed, are the bases for vaccines. Vaccine culture to H5N1 requires adapting the virus strains to grow in eggs, a significant additional hurdle.

The (potentially) good news is that Sanofi-Pasteur, operating under contract with the US National Institute of Allergy and Infectious Diseases, has progressed to the stage of testing a vaccine that offers promise. We shall not know if the vaccine is effective for several months, although the director of the Institute, Dr. Anthony Fauci, said last week, in an enthusiastic story carried on the front page of *The New York Times*, that the vaccine had passed preliminary tests and could be used in the event of a medical emergency. The next day, perhaps in response to criticism from some prominent epidemiologists, *The Times* ran an editorial that poured some cold water on its own report. “The rub is that the dose needed was so high that the amount of vaccine stockpiled and soon to be on order

by the federal government would protect only a few million people. That would be pathetically inadequate coverage should a pandemic strain of influenza emerge globally, endangering virtually everyone in its path."

"Health officials are nearly unanimous in warning that the mere development of an effective vaccine is no guarantee of success against a pandemic. One uncertainty is whether this particular vaccine, intended to combat an existing strain of avian influenza, would work against a pandemic strain that had mutated greatly."

"Another concern is that the current production capacity for influenza vaccine is so limited and so fragile that it can barely cope with a normal flu season...It will be urgent to develop new production techniques and a more robust industrial base....So keep your fingers crossed that no pandemic emerges for the next several years."

Dr. Michael Osterholm, director of the University of Minnesota's Center for Infectious Disease Research and Policy, author of recent articles in *The New England Journal of Medicine* and *Foreign Affairs* (whom we have consulted in the preparation of this report), said, in response to Dr. Fauci's announcement, "We're starting, from these results, with the amount of antigen needed to immunize a person standing at twelve times what's needed for a typical flu vaccination." He also raised doubt about the testing procedures, which concentrate on adults over 65 and children, who are at most risk from typical influenzas. "The H5N1 strain may not fit this pattern; mortality rates in the 1918 flu pandemic were highest in otherwise healthy adults," he noted. (See our discussion of that outbreak on p. 14)

The Known Knowns

1. Pandemics

A pandemic is an infectious disease that spreads across many countries within a short time, a sort of epidemiological form of instant globalism. It can be a catastrophic pandemic, such as the Black Death (1345-50) or the 1918 Influenza (now listed as Influenza A/H1N1), or a mild pandemic, such as the world flu pandemics of 1957 and 1968. Epidemics are local, or regional occurrences.

Pandemics have historically originated in East Asia and spread across the world in a process that can take years. Mortality statistics on past plagues are therefore subject to extensive revisions as historians try to reconstruct data from countries that kept few, if any, reliable statistics on the numbers of infected persons and the mortality rates.

The Black Death is now thought to have killed roughly one-third of Europe's population before retreating... to recur, with diminishing impact, on several occasions.

2. Flu Pandemics

According to Dr. Julie Gerberding, Director, Centers for Disease Control and Prevention:

"For an influenza virus to cause a pandemic, it must meet three major criteria: (1) possess a new surface protein to which there is little or no pre-existing immunity in the human population; (2) to be able to cause illness in humans; and (3) have the ability for sustained transmission from person to person."

She continued: "So far the H5N1 virus has met two of these three criteria, but it has not yet shown the capability for sustained transmission from person to person." That criterion is today, by our definition, a Known Unknown.

There are three types of flu virus, A, B, and C. Influenza has been around for as long as we have records. Hippocrates wrote of it 2400 years ago. Although no one is sure how it got its name, some believe that it was called influenza del freddo (the influence of cold) by Italians in the 19th Century, who noticed that the same sickness came each year with the cold weather.

Millions of people are infected with flu each year. In the US, despite large-scale vaccination, an average of 36,000 people die because of flu, or flu-related diseases. Those most at risk from these epidemics of "normal" flus are the very young and the elderly.

Scientists believe that three times in the past century influenza A viruses have undergone major genetic changes, resulting in pandemics—1918, 1967, and now.

3. The 1918 Influenza

Estimates on worldwide deaths from this catastrophe range all the way from 25 million to 100 million. Some experts believe it killed more people than the Black Death.

Estimated American deaths were 675,000, ten times as many as those killed in action in World War I. Of the American soldiers who died in Europe, roughly half perished from flu. Globally, the numbers of people killed were far more—perhaps seven times—the number who died as a direct result of the four years of the War.

The published projected average lifespan of Americans fell by 10-12 years in a few months.

The US mortality rate was roughly 2.5%, but rates in some countries abroad were far higher: India's was 5%. Even at that "low" American rate, it was 25 times deadlier than ordinary flu. (According to Gina Kolata, who published a book in 1999 on the 1918 Influenza, even at the low end of estimated deaths worldwide, it killed more than twice as many people in a few months as AIDS had killed through 1997. Historian Alfred Crosby says it "killed more humans than any other disease in a period of similar duration in the history of the world.")

It was known as the "Spanish Flu" because of how hard it hit Spain. Some epidemiologists believe that the virus originated in China, migrated, and then mutated into a potent new form at a military base in Kansas. It circulated in army camps in March and April, and rode with the troop ships to Europe. It was still a "mild" flu that sickened people for three days. In August, it re-emerged in mutated form as a lethal virus in Boston. In that form it swept around the world. It returned to Europe with the troop ships, which became known as Death Ships. Doctors called on President Wilson to halt troop shipments. He had caught the flu in its earlier, mild form, and refused to accept the appeals.

For those who think this was just a particularly nasty flu, think again. Patients' faces turned purple as they gasped for breath and coughed blood, while their feet turned black. They died in a form of drowning as their lungs filled with fluid. In his publications, Dr. Osterholm notes that the 1918 flu was particularly lethal for persons aged 20-40. Apparently, this is because those people have survived the childhood diseases and their bodies' immune systems are strong. This means, paradoxically, that their bodies are forced into a fatal overdrive when attacked by a previously-unknown disease. This brand-new pathogen unleashes "a classic immunologic storm...a cytokine storm...in 24 to 36 hours their lungs just become bloody rags."

In a cytokine storm, the autoimmune process runs wild, and the victim is, in effect, killed by his body's immune responses. The immunologically fittest die at a faster rate than the unfit. In pondering this information, we thought back to what we remembered of Boccaccio's description of the plague in Florence in his classic *Decameron*, published in 1350. He wrote, "But what gave this pestilence particularly severe force was that whenever the disease mixed with

healthy people, like a fire through dry grass or oil, it would run upon the healthy."

