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# **SYNCHRONIZATION OF RECESSIONS IN MAJOR DEVELOPED AND EMERGING ECONOMIES**

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# Synchronization of Recessions in Major Developed and Emerging Economies

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## **Abstract**

This paper examines various measures of synchronization of recessions, including clustering of the onset of recession across economies, proportion of economies in expansion and the diffusion index of international coincident indexes, and shows that the recent global recession was possibly the most concerted in the post world war period. Factors that contributed to the synchronization and severity of the recession, such as trade and financial linkages and timing of policy actions, are analysed.

## **Acknowledgments**

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## 1. Introduction

With the U.S. economy experiencing its worst post-war recession beginning December 2007, the global economy experienced the most synchronized recession on record. The breadth and depth of this remarkably concerted global recession was a reflection of increased globalization and strong global interdependence amongst economies, in terms of both their financial interconnections and trade linkages. The trade linkages, in fact, greatly amplified the transmission of the global recession to the export-oriented economies due to declines in consumer demand the world over, but especially in major developed economies such as the U.S. and Japan. The simultaneity of the worldwide downturns due to the trade linkages was further exacerbated by a financial market crisis that not only led to a severe abatement of trade flows but also resulted in major financial imbalances. The upshot was that the economies of virtually all major developed countries shrunk rapidly, along with many export-dependent developing economies.

This includes China, which experienced its worst downturn in nearly two decades, with over 20 million migrant workers reportedly having lost jobs by late 2008. India too experienced a sharp slowdown in the midst of the severe global recession. It is noteworthy, however, that both China and India did not experience a recession, but a milder counterpart called a slowdown, meaning a downshift in the pace of positive growth in economic activity. A recession, on the other hand, would have been more severe, involving a vicious cycle of pronounced, pervasive and persistent cascading *declines* in output, income, employment and sales, which both countries escaped.

Before the spread of the global recession, the belief was that while the U.S. economy would go into recession, the rest of the world – especially Europe, China and India – would decouple and escape relatively unscathed. Historically, however, even a slowdown in U.S. economic growth has significantly damaged growth in European exports. In fact, this time around, there were actual *declines* in consumer demand, especially in major developed economies like the U.S. and Japan, and the ripple effects spread the world over. This was further compounded by the global financial turmoil. Additionally, oil prices skyrocketed in the middle of 2008 and the resultant jump in headline inflation misled a number of central bankers into raising interest rates at a time when the economic conditions were already contractionary. For instance, in Europe, the European Central Bank raised interest rates in July – at a time when every significant Eurozone economy was already in recession. The

tightening of monetary policy in China and India also took its toll in the form of significant slowdowns in economic growth that followed some months later.

Thus, the decoupling hypothesis was clearly demolished, resulting in an unusually synchronized global recession. While the onset of the recession in the U.S. was in December 2007, the recession intensified significantly in the U.S. in the second half of 2008. The subsequent financial market mayhem worsened the economy's outlook further, triggering dramatic cutbacks in U.S. consumer spending. This virus spread across the global economy, aggravated further by the untimely contractionary monetary policies in many economies. While the cyclical coupling of international industrial growth due to trade was not a new phenomenon, the spike in global commodity prices in the first half of 2008 hurt consumer spending worldwide while also triggering rate hikes in many economies including the Eurozone, China and India, whose lagged effects further damaged growth later in the year. Meanwhile, the popularity of cross-border financial investment – especially between Europe and North America – meant that the U.S. credit crisis spread like wildfire in western countries. The credit crisis also resulted in a sudden evaporation of trade finance, as it became virtually impossible to obtain letters of credit, which are the lifeblood of international trade, especially for developing economies. No wonder this was the perfect storm, resulting in the most synchronized global recession on record.

This paper is organised as follows. Section 2 discusses various ways to measure the synchronization of recessions and applies these to the current global recession. Section 3 examines the nexus between trade and the global crisis. Section 4 focuses on the role of financial integration in the global recession. Section 5 comments on the timing of stabilization policy in the current global recession, and the ensuing section concludes the paper.

## **2. Synchronization of Recessions: Measures**

The severity of a recession<sup>1</sup> is measured in terms of its diffusion, depth and duration. In the context of international recessions, diffusion is the extent to which the recession has spread to different economies. Diffusion of a recession thus refers to how concerted the

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<sup>1</sup> A *recession* is a vicious cycle of pronounced, pervasive and persistent cascading declines in output, income, employment and sales, eventually giving way to an *expansion*, which is an analogous virtuous cycle of rising economic activity. Sometimes, an economy exhibits not a recession but a milder counterpart called a *slowdown*, meaning a downshift in the pace of positive growth in economic activity. The transitions between the vicious and virtuous cycles are the *peaks* and *troughs* in the cycle, also known as cyclical *turning points*.

global recession is. We therefore analyse the diffusion or synchronization of a global recession.