In America, Philadelphia was the hardest-hit city: out of a population of almost 2 million, almost 13,000 died—11,000 in October alone.

It was already killing people across the state when, despite warnings from health officials, the city went ahead with a big parade to promote sale of war bonds. Two hundred thousand people watched. The next day, 635 case of flu were reported, with 139 deaths. Within days, the city proclaimed an epidemic, ordering the closing of churches, schools and theaters. Because the supply of coffins was exhausted, hundreds of corpses were dumped into group graves. The Bell Telephone Company ran full-page ads asking subscribers to cut back on telephone usage because 800 operators—27% of its employees— were absent from work due to flu.

4. The 1976 Swine Flu "Fiasco"

When Private David Lewis died at Fort Dix, the autopsy disclosed that he had a particularly potent form of flu. Four other soldiers had been hospitalized, but they recovered.

It was identified as a form of swine flu. Doctors at the Centers for Disease Control considered the evidence, then went to President Ford with a call for mass inoculations. They were joined by America's star epidemiologist—Dr. Jonas Salk, of polio fame.

The President listened to them and prevailed on Congress to appropriate special vaccination funds. An emergency large-scale vaccination program was approved and implemented, with full backing from the drug industry and the medical profession. Forty million people got shots.

But the "epidemic" never happened, and the vaccination was halted.

Hundreds of those vaccinated developed serious neurological side effects, including the rare Guillain-Barre disease, and many of them, or their survivors, sued the government.

It turned out to be just another of Gerald Ford's hard-luck experiences in his brief term of office, and a contributor to his defeat by Jimmy Carter in what was (until 2000), the narrowest margin in a Presidential race of the century. Carter's choice as Secretary of Health, Education and Welfare, Joseph Califano, called it Ford's "fiasco," and that label stuck.

To this day, many prominent American and WHO epidemiologists speak with horror about the public rage against the epidemiologists' errors in 1976. Publicly, they warn about what could happen if the virus mutates successfully into a reprise of 1918, but are careful to point out that "there is no imminent threat." Privately, they express fear, but don't wish to put themselves in the position that the only way they can be sure of keeping both their public respect and their jobs is if the world is ravaged by a plague.

5. Influenza A (H5N1)

This virus was first identified in terns in South Africa in 1961. (The world is lucky it hadn't mutated into lethality, because no bird species travels further than terns—who migrate between polar regions.)

Until recently it was a virus that was present in birds and mammals, but it rarely killed them. Its first known infection of humans came in 1997, when it emerged in Hong Kong, killing six of its 18 victims. In response to effective crisis management by the Hong Kong government, the outbreak was halted, to re-emerge in 2003.

H5N1 is a zoonotic disease, which means an illness that is capable of moving from animals to infect humans. It originated with birds, moved to mammals, and began infecting humans after years of mutation. That process involves differing strains of virus reassorting their RNA through combining with each other within one host—"the learning process."

Reassortment is one reason why WHO worries about the implications of H5N1's infection of millions of migratory Asian birds: when they return south from Siberia, they will have the opportunity to mix with resident birds who are infected with a different form of the virus, raising the possibility of large-scale recombination to achieve the right structure of amino acid shells for highest virulence. To reach pandemic status, the virus would reassort with another influenza virus within a person, thereby learning transmission.

Perhaps the most highly-publicized case of mammalian death to date from H5N1 came from a zoo in Thailand, where 147 (out of 418) tigers died. Sudden large-scale deaths of members of a well-known endangered species guaranteed heavy media coverage.

But the tigers are a tiny percentage of the victims of H5N1.

This outbreak has already been serious enough to force the culling of 120 million birds in Southeast Asia in 2004. Such large-scale culling

is effective at destroying birds carrying the virus. However, East Asian governments give minimal or zero compensation to the luckless peasants whose flocks are destroyed. However successful this process may be at slowing the progress of the disease, it hardly operates as an incentive to report outbreaks.

Given the history of past pandemics (and SARS), WHO has long feared that the next lethal outburst would originate in Vietnam or China, where hundreds of millions of people live in daily contact with birds and/or pigs. Those animals have been the incubators of past killer viruses.

As Dr. Osterholm notes, "It is sobering to realize that in 1968, when the last influenza pandemic occurred, the virus emerged in a China that had a human population of 790 million, a pig population of 5.2 million, and a poultry population of 12.3 million; today, these populations number 1.3 billion, 508 million, and 13 billion, respectively. Similar changes have occurred in the human and animal populations of other Asian countries, creating an incredible mixing vessel for viruses. Given this reality, as well as the exponential growth in foreign travel during the past 50 years, we must accept that a pandemic is coming—although whether it will be caused by H5N1 or by another novel strain remains to be seen."

In its current form, H5N1 has achieved (as noted earlier in discussion of a possible new vaccine) a 100% mortality rate with chickens, and with some flocks of migratory birds. Previously, birds carrying a flu virus were mostly asymptomatic.

With the outbreak in May which killed migratory birds in the Qinghai nature reserve in China, the virus has expanded its geographic range with remarkable speed. Previously, it had been killing wild birds in Southeast Asia; in recent weeks, reports of migrant deaths have come from Kazakhstan, Tibet and Mongolia. The first Russian outbreak was in Novosibirsk, Siberia; since then, the virus has been moving westward toward European Russia.

According to *The Moscow Times.com*, Russia's Emergency Situations Ministry reported on August 10th that the number of deaths among domestic and wild birds in Siberia was just 15 overnight, compared with a total of 5,583 in mid-July. "The country's top epidemiologist, Gennady Onishchenko said it was too early to draw any conclusions. 'We would have been drinking champagne by now if it had been pinned down.'....There were also fears among veterinary officials that

migrating birds could take the virus to other countries. 'It is possible that they have already spread it' ...a senior veterinary official told Interfax. 'They fly not only over Siberia but along the far eastern coast on to the United States.'"



To date, few humans have been recorded as victims, although WHO is skeptical that Vietnam, China and North Korea have been scrupulous about identifying or reporting H5N1 victims. Since cremation is the preferred burial technique in those countries, WHO has obvious problems in assembling conclusive evidence through post-mortems.

To sum up the unsatisfactory state of scientific knowledge about Asian outbreaks: WHO lacks adequate evidence about WHAT number of people and animals have been infected, WHEN infections and deaths occurred, and WHERE they occurred, which is WHY epidemiologists fear the worst.

A typical WHO comment came from spokesman Peter Cordingly at the flu conference in Malaysia in July: "Billions would fall sick, billions more would be too afraid to go to work, leading to a collapse of essential services."

On August 5th, WHO reported that, of the 112 humans infected to date, 57 have died. (Press reports since then have increased the death count from Vietnam.) To date, China is virtually the only country in East Asia which has not admitted to any human infections. It has reported large-scale bird deaths and has denied reporters and investigators access to some remote regions where avian flu outbreaks have been reported.

Sustained human-to-human transmission has not occurred to date. There have been two cluster deaths—the first in Thailand in 2004, where an infected child may have communicated the disease to her mother and aunt, and, most recently, in a suburb of Jakarta, where three family members died. Initially, this looked like person-to-person infection. However, three other family members did not catch the virus. The victims appear to have been infected through exposure to chicken droppings in their backyard, although their family does not keep chickens.

There have been several international conferences this year about H5N1 risk. At each, scientists pled for rapid development of crisis response among participating governments, plus major increases in funding for testing costs, vaccines (human and animal), antivirals, culling, and health care providers. Needed changes to farming and food processing practices also require funding, to reduce what scientists call the "mixing bowl" problem where numerous breeds of animals are kept together in markets and sold live. The amounts pledged for these responses have been disappointing to WHO and to epidemiologists in other countries. They lament that it is much

easier to get governments and the public alarmed about ebola, West Nile Disease—or even meningitis—than a potential killer flu. It's too bad the authorities can't give it some Crichtonesque name that will arouse the populace to a new plague.

The Known Unknowns

Two years ago, SARS was the new disease that could threaten the world. It was first identified in rural China. When infected animals were sold and eaten by humans, it crossed the species barrier, spreading to five countries within 24 hours, and to more than two dozen countries within months. Sherry Cooper recounts the impact of that outbreak in detail.

A flu epidemic that had any resemblance to 1918 would make SARS look trivial. It would easily infect more people in an hour than all the victims of SARS, and kill twice as many people in a day as SARS killed in six months.

So SARS' effect on the global financial system is a useful starting point for investors in thinking about H5N1. What are the lessons? What should we expect?

1. Quarantining and Controls

Governments will not hesitate to impose quarantining, including requiring people who may have had exposure to the virus to stay within their homes, denying landing rights to planes and ships from countries where the disease is spreading, forcibly isolating people showing suspicious symptoms, banning concerts, parades and sporting events, and making businesses liable for enforcing such emergency rules on their staffs. The populace will accept restrictions as long as the initial panic lasts, but when the strains on the health care system and the economy become too painful, and new infections don't seem to be appearing, the populace resists government controls. Singapore is constituted to manage an epidemic: most other democracies, of all stripes, are not.

2. Financial Market Reactions

Because so few people actually remember the 1918 pandemic, and because it occurred against the backdrop of "The War to End All Wars," most people are unwilling to believe that "mere flu" could be lethal on a scale reminiscent of Black Death. That probably means that the stock market reaction would take a little longer to develop than if the pandemic were some supposedly more fearsome disease. That might be a window of opportunity for those who understood

the challenge H5N1 offered. WHO flatly predicts that stock markets would close once a pandemic was confirmed, but that forecast probably assumes a sequential response—with Asian markets closing first, and North American and European markets staying open until local business closures and soaring death rates precipitated panics.

What can we learn from behavior of financial markets in 1918?

Answer: very little.

“The War to End All Wars” was the overarching preoccupation for people in Europe and North America. Although flu infection and death rates were shockingly high on those continents, the overwhelming majority of deaths occurred in Asia, Europe and Africa, and most of those deaths went unreported for years.

That pandemic didn't hit at a time when international trade as a % of world GDP was at an all-time high, and when financial and economic information was instantly disseminated worldwide to investors who could trade stocks, bonds, commodities and currencies around the clock, around the world.

Nor did it hit at a time when just-in-time inventory management and global supply chains characterized all major economies—and all major manufacturing, transportation, distribution and merchandising organizations. The expansion of free trade in the past two decades both facilitated and drove this trend toward creation of global supply chains.

This wasn't the case in 1918. The world had experienced remarkable growth in free trade in the late 19th Century, but this had given way to a revival of protectionism and, in the case of Prussia, Austria and Italy, to a growing reliance on autarky. National self-sufficiency had become fashionable before the war, even in Britain. The US had a wide array of protectionist barriers in place to shelter its manufacturers and farmers from foreign competition.

Thus, flu didn't come to a world characterized by economic interdependence and economic cooperation, or to a corporate world prospering through internal transfers of goods and services across international boundaries.

Contrast that world with ours. The very strength that has made this economic recovery a global phenomenon able to integrate China and East Asia into its processes, with mutually reinforcing exchanges of goods, services and capital is our global Achilles heel. It makes the economy and financial markets more vulnerable should a pandemic that kills many millions across East Asia force quarantines and stock market closures.

The analogy that may be most relevant for our situation is the pattern of mortality statistics of the 1918 pandemic: according to historians, the physically healthiest demographic cohort—persons 20-40—had the worst mortality statistics, because its strength was its weakness in face of this new kind of pathogen. The healthiest sectors of today's global economy are precisely those most at risk from a pandemic.

Among the best-performing sectors in global financial markets in this millennium have been the commodity stocks, whose performance depends, in large measure, on continued economic strength in Asia, particularly China. A runaway pandemic would hit commodity prices especially hard. The combination of collapsing demand from China and India and the likelihood of a collapse in demand for housing and cars in the OECD nations would mean prices of base metals and steel would plunge, probably reversing their entire post 9/11 rally. Oil prices would also plummet, because of the ending of the China boom and because of the sudden reduction in the number of consumers in the OECD. There would be no rush into precious metals from other financial assets, if only because high global death rates would mean large scale estate liquidation of jewellery.

In 1918, few countries had anything that could be called a health care system. Health care was mostly a local responsibility, financed from personal wealth and public charity.

However, based on the evidence that flu overwhelmed American and Canadian hospitals and health care providers in 1918, (and on what SARS did to Toronto, as discussed by Sherry Cooper), the lack of meaningful surge capacity in health care systems worldwide would mean enormous economic impact in a new pandemic. Rates of both absenteeism and death would be sharply higher than should be necessary. Income and profitability of businesses of all kinds would suffer. Financial institutions would be under enormous pressure to sustain their services, due to employee absenteeism and chaotic financial markets.

Attendance at public events, such as theme parks, sporting events and movies would collapse—if not banned outright. Patronage in restaurants (particularly Asian-style restaurants), hotels and bars would plummet.