The synchronization of a global recession can be gauged by the following:

- ◆ Clustering of start of recession dates
- ◆ Proportion of economies in expansion
- ◆ Diffusion Index of the coincident indexes<sup>2</sup> of various countries

#### ***Clustering of start dates of recessions***

The Economic Cycle Research Institute (ECRI) has tracked 19 countries over a long period of time. These include the following: U.S., Canada, Mexico, Germany, France, U.K., Italy, Spain, Switzerland, Sweden, Austria, Japan, China, India, Korea, Australia, Taiwan, New Zealand and South Africa. It has also recently added Brazil to its list.

ECRI has now established the recession start dates for almost all the economies it tracks that were recently in recession<sup>3</sup>. Table 1 on Business Cycle Chronologies provides recession dates for the countries covered by ECRI, using the same approach used by the National Bureau of Economic Research to determine the official U.S. recession dates. This dating reveals an interesting sequence. Italy led the way, entering recession in August 2007, followed by New Zealand in November and the U.S. in December 2007. In February 2008, Japan, Taiwan, France and Spain fell simultaneously into recession, followed by Germany and Sweden in April, U.K. in May, Korea in July, and Brazil in September 2008.

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<sup>2</sup> *Coincident indicators* are those that move reliably in step with the economy, so their peaks and troughs roughly coincide with those of the economy itself. A *coincident index* for a particular economy comprises various coincident indicators that collectively represent the current state of the economy. It indicates whether the economy is currently expanding or is in a recession. It is a summary measure designed to track fluctuations in aggregate economic activity that make up the business cycle. Thus a coincident index can be used to decide the phase of the business cycle the economy is in at a given point in time. The index can therefore be used to help determine the timing of recessions and expansions as well as speedups and slowdowns in the economy.

A *classical business cycle* measures the ups and downs of the economy, with absolute levels of coincident indicators entering the coincident index. A *growth cycle* traces the ups and downs through deviations of the actual growth rate of the economy from its long-run trend rate of growth. *Growth rate cycles* are simply the cyclical upswings and downswings in the growth rate of economic activity. Since the growth cycles require determination of the trend in the time series, this analysis is less than ideal as a tool for monitoring and forecasting economic cycles in real time. We therefore use the classical business cycles and the growth rate cycles.

<sup>3</sup> The timing of recessions and expansions of business cycles is determined on the basis of a careful consideration of the consensus of cyclical co-movements in the coincident indicators that comprise the coincident index. (Details are described in Dua and Banerji, 1999, 2004, 2007). A specific cycle, that is, a set of turning points for each series, is obtained. A *reference cycle chronology* is then determined based on the central tendency of the individual tuning points in a set of coincident economic indicators. A reference cycle based on the levels of the coincident indicators thus gives the consensus of turning points of the coincident indicators. The reference cycle derived from growth rates of the coincident indicators gives the highs and lows of the growth rate cycle. This dates the slowdowns and the speedups in economic activity.

The dates for the onset of the current recession in various economies imply that the vast majority of economies went into recession before last fall's market mayhem. These dates also highlight the reality that the global contraction was highly concerted and that the decoupling hypothesis had been misguided.

To represent the closeness of the start of recession dates in a graphical manner, we examine ECRI's 20-Country Composite Coincident Index, shown in Figure 1. Although only the main economies are shown in the figure (for the sake of clarity), it clearly reflects how closely the recessions are clustered in this global downturn, as compared to the one in the early part of this decade.

### ***Proportion of economies in expansion***

The number of economies in expansion as a proportion of the total number of economies tracked is another measure of the diffusion of a global recession. In a widespread global recession, the size of the decline in the proportion of economies in business cycle expansions measures this extent of diffusion.

Using this measure, Figure 2 shows that the proportion of economies (tracked by ECRI) in expansion plunged to its lowest reading on record. This therefore demonstrates that the recent recession was very widespread.

### ***Diffusion Index of the Coincident Indexes of Various Countries***

The Diffusion Index of ECRI's coincident indexes for various economies measures the proportion of the coincident indexes that are higher than they were three months ago.

The top portion of Figure 3 shows the proportion of the coincident indexes for the Group of Seven (G7) economies (U.S., Japan, Germany, France, U.K., Italy, Canada) that were higher at each point in time than they were three months earlier. The G7 diffusion index touched zero in late summer, 2008, meaning that every one of the seven economies was contracting. Thus the recessions in the major developed countries were as concerted as they were in the mid 1970s and early 1980s.

The bottom line in Figure 3 shows the 19-country coincident index diffusion index, which is the proportion of the coincident indexes for all 19 economies monitored by ECRI that were higher at each point in time than they were three months earlier. This diffusion index paints a slightly different picture and shows that it was at its worst reading in the recent recession. Nevertheless, it was not as low as the G7 diffusion index, possibly due to the positive impact of economies with higher trend rates of growth such as China and India.

All in all, the three measures of diffusion of a global recession convey that the recent global recession was the most concerted at least in the last three decades or so.

We now examine how and why this happened given the increased trade and financial interdependencies across the globe.

### **3. Trade and the Global Crisis**

The world's economies have become increasingly interdependent since the early 1990s, with greater openness in the flows of services, capital and trade – especially in merchandise – from one country to another. For instance, in recent years, global merchandise exports have accounted for over 20% of world gross domestic product (GDP), compared with about 8% in 1913 and less than 15% as recently as 1990. Furthermore, the emergence of China and India has advanced the integration of the global economy.

Figures 4a through 4c show exports as a percentage of GDP in major economies. While the proportions vary country to country, it is clear that the importance of exports as a percentage of GDP increased sharply in the early 1990s in almost every country. This is consistent with the intensification of globalization.

In the Asia-Pacific region (Figure 4a), exports as a percentage of GDP in Taiwan advanced to almost 70% from 40% in 1990, while in Korea it tripled to over 60% from 20% in 1993. Exports as a percentage of GDP in China more than doubled to 33% from 15% in 1990, while it tripled to 21% from 7% in 1990 in India. In Japan, it doubled to about 16% from 8% in 1990.

In Europe (Figure 4b), exports as a percentage of GDP in Germany doubled to 50% from 24% in 1991, while increasing to about 30% from less than 20% in the U.K., France and Italy.

In North America (Figure 4c), the proportion of exports over GDP increased from 25% to almost 45% in the 1990s before slipping back in Canada. While tripling to 30% from 10% in Mexico, it rose to 12% from 8% in 1990 in the U.S.

These enhanced trade linkages served as a more efficient mechanism for the transmission of business cycles across the globe. With many countries in simultaneous recessions, the hit to exports was dramatic. Figure 5 presents the performance of total export growth for the 30 member economies of the Organization of Economic Cooperation and Development (OECD). Shaded areas represent global recessions, which correspond roughly to cyclical downturns in ECRI's 19-Country Coincident Index.

It is clear from the figure that in the world recessions of 1973-75, 1980-82 and 2001, export growth plunged well below zero, as the actual level of exports declined. However, the severity and rapidity of the recent drop in world exports is unprecedented. As of January 2009, this measure had deteriorated to levels far below those seen in previous world recessions.

Clearly, trade is increasingly serving as a primary method of international transmission of business cycles. We now analyse this mechanism for the spread of the global recession.

### ***The Bullwhip Effect***

The underlying transmission from trade linkages to the spread of the global recession and increase in its intensity as witnessed lately can be explained with the help of a very simple story uncovered more than 50 years ago in a study of the shoe, leather and hides sequence by Ruth Mack (1956), a business cycle researcher at the NBER. The mechanism holds just as well today as it did half a century ago.

When Mack did her study, shoes were expensive products that consumers replaced only in good economic times. But if they felt financially insecure, they got their shoes repaired and postponed the purchase, meaning that shoe demand was moderately cyclical. Shoemakers caught with excess inventories of shoes and shoe leather when consumer demand growth started to slow would cut back on production and on orders for leather, meaning that a *slowdown* in shoe demand would translate to an actual *decline* in the demand for leather, which is made from cattle hides. In turn, this would trigger a sharp *plunge* in the demand for hides.

Mack's study showed how small shifts in demand growth at the consumer level were amplified into big swings in demand as orders moved up the supply chain away from the consumer. This magnification of even small shifts in consumer demand growth up the supply chain is called the *Bullwhip Effect*, because a little flick of the wrist produces a big arc at the end of a bullwhip. In fact, scientists have shown that the "crack" of a real bullwhip is the sound of its tip breaking the sound barrier while travelling at over 1,500 km/hour!

Applying this sequence in the current scenario to China, one can say that its role as the "world's factory floor" implies that even a relatively modest downturn in consumer demand in the developed economies can potentially trigger a significant industrial downturn in China. Because consumer demand in the developed economies saw its first serious downturn since China's emergence on the global economic stage, it triggered a major industrial downturn in China.



Matters were even worse for suppliers further up the supply chain from China – not only neighbouring economies that supply components for assembly in China, but also the suppliers of commodities, such as Australia, Canada and the oil-producing economies. Because the supply of commodities does not adjust quickly enough to the sort of plunge in commodity demand suggested by the Bullwhip Effect, we always see a dive in commodity prices during global industrial downturns. The unusually large decline in U.S. consumer demand this time also led, via the Bullwhip effect, to a plunge in German and Canadian exports.