In one respect, our era would be better-positioned to manage a pandemic than the world of 1918: a surge toward internet-based merchandising among the bedridden and the merely scared would shift buying patterns. Staying indoors would be the course of prudence, and e-commerce would find millions of new users—if, that is, UPS, the postal ser-

vice and Fedex were actually able to maintain some acceptable level of delivery services during the pandemic.

Does that mean investors should assume technology stocks in general would be a haven?

The answer is surely "No."

Information technology and broadband equipment stocks would be extremely vulnerable, for at least three reasons:

First, they have high p/es and high betas and, in most cases, pay no dividends;

Secondly, they are heavily integrated into East Asian economies, particularly China and Taiwan, both as component suppliers and contract manufacturers, and are therefore heavily at risk from supply chain disruptions;

Thirdly, much of their sales growth has come from that region, so they share the commodity producers' problem that a severe economic contraction there would be severely painful for their top and bottom lines.

Soaring death rates would puncture the housing bubble and create vast housing oversupply. Apartment owners would slash rates to try to replace deceased tenants. As prices of houses and condos fell, the many millions who had bought their properties with little or no money down would default, exacerbating the rate of price decline. Based on 1918 experience, the effect would be most severe in the major cities, where infection and death rates would be higher than in smaller centers.

Tamiflu to the Rescue?

The only antiviral agent which experts think could save lives if H5N1 breaks out into pandemic is Tamiflu. An antiviral agent is not actually a vaccine, although it can prevent infection if taken prophylactically. It is, therefore, strongly recommended for persons traveling into a region where there are known flu outbreaks. If taken within the first two days after the first onset of symptoms, it reduces the severity of the disease. Already, the WHO has called on Roche, its producer, to supply 250,000 units for health care professionals worldwide. We understand Roche plans a major donation of pills. One possible complication is litigation brought against Roche by Gilead, the US biotech company which originally developed the drug and licensed it to Roche. (Gilead claims Roche has not done enough to promote Tamiflu). Roche produces the drug in one plant in Switzerland, whose output was doubled in 2004 and will

be redoubled this year. The extensive publicity about Tamiflu's unique efficacy has naturally created enormous pressure on Roche to expand its production.

Roche plans to start making the drug in as many as six US plants this fall. The US government has announced the goal of purchasing twenty million treatment courses of ten pills each. Another possible constraint on supply: if H5N1 breaks out in China, and the Chinese economy is disrupted, this could cut off shipments to Roche of a key ingredient in the manufacture of Tamiflu.

The Unknown Unknowns

Reading the extensive literature on pandemics, one is struck by how devastating they have been to the societies that suffered through them.

That doleful historical record raises questions about the viability of some political systems if a 1918-style influenza with a death rate somewhere between 1% and 50%—however temporarily—were to ravage Asia. Asia has no supply of vaccines, although China does have some stocks of Tamiflu. There was rage in China during the SARS troubles, because the regime exacerbated the effect of the disease through its cover-ups. A disease that was infecting thousands of people a day and spreading rapidly across the Asian land mass would, perhaps, give a new kind of challenge to the various kind of autocracies and limited democracies in Asia. Avian flu is, according to reports, spreading rapidly across North Korea as this is written, but it is unlikely that anything could bring down the Kim Jong Il regime.

China's regime might totter, but unless the populace concluded that their leaders had prevented control of the pandemic through their mendacity, it is likely that the Communist rulers would stay in command—of a noticeably smaller population.

If the disease broke out, how would the world allocate output of vaccine and Tamiflu, when all the companies who produce the precious products are headquartered in North America and Europe? Would the governments of the industrial countries whose factories would be working overtime to supply vaccines, antivirals, antibiotics, and masks permit those products to be exported?

Would currency values swing in response to perceived levels of infection and mortality among the nations with tradable currencies? Or would they respond more closely to perceptions about the impact on their

terms of trade of wild swings in supply and demand for differing kinds of goods and services?

We are making no recommendations on Gilead or Roche, or, for that matter, companies such as coffinmaker Hillenbrand. Governments could be under extreme pressure to prevent corporations from “profiteering” from catastrophe. Yesterday, in *Lancet*, the British medical journal, some Asian doctors called for stripping patents from Tamiflu, and from another antiviral drug, Relenza (made by Glaxo SmithKline) that they believe should also be stockpiled. We also make no recommendations on life insurance stocks, because the impact of a pandemic would vary from company to company depending on the nature of its reinsurance arrangements, and the percentage of its coverage sold under term contracts. There is, however, no doubt that life insurance share prices would be very vulnerable.

How long would it take for the pandemic to run its course? Since it would spread faster than any previous virus because of the level of airline, automobile, bus and ship travel in the world compared to earlier pandemics, perhaps it would run its course far quicker—like SARS. In previous pandemics, the virus’s lethality tended to decline as its rate of infection increased, as if it had “decided” that it was more efficient to keep its hosts alive than to kill them.

Conclusion

As this essay was being prepared, we were pleased to read, in the *Financial Times* of August 5th, an editorial “How to nip the flu pandemic in the bud.”

Here is an excerpt:

“The next few months will be critical for the battle to avoid what could be a cataclysmic flu epidemic, killing millions of young people and costing hundreds of billions of dollars in economic disruption...If the WHO is to stand a chance of success, there are two critical requirements. The first is that national flu surveillance systems work well—and countries do not suppress news of an outbreak, as China did with the early SARS cases...Secondly, prophylactic courses of Tamiflu, the only antiviral drug likely to work against the infection, must be given immediately to many thousands of people in the locality of the outbreak. Roche...is negotiating a substantial donation to the WHO..and with Tamiflu manufacturing facilities currently overstretched, filling the

international stockpile should take priority...Judging from the panic over SARS, a flu pandemic would have a devastating impact on the global economy. It must be worth investing in something that increases even modestly our chances of avoiding such a catastrophe."

In order to fight flu at home, we must collectively fight it abroad. "Homeland security" doesn't apply in pandemics, as the Europeans learned during the Black Death, and as Americans learned in 1918.

We present these observations in hope that they will contribute to public discussion about the wisdom of allocating meaningful levels of public funds to pandemic response. Dr. Osterholm cites a useful analogy: one reason nobody died when the Air France jet crashed at the Toronto airport was the swift and successful response from well-equipped emergency crews.

All that equipment and all those people have been maintained at great public cost, even though they haven't been needed on more than handful of occasions over many years. Was all that spending unnecessary during the years no jets crashed?

A pandemic will come sometime. If we are fortunate, it won't come before we have put the resources and systems in place to confront and control it.