In sum, the Bullwhip Effect amplifies downturns in consumer demand because even a small slowdown in consumer demand growth results in an unexpected inventory buildup escalating up the supply chain. The upshot is a much larger plunge in global industrial growth and an even more vicious nosedive in commodity prices. In practice, even the best supply chain management systems in use today cannot cope with the Bullwhip Effect, because they lack the advance warning of turns in the cycle that only good leading indicators of consumer demand can provide.

When demand drops, manufacturers cut production as they race to slash inventories, but once the inventories are sufficiently reduced, production rises closer to the level of consumer demand. Furthermore, when the rate of decline in consumer demand eases, the supply chain is once again caught by surprise, and has to readjust. In other words, *slower decline* in consumer demand typically translates to a rise in commodity prices and industrial growth. This reversal of the Bullwhip Effect accounts for some of the “green shoots” seen around the world in recent months.

Figure 6 helps us to understand Mack’s study in the real economy and shows why the global industrial sector was so hard hit by the Bullwhip effect. The top line depicts growth in U.S. consumer spending on goods, and the second line is growth in the Global Industrial Production Index for the 30 OECD member economies plus Brazil, Russia, India and China, while the third graph represents the growth rate of the aggregate exports of capital goods for the U.S., Germany and Japan.

It is evident that small shifts in spending growth cause larger swings in global industrial growth, which in turn lead to greater declines in demand growth for capital goods. For instance, in the 2001 recession, growth in consumer spending fell but stayed mostly positive, i.e. consumer spending continued to advance, but at a slower pace. However, global industrial growth went into a more pronounced downswing, turning clearly negative. Finally, export growth for capital goods plunged sharply to almost -20%.

In the recent global recession, both consumer spending growth and global industrial production growth dived deep into negative territory, causing capital goods export growth to plummet below -65%. Thus, the economic and financial crisis that struck the U.S. economy, along with the Bullwhip effect, brought on a sharp global industrial downturn.

We now elaborate on the financial linkages.

#### **4. Financial Integration and the Global Recession**

Increased cross-border financial flows and financial innovation, coupled with the reduction or elimination of capital controls, have resulted in a highly integrated world economy. These dynamics have served as catalysts for the broad transmission of business cycles beyond national borders. It is notable that the U.S. financial crisis, triggered by the plunge in the value of securitized subprime mortgages and exacerbated by the onset of recession in late 2007, reverberated around the world because these financial instruments were owned by investors globally. In this context, it is also noteworthy that in the fourth quarter of 2008, foreign entities owned almost nine times the amount of U.S. credit market instruments as they did in 1990.

International financial institutions were among the hardest hit. In the U.S. and Europe, a number of banks needed capital infusions to stay afloat. Iceland, where the banking system collapsed as its three largest banks failed, became the first developed country in decades to seek IMF support. In a recent report, the IMF estimated the deterioration of U.S. originated credit assets to be 2.2 trillion dollars.

The crux of the problem was that financial institutions around the world, but especially in the western economies, had purchased these U.S. credit assets, especially U.S. mortgage backed securities (MBS) whose value plummeted when U.S. home prices turned down on a sustained basis for the first time since the Great Depression – an eventuality that the MBS originators had not considered. As these “toxic assets” mushroomed on banks’ balance sheets, they eviscerated their capital base, along with their ability to lend. With suspicions about the solvency of most major banks mounting rapidly, interbank lending ground to a halt, and letters of credit, which are used in the vast majority of transactions involving developing countries, became virtually impossible to obtain. In this fashion, while the collapse of demand in developed economies spread in an amplified fashion through international supply chains, engulfing developing countries, even south-south trade involving just developing countries ground to a virtual halt due to the dearth of letters of credit.

The ensuing global credit crunch also crimped lending to emerging economies and increased the cost of trade finance. This rise most definitely had a heavy impact on emerging economies. No wonder there was such a concerted and sudden plunge in global economic activity.

The extent of global financial integration and the resulting herd behaviour can also be gleaned from the high correlation between U.S. stock prices against not only European stock prices, but also those of Asia.

Figure 7 shows scatter plots of the monthly S&P 500 index of U.S. stock prices against British, German, Hong Kong and Indian stock prices. The S&P 500 index has a 99% correlation with British stock prices over the period 1987 to 2001. Over the 2002-08 time period, the same stock price indexes have a 97% correlation. Furthermore, the U.S. stock price index exhibited a 97% correlation with German stock prices from 1987 to 2001 and a 94% correlation over the 2002-08 period.

In Asia, S&P 500 has a correlation of 85% with Hong Kong's Hang Seng index of stock prices from 1987 to 2001, despite the hit taken by the Hang Seng index from the Asian crisis of 1997. During the 2002-08 period, these indexes exhibited an 88% correlation. With India, S&P 500 has a 66% correlation with the Bombay Sensex. In the period 2002-08, once India became a popular destination for portfolio investment, the correlation with the S&P 500 rose to 86%.

The corollary of the above analysis is that international diversification provides very little protection in international recessions even when they are not as global as the recent one. The exception would be investment in a country that is outside the economic mainstream, as India was until the beginning of this century.

## **5. The Timing of Policy**

The timing of stabilization policy in the current global recession has been a major issue. The problem really was that although pre-emptive monetary and fiscal policy actions were possible and timely action based in part on reliable leading indexes could have been taken, policy measures took effect too late to head off a recession.

While many central banks acted aggressively to combat the financial crisis, key central banks – including the Fed and the European Central Bank (ECB) – were slow to recognize the recession risk, focusing much more on inflation concerns. This is a failure of the *timing* of policy.

It is well known that monetary policy acts with long and variable lags on the economy. It therefore behooves central banks to act early to head off recession. Because recession kills inflation – every time – the approach of recession should have dispelled inflation concerns. However, in the face of recession, the major central banks were more preoccupied with inflation.

Specifically, though ECRI's 19-Country Long Leading Index turned down in August 2007, long before the global recession began in July 2008 (Banerji, Layton and Achuthan, 2008), the major central banks were slow to recognize the threat. Perhaps the most egregious was the ECB, which was still hiking rates in July 2008, even though, as we now know, all of the major Eurozone economies plunged into recession between August 2007 (Italy) and April 2008 (Germany). Since those recessions would have killed inflation in any case, the ECB's actions in hiking interest rates during recession were scarcely well advised. Clearly, they were not being guided by reliable leading indicators of recession.

The Fed's awareness of recession risks was not much better. By June 2008, based on widespread comments from Fed governors, the Fed Funds futures markets were factoring in about 100 basis points of rate hikes in 2008 – in other words, based on the best indications available from policy makers, the markets had reason to believe that the Fed funds rate would be boosted from 2% to 3% during the second half of 2008 – even though the economy was in recession.

Evidently, policy makers were unaware of the recession risk. The excuse some use is that it was the unforeseeable September 2008 failure of Lehman Brothers that precipitated the recession – before that, GDP was still rising. Part of the problem here is economists' undue reliance on GDP not only to recognize recessions but also to define recessions (Layton and Banerji, 2003) – a mistaken perspective that may have contributed to past policy errors as well<sup>4</sup>.

Be that as it may, it is a little-known fact that the U.S. recession was *already deepening* when Lehman Brothers collapsed. For evidence, it is worth looking at two key coincident indicators that are used officially to define recessions. First, in August 2008, U.S. industrial production experienced its biggest one-month decline in three years; the plunge passed unnoticed because the data was released on September 15, on a day when the news of

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<sup>4</sup> A decline in GDP alone, when it does not trigger the characteristic vicious cycle of falling output, employment, income and sales, does not constitute a recession. Similarly, a transient rise in GDP that does not ignite a self-reinforcing recovery in output, employment, income and sales does not qualify as a new expansion. However, because of its simplicity, two consecutive quarterly declines in GDP has become perhaps the most popular rule for determining the onset of recession.

the Lehman failure virtually swamped all other news. Second, payroll job losses, which (based on data available at the time) averaged a mild 75,000 a month in the first half of 2008, accelerated during the summer, increasing sharply in September to 321,000 jobs (the initial release showed over 400,000 jobs lost). The point that is often missed by those blaming their lack of prescience on the Lehman debacle is that the September jobs data was collected, as usual, in the week that includes the 12<sup>th</sup> of the month, i.e., the week *before* the Lehman failure.

In other words, the recession began to intensify before the Lehman failure, which certainly hurt the financial system dramatically, but is no excuse for the fact that policy makers were largely unaware of a deepening recession before that shock. Yet, leading indexes with a good *real-time* track record of recession forecasting (*The Economist*, 2005), such as ECRI's Weekly Leading Index (WLI), had long been pointing unambiguously to recession.

In fact, the WLI turned down in early June 2007, and by December 2007, when the recession began, WLI growth had dropped to its worst reading since the 2001 recession. Yet, even in December 2007, when the financial markets were expecting at least a 50-basis point rate cut, the Fed surprised the markets with a 25-basis point cut – before belatedly slashing rates in January 2008. By mid-2008, as we noted, the Fed had moved once again to a hawkish stance, seemingly oblivious to a deepening recession. In sum, the Fed's actions were belatedly aggressive, as it tried to make up for lost time.