When the Black Death invaded Europe, such central governments as existed had virtually no power to organize defenses against the plague. Each of the cities and towns was essentially left to its own devices. Religious rites, self-flagellation, execution of Jews and other desperate measures were tried. (Finding scapegoats seems to be a pandemic habit: German terrorists were widely blamed in America for the 1918 flu.)

In 1918, there were hospitals, nurses and doctors and care-givers.

Next time, we shall have antibiotics, antivirals, and maybe a vaccine. Beyond these pharmaceutical defenses, we shall have international, national and community organizations, and will be able to follow the global progress of the disease through the media.

Those resources are greater than what our forebears could muster.

But, then, there are more of us, crowded into much bigger cities, in a world where people traverse the globe in a day, bringing goods, services, information, capital—and, in some cases, viruses.

Y2K triggered a worldwide response, and the expenditure of more than \$100 billion. The business community, believing its own survival was

at stake, did everything the experts asked, based on those experts' appraisal of the risks. Maybe a significant proportion of that effort and expense was wasted, but the desired result was achieved—not even a glitch. Shouldn't the business community get engaged once again?

The 1918 catastrophe was over in months. Soon, the world had entered the roaring 20s, and from that sustained outburst of economic activity and a booming stock market, there were hordes of newly-rich people... and many of the Old Rich had become fabulously rich.

They were the lucky survivors.

This time around, it will not be necessary to rely on luck to protect the value of one's portfolio. Cash, put options on volatile stocks, high-quality bonds, and high-quality dividend-paying stocks of companies with minimal exposure to the risks we have described will be the best survival packs. They will provide the survivors of the pandemic with the capital to take advantage of the wide array of cheap assets that will—however temporarily—be available after the virus has joined its predecessors in whatever resting places the world has on offer.



Dr. Sherry Cooper

ECONOMICS

Pandemics, Panic, and the Global Economy

It is perilous to forecast the economic implications of an unprecedented event, though economists are obliged to do so. Fed Chairman Alan Greenspan instituted a Crisis Management Task Force nearly twenty years ago, and its members have never been idle. Be it financial market collapse and bankruptcies, such as the 1987 stock market crash or the Russian debt default of 1998, which led to the rapid demise of Long-Term Capital Management, or terrorism, war, the Asian financial crisis, corporate scandals, skyrocketing oil prices, political crises, and epidemics and pandemics, the Fed must be prepared. It sees itself as the keeper of the security and efficacy of financial markets worldwide, the lender of last resort for the world banking and financial system.

As a newly minted kid economist, I cut my teeth at the Fed under the auspices of Paul Volcker and two of his predecessors. The crises then were runaway inflation, the collapse of Continental Illinois and Drysdale Securities, the junk bond scandal and the ensuing Savings and Loan industry crisis, widening budget deficits, Jimmy Carter's capital controls, sky-high interest rates leading to a collapse in the housing, construction and agricultural sectors, the energy crisis and the freezing of Iranian assets in the wake of the hostage taking—just to name a few.

Today, public health officials warn of the possibility (or is it probability?) of an Influenza Pandemic now in its gestation period in the form of Type-A H5N1 influenza, better known as "bird" or "avian" flu. Some in the medical community suggest that the global network of public health organizations is in a state of "controlled panic".

Without assessing and evaluating the chances of a human pandemic in coming months or years, for we have no expertise to do so, and the scientific community seems to be relatively certain of its ultimate arrival; we will liken such a catastrophe to crises of the past to get a general sense of the economic issues that might arise. The bottom line is that a pandemic, even one meaningfully less virulent than the 1918 Influenza breakout (discussed earlier by Don Coxe), would have hugely disruptive effects. Depending on its length and severity, its economic impact could be comparable, at least for a short time, to the Great Depression of the 1930s.

The impetus this time would be the rapid spread of the disease and the panic that would ensue. The disruption in trade could be analogous to the Smoot-Hawley Tariff of 1930, but even worse given that the free flow of people across borders would no doubt be curtailed. The resulting collapse of the airline and land and water transportation industries, tourism and hospitality sectors, much of retail and wholesale trade along with essential imports and exports would be devastating, at least for some period. This would trigger foreclosures and bankruptcies, credit restrictions, and financial panic. In addition, whole swaths of the population would be unable to work—either because of illness, care giving or quarantine. Schools (and possibly, nursing homes) would close as young children and the elderly might well be particularly vulnerable to getting and spreading the disease. This would throw many able-bodied workers into care-giving status. Yet, if the experts are correct that this could be, as Don suggests, a cytokine storm, where those with the strongest immune systems are most likely to die, the bulk of the labor force in the 20- to-40 year old age range would be severely incapacitated.

Businesses would suffer the consequences of reduced labor at a time when the labor markets in at least the U.S. and Canada are fairly tight. Moreover, the insurance industry, in particular, would be decimated. Health care would be strained beyond the breaking point. Many acute care facilities are already woefully at overcapacity, especially in Canada. All public gathering places would close, as would mass transit and non-essential services (and even those would be stretched). Front-line health care and nursing home workers would be essential, and judging from past experience, many of them would be subject to infection and quarantine despite our best efforts at isolation, immunization and antibiotic protection.

Businesses would voluntarily quarantine a meaningful proportion of their essential staff at remote locations to have a stand-by team in case of emergency. Large cities with dense populations in residential, shopping and office space would be most harshly impacted. People would shun

high-rise office buildings and large condos, not because of terrorism; but, instead, because of nature's microbial attack. Stock piling of basic food, drug, water, energy and safety supplies would initially lead to shortages and skyrocketing prices (reminiscent of the run on duct tape and gas masks in New York City in the aftermath of 9/11).

But in relatively short order, the deceleration of almost all non-essential economic activity would trigger a rampant decline in spending. Then, deflation and high levels of "involuntary unemployment" would set in. Households would be unable to make their mortgage and credit card payments. Businesses, as well, would default on their debt. Loan losses at banks could rise sharply, at least temporarily, as financial institutions scramble to provide liquidity, alleviate or reduce credit burdens, and keep their trading and lending businesses going with severe labor shortages.

The poorest countries would be the hardest hit, because they have no advance preparations, effective public health teams, and available financial and real resources. China and India, with their 2.4 billion people, many of whom live in close quarters to animals and birds, would also be especially hurt. And, the impact of their decline would have devastating effects on the rest of the world. Today, these two countries represent around 35% of the world's population and boast the fastest growing economies in the world. They are directly responsible for the growth in other Asian countries, Russia, and Latin America, and definitely provide a boost to Australia, Canada and other commodity-producing countries. China is especially important because it is the number-one consumer of cement, iron ore, steel, aluminum, copper and coal, and the number-two consumer of oil, second only to the U.S. A major slowdown in China and the rest of Asia would lead to a decline in commodity prices, as Don suggests, and a huge disruption to the global supply chain.

In a world of just-in-time inventory management for material inputs, finished goods and labor, disruption at the ports, airports, borders and rail lines would quickly lead to empty shelves. Health care services, vaccines and antibiotics, masks and other protective materials would be in short supply regardless of price. Every sector and every business in every country would be affected.

Food chains and supplies would be disrupted as people in panic shift from animal foods to a more vegetarian diet (think of what BSE did to beef consumption). Not only would poultry and eggs be shunned, but so would pigs and other animals that could provide the conduit for disease transmission to humans. Thailand and China are major producers of exported chicken.

Panic-driven irrational behavior would follow. People would be constantly washing hands with antibacterial agents; would discriminate against Asians and Asian restaurants; be afraid to leave their homes; and obsess on the real-time Internet and media statistics regarding the latest numbers of cases and deaths. Think of the Florida hurricane coverage for a far more catastrophic event over a much wider land mass.

Flight to safety in financial markets would be a knee-jerk reaction. Initially gold, the U.S. dollar and U.S. Treasuries would benefit. Gold prices would rise and remain high for sometime, despite potential jewelry liquidation. We saw gold prices pop immediately after 9/11, and declined only after the immediate crisis abated. People would be concerned that the Treasury market would subsequently be vulnerable to massive selling by Asian central banks whose holdings, particularly in China and Japan, are enormous. These sales might arise as government coffers are drained in these regions and more money is needed for assistance and prevention. Interest rates, however, would ultimately fall sharply, as in the Depression, as deflationary forces take hold, economic activity would slow and credit demand would plummet. Credit risk premia would rise sharply, taking the spread between corporate and government bonds up meaningfully. Many who are now over-extended with debt would lose their homes and their businesses. The surging supply of houses and rental properties (as tenants and homeowners die or can no longer afford them) would burst the housing bubble.

As Don suggests, those who could protect their assets and hoard cash would ultimately benefit by buying real estate, farms, businesses and stocks at extraordinary bargains. This sounds rather callous, because the death toll could be so high, but those with liquid assets in the lead-up to the Depression were able to scoop up the property of those who were heavily indebted. A pandemic would be even worse in that many would avoid homelessness and soup lines having paid the ultimate price.

The psychological effects of the pandemic might even be longer lasting, though more difficult to quantify. Post Traumatic Stress Disorder (PTSD) would develop gradually after the first emergencies and could last for an extended period, even a generation. We have seen the first few years of this in the U.S. since 9/11/01 and we are only beginning to see it in the U.K. since 7/7/05. The Israeli population and no doubt neighboring Palestinians have suffered from PTSD for years. People lose confidence, become depressed, tired, irritable, sleep-deprived, more cautious and paranoid and the finger-pointing begins. Politicians and public officials lose their jobs, as the blame game ravages confidence and goodwill. Countries will turn against countries and become antagonistic towards international bodies like the UN or the WHO for not doing enough to

prevent or stop the pandemic. Personal liberties and freedoms might be at risk as governments restrain the movement of people; civil liberties would also be jeopardized by ill-founded aversions to Asians everywhere.

Traumatized children could suffer mental and learning problems. Adults would as well, and all will mourn the loss of loved ones, neighbors and co-workers. No one will feel safe, a phenomenon that was already kindled by terrorism and war. Businesses that support their affected workers and customers, as well as their families will be lauded, but many will be seen as uncaring and heartless. This will be a huge burden for many companies, especially smaller ones and those that have suffered very high mortality rates (think of Cantor Fitzgerald since 9/11).

People would stay closer to home, value family and friends, and basically 'cocoon' as we've seen so vividly in New York City.

The unemployed, self-employed and uninsured will look to governments for assistance. This will tax the resources of governments at all levels, and global agencies will be called on for help. The medical community worldwide will rapidly create Global Health Security Commissions, and huge amounts of money will be spent on prevention, detection, surveillance, and control—monies that should be spent before the pandemic, the sooner the better.

I'm sure, by now, many readers are thinking that I'm too shrill—a Chicken Little, or a Cassandra.

To be sure, I do not know if a pandemic will occur in the next few years. And, if there is one, I have no idea how severe or long lasting it might be. My comments thus far have been speculative and merely suggestive of what might befall us. The longer I think about this, the grimmer it appears. Certainly there would be winners, such as funeral homes and other 'death-related' businesses, some drug companies and private medical establishments; but they would be relatively few in number and relatively small in the economic scheme of things.

The experience of the recent past is a testament to the resilience of the global economy and global financial markets. Some sectors of the economy would rebound rapidly, but others would suffer more lasting effects.

I can suggest these effects because I have recently lived through a mini-test case of a health crisis—the SARS outbreak in Toronto.

SARS

By any standard, the SARS pandemic was quite moderate, but it sure didn't seem that way in the first two quarters of 2003. An estimated 8,097 people worldwide were infected in over 25 countries, of which 775 died, according to the latest statistics compiled by the WHO (Table 1). The estimated cost per Asian country is also shown in the table and amounts to over 5 percentage points shaved off of growth in this region. Combine this with the significant cost for Canada and you see that a comparatively short and limited pandemic with fewer than 1,000 deaths had a meaningful effect on economic activity and public well being for those countries involved.