Imagine a heavy Roman stone pillar that is just beginning to tip. At that moment, it does not take much force to right the column. However, time is truly of the essence – once the column is leaning at a 45-degree angle, even a strong upward push is unlikely to prevent the column from crashing down. The economy has somewhat analogous nonlinear dynamics – in the sense that policy delays can be enormously costly, as it is almost impossible to make up for lost time. The consequence is that policy makers had to throw almost unimaginable sums of money at the economy just to stave off its total collapse – a costly delay indeed.

## **6. Conclusions**

The main conclusions of this paper are as follows:

- ◆ The global economy recently experienced the most synchronized recession on record in the post-war period.
- ◆ The sheer extent to which international recessions were in synchronization added to the severity of the recession in the U.S. and other economies.

- ◆ The breadth and depth of this remarkably concerted global recession was a reflection of increased globalization and strong global interdependence amongst economies, in terms of both their financial interconnections and trade linkages.
- ◆ Although pre-emptive stabilization policy actions were possible and timely action based in part on reliable leading indexes could have been taken, policy measures took effect too late to head off recession in key economies.

## References

Banerji, A., Layton, A. P. and Achuthan, L. (2008), "Dating the 'World Business Cycle,'" ECRI Working Paper.

Dua, P. and A. Banerji (1999), "An Index of Coincident Economic Indicators for the Indian Economy", *Journal of Quantitative Economics*, 15, 177-201.

\_\_\_\_\_ (2004), "Monitoring and Predicting Business and Growth Rate Cycles in the Indian Economy", in *Business Cycles and Economic Growth: An Analysis Using Leading Indicators*, ed., P. Dua, Oxford University Press.

\_\_\_\_\_ (2007), "Business Cycles in India," in *Oxford Companion to Economics in India*, ed., K. Basu, Oxford University Press.

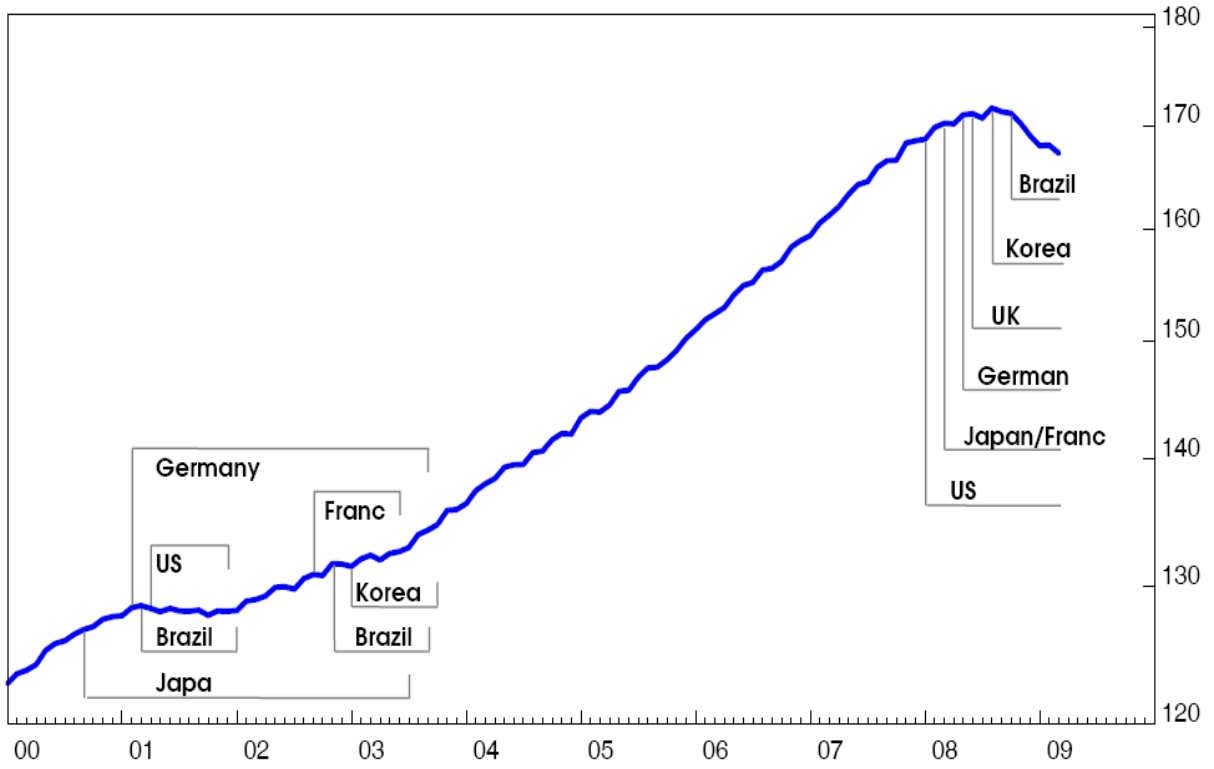
*The Economist* (2005), "Divining the Future," January 15.

Layton, A. P. and A. Banerji (2003), "What is a Recession? A Reprise," *Applied Economics*, 35, 1789 – 1797.

Mack, R. (1956), *Consumption and Business Fluctuations: A Case Study of the Shoe, Leather, Hide Sequence*, National Bureau of Economic Research.

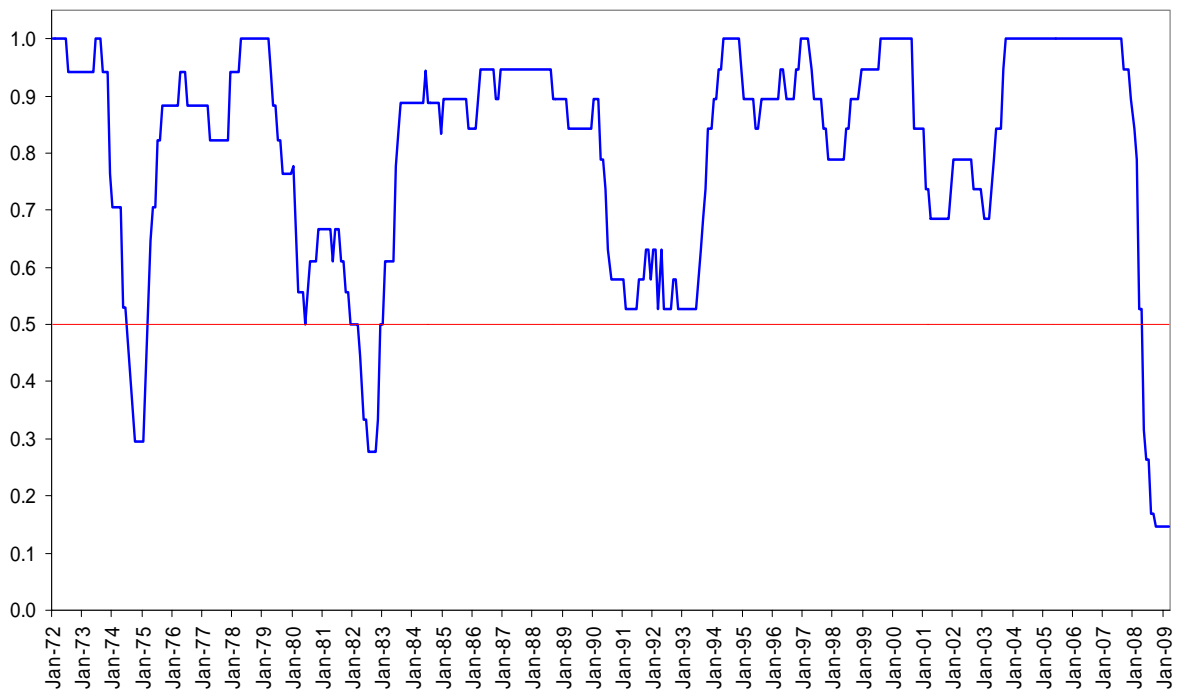
**Figure 1**

**ECRI 20-Country Coincident Index**



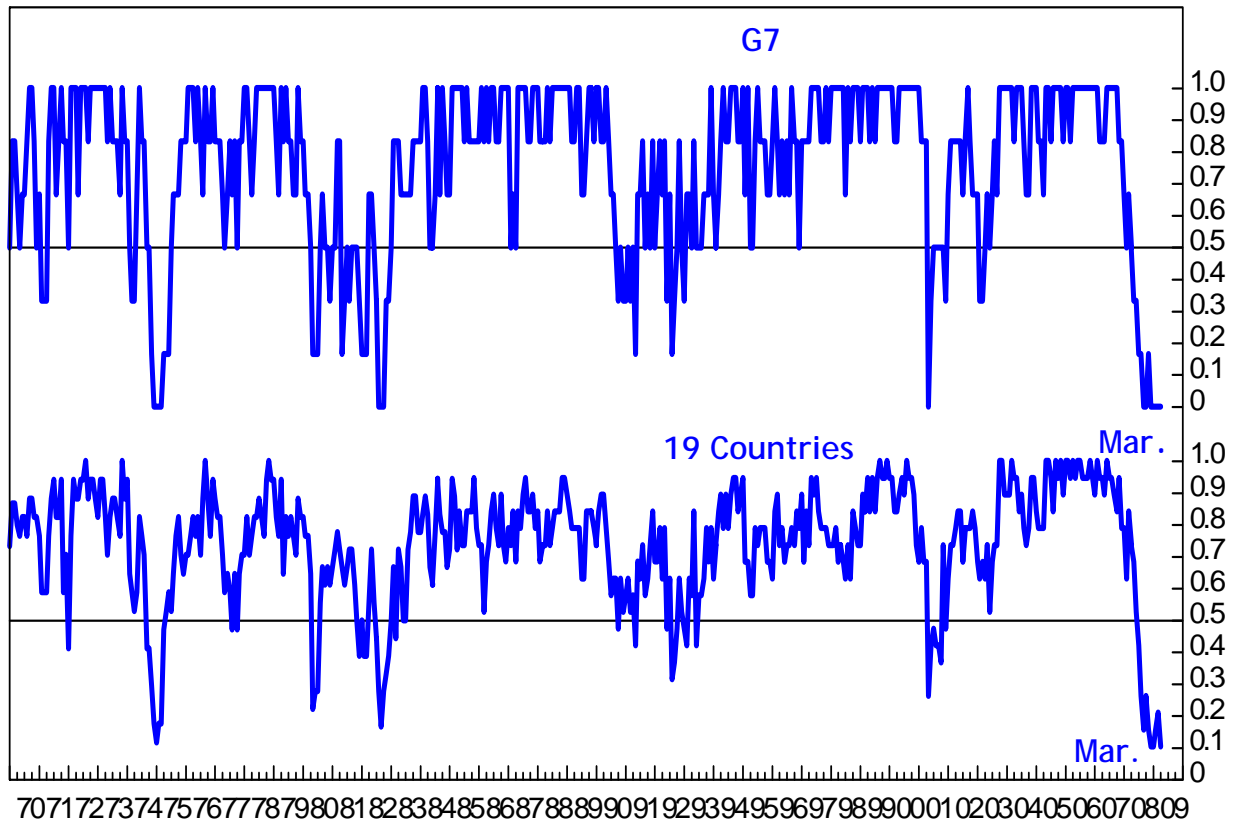
**Figure 2**

**Proportion of 19 Economies in Expansion**

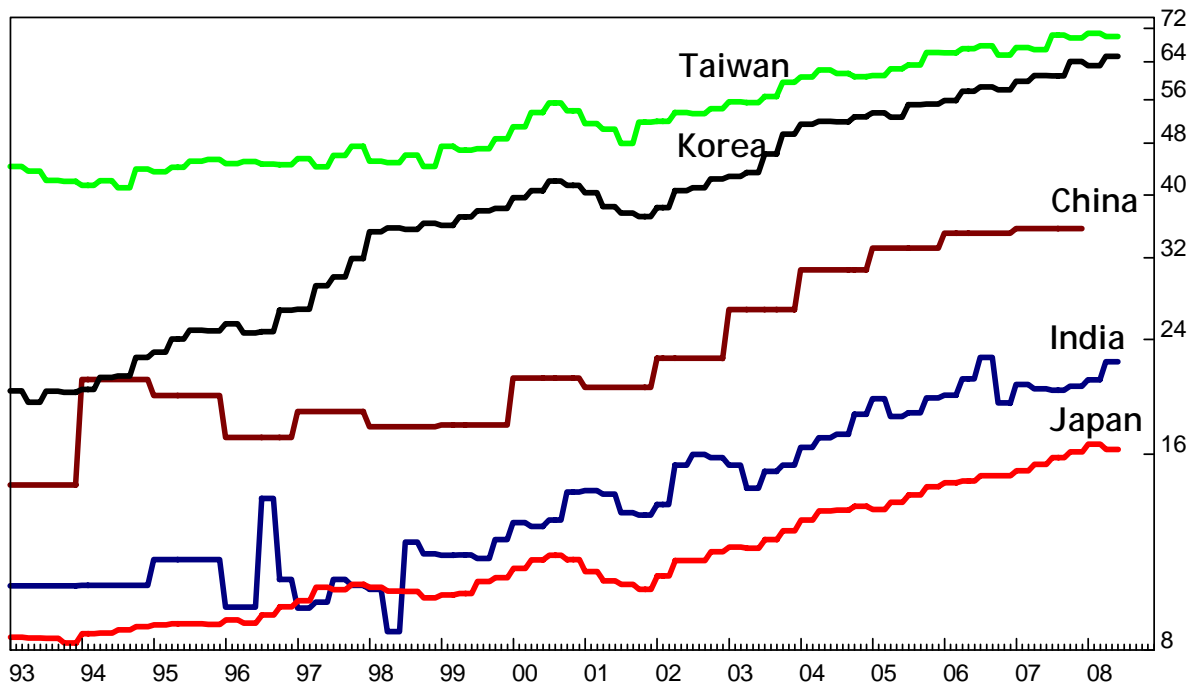