TABLE 1
Total SARS Cases Worldwide

	Cases	Deaths	Change in GDP due to SARS* (ppts)		Cases	Deaths	Change in GDP due to SARS* (ppts)
Asia	7775	729		North America	279	44	
China	5327	349	1.05	Canada	252	44	0.60
Hong Kong	1755	299	2.63	U.S.	27	0	0.07
Taiwan	346	37	0.49				
Singapore	238	33	0.47	Europe	33	1	
Philippines	14	2	0.10	Germany	9	0	n.a.
Vietnam	63	5	n.a.	France	7	1	n.a.
Thailand	9	2	0.15	Sweden	5	0	n.a.
Mongolia	9	0	n.a.	Italy	4	0	n.a.
Malaysia	5	2	0.15	U.K.	4	0	n.a.
Korea	3	0	0.10	Spain	1	0	n.a.
India	3	0	0.04	Switzerland	1	0	n.a.
Indonesia	2	0	0.08	Ireland	1	0	n.a.
Macao	1	0	n.a.	Romania	1	0	n.a.
South Africa	1	1	n.a.				
Kuwait	1	0	n.a.	Australia/NZ	7	0	
Russia	1	0	n.a.	Australia	6	0	n.a.
				New Zealand	1	0	n.a.
				WORLD TOTAL	8097	775	

Source: World Health Organization, Brookings Institute, BMO Nesbitt Burns

* estimated

In Toronto, the SARS outbreak hit in two phases: March 13, 2003 to early April; and then, following a short respite, another bout of cases emerged in mid-May until early June. In July, health officials declared that the global epidemic of SARS was over, even though a few more cases in China were subsequently reported. In Toronto, the city was dramatically affected, yet there were only 252 cases and 44 deaths. Compare this to the devastation of previous pandemics and you see just how "minor"

this outbreak was. Even China (excluding Hong Kong) suffered “only” 349 deaths followed in number by Hong Kong at 299. Anything like the H5N1 pandemic many health officials are now predicting would make SARS look relatively trivial.

But, even before the WHO's terse advisory against travel to Toronto on April 23, 2003, the city was meaningfully impacted. On that date, the World Health Organization warned against all unnecessary travel to Toronto, Beijing and China's Shanxi province. These three locations joined Hong Kong and China's Guangdong province on WHO's list. The advisory virtually guaranteed that the damage would spill into an extended period of reduced tourism, travel, public gatherings, and general public disruption. Incoming and outgoing travel from Toronto plummeted, and already-beleaguered Air Canada—which on April 1 filed for bankruptcy—fell into even more dire economic straits. Pearson airport was empty, and my family living in Philadelphia and Baltimore wondered if I shouldn't leave, and certainly refused to visit. My son was in university in Boston, and the school recommended that all students from listed regions refrain from traveling home if possible. Certainly, if they did travel home, they weren't welcomed back without a 10-day quarantine period.

The news spread so broadly worldwide that many of our colleagues in Chicago, New York, and London envisioned an entire city of quarantined or mask-wearing residents. Business conferences and inessential business travel were cancelled. Elton John and Billy Joel scrapped their April 28 concert at the Air Canada Centre, just one among many concerts, sporting and entertainment events that were scratched. At least four major Toronto conventions were cancelled, which would have added more than 50,000 room nights for hoteliers. Miramax changed the filming location of the movie, “*Shall We Dance?*” starring Richard Gere and Jennifer Lopez from Toronto to Winnipeg. Toronto is a big movie filming town, but all such activity screeched to a resounding halt over the period. However, when the Rolling Stones had the courage to perform a benefit rock concert in the city, close to 450,000 people attended.

The tourism industry, Toronto's second largest sector, lost more than C\$500 million and 28,000 tourism jobs were obliterated. The Province of Ontario estimates a loss of over C\$2 billion in tourism, including lost income and jobs. Hotels in downtown Toronto sat two-thirds empty during the peak of SARS, which cost over C\$125 million for the hotel industry; according to the Greater Toronto Hotel Association, cancellations led to about C\$39 million in lost revenues in April 2003 alone. The hospitality industry generally suffered.

Tourism plunged in other cities across Canada as well, as many were afraid to travel anywhere in the country (although there were no known cases of SARS anywhere other than Toronto). The effects on tourism and travel lingered long beyond the last SARS case, despite a C\$10 million federal government mass-media campaign to promote Toronto, Ontario, and Canadian tourism in the U.S. and Europe. The number of non-residents entering Canada fell 13.4% in 2003 from a year earlier, and was down nearly 20% during the peak SARS period. The number of visitors has never really recovered from that episode, with non-resident travelers actually dropping a further 0.4% in 2004, and remaining below year-ago levels so far during 2005. Some of this can be attributed to the stronger Canadian dollar, but it might well also reflect the continued negative perception of Canada as a travel destination.

Mass transit was hit hard as people cut their usage of buses and subways. Attendance at museums, the zoo, theaters and restaurants declined sharply. Extracurricular activities at schools were sharply curtailed as were non-essential social, religious, and business gatherings. Many places of worship were empty and service station revenues were down.

There was also a run on face masks and anti-bacterial soap. Signs appeared in public washrooms giving instructions on how to wash your hands properly. Everyone glared and moved away in response to even a single cough.

More than 15,000 people were confined to their homes for 10 days of quarantine and many businesses, our bank included, sequestered a proportion of essential employees in their homes to be called on in the event of an outbreak at the office. Two teams were created—one at home and one at work—on the chance that the working team would have to be quarantined, which would occur if a single person were exposed to the virus. In suburban Markham, all 1,700 students in a high school were quarantined after one student picked up the disease from a parent who was a health-care worker.

But, by far, the highest tolls were on the health-care system, its workers, its patients, and its prospective patients. SARS was transmitted to Canada by an infected individual traveling on a flight from Hong Kong to Toronto. The prevalence of travel to and from Asia increases the likelihood of the spread of disease emanating in that region—such as today's bird flu. Canada has the largest percentage of Asian residents outside of Asia and Australia, and between North America and China, increasing business is conducted face-to-face. More than 7 million passengers were screened in airports across Canada, and those traveling from the Far East were particularly scrutinized, during the crisis.

Hospitals were initially caught off guard, which accounted for the spread of the first few cases of the disease as infected individuals were placed in double rooms, infecting patients and their families. The first case in the area was reported at Scarborough Grace Hospital on March 13. The patient did not have a travel history and had no history of contact with pneumonia. It was his mother who had brought the disease back from Hong Kong, and she died a week prior of an undiagnosed pneumonia. The hospital was forced to close on March 23. Frightened health care and other front-line workers were exposed to the virus. By the end of the epidemic, nearly half of the reported cases of SARS were among these workers (109 cases) and three of them died. Even so, the commitment and diligence of the hospital community was spectacular. Staff at all local hospitals were working at the very limits of their capacities.

In the span of 48 to 72 hours, hospitals were re-engineered; all hospital procedures were changed, but even so, data analysis, surveillance and infection control were later deemed to be inadequate. There just weren't enough people or systems in place to monitor all SARS-like pneumonias and properly investigate them.

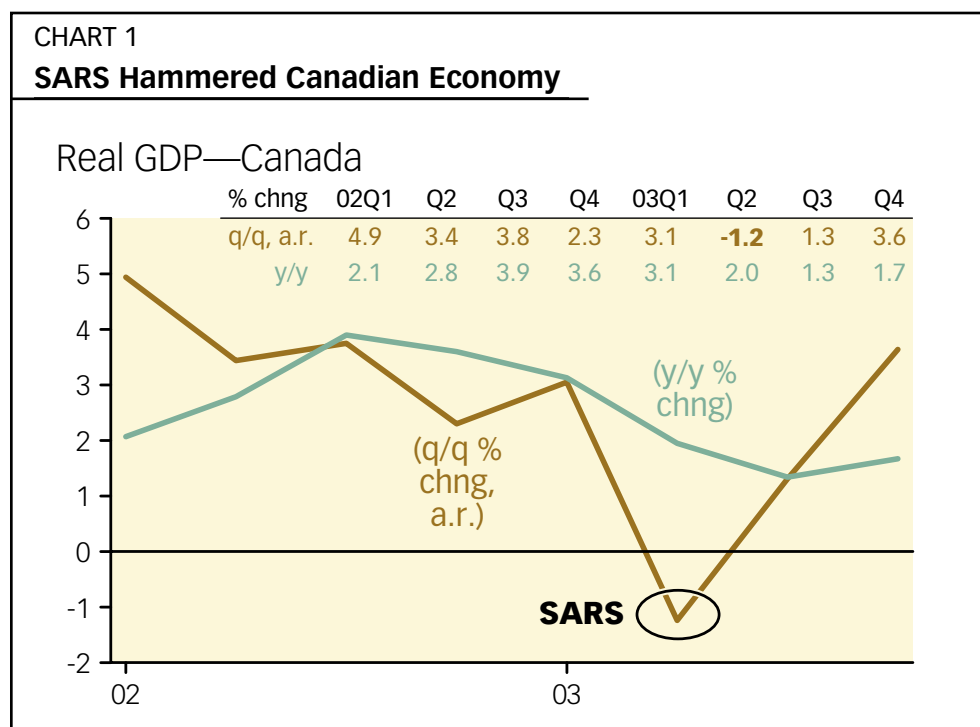
During the initial outbreak, patients were transferred from the epicenter at Scarborough Grace to all the major health facilities in Toronto. This essentially shut the hospital system down. There were huge backlogs and important surgical and medical care was necessarily neglected. Hospital visitors were prohibited except for intensive care patients, and those visitors had to follow strict quarantine rules.

Waiting lists for joint replacement surgery and other 'elective surgeries', which were already two years in length, got even longer. Horror stories of insufficient capability to administer chemotherapy and radiation treatment were numerous and many were forced to delay essential testing, biopsies, procedures and treatments. Those who could afford it sought care in the U.S.; while others were forced to wait. Emergency rooms were jammed with many routine, as well as emergency, patients. Family doctors and specialists were overwhelmed with visits and infection risk. Many people refused dental work and many dentists refused patients—again because of the risk of contamination. All doctors' offices required a hand wash with an anti-bacterial agent before and after service. Indeed, I visited a physician who had a sign on his door telling patients to go to the nearest emergency room if they had a dry cough or fever.

The estimates of the impact of SARS on Canadian GDP are difficult to decipher, as a number of other negative forces hit at the same time. The Canadian dollar rose sharply, as the Bank of Canada began tightening

while the Fed was easing. U.S. industrial production declined around this time, as manufacturing continued to slump and there was talk of outright deflation. The slowdown in U.S. economic activity hit Canadian exports, and net exports in Canada dropped significantly in the second quarter. As well, the Iraq war and a single case of BSE in Canada were other contractionary factors.

The Bank of Canada estimates that the most severe economic impact was in the second quarter when GDP growth fell from 3% in Q1/03 to -1.2% in Q2/03. Its estimate is that SARS cut second quarter GDP by 0.6 percentage points (Chart 1). Moderate as this estimate sounds, the effect in Toronto was significantly more dramatic, as Toronto represents about 15–20% of overall Canadian economic activity.



SARS in Hong Kong

The negative economic and social effects on Hong Kong were even more dramatic, as it suffered 7 times as many cases and fatalities as Toronto. Medical staff was also hard hit, with 386 cases and 6 deaths. Hong Kong and other adversely affected Asian areas underwent cancelled business trips, the collapse of the tourism and ancillary sectors, and falling stock prices. Locals stayed home and hotels and restaurants in Hong Kong and Singapore regularly were more than half empty, if they were open at all. Food prices across Asia tumbled as restaurants cut down on purchase orders, leaving the region's farmers and fishing fleets high and dry.

Roughly 50 restaurants in Hong Kong closed temporarily; retail sales dropped an estimated 10% to 50%, depending on the store. Those that catered to tourists were hardest hit. Cathay Pacific Airways estimated its loss per day at US\$3 million, as cancelled flights rose from 10% in late March to over 40% in mid-April. For Dragon Airlines, the flight schedule was cut by 48% over the peak period of SARS infection. Mass transit revenues fell by between 10% and 20%, depending on mode, the Cinema Association reported a 47% decline in revenues in March, and the Hong Kong Convention and Exhibition Centre lost millions in cancelled bookings.

Fear and panic subsided quickly, as it did in Toronto, once the outbreak was under control, and the Hong Kong economy rebounded rapidly. Real GDP growth for 2003 turned out to be 3.1%, better than feared, but was still an estimated 2.6 percentage points below what it would have been without SARS. Hong Kong fared better than Toronto in the revival of business and tourist travel. The number of visitors returned to normal levels by August 2003, a clear indication of the importance of the region.

In the United States, transpacific travel was down 40% during the peak of the outbreak from year-before levels. Chinatowns in San Francisco and other cities became ghost towns. And all this was without a single American death and only one European death.

Conclusion

It is for others to decide the likelihood and severity of the next pandemic. What Don and I have concluded is that the economic and societal effects of a pandemic, even a moderate one, are so severe that businesses and consumers need to join the medical and scientific community in creating a crisis prevention and management plan. Investors and business leaders must be aware of the risks and factor them into their strategic planning. As the story moves to the front pages and headlines of news broadcasts, panic might well ensue. If this is real, waiting for the spread of disease from human to human will be too late.

If nothing else, we hope to raise the consciousness of citizens around the world in an effort to support the urgent endeavors of the public health and medical professionals. Governments must take the lead in providing funding to all regions of the world, particularly the poorest nations of Asia. In today's world, the economy is borderless and so are public health and terrorism risks. Forget the 'each-man-for-himself' psychology of protectionist and anti-globalization rhetoric. Like it or not, we are all in this together, and we are all dragged downward by the weakest links.

BMO Nesbitt Burns Disclosures

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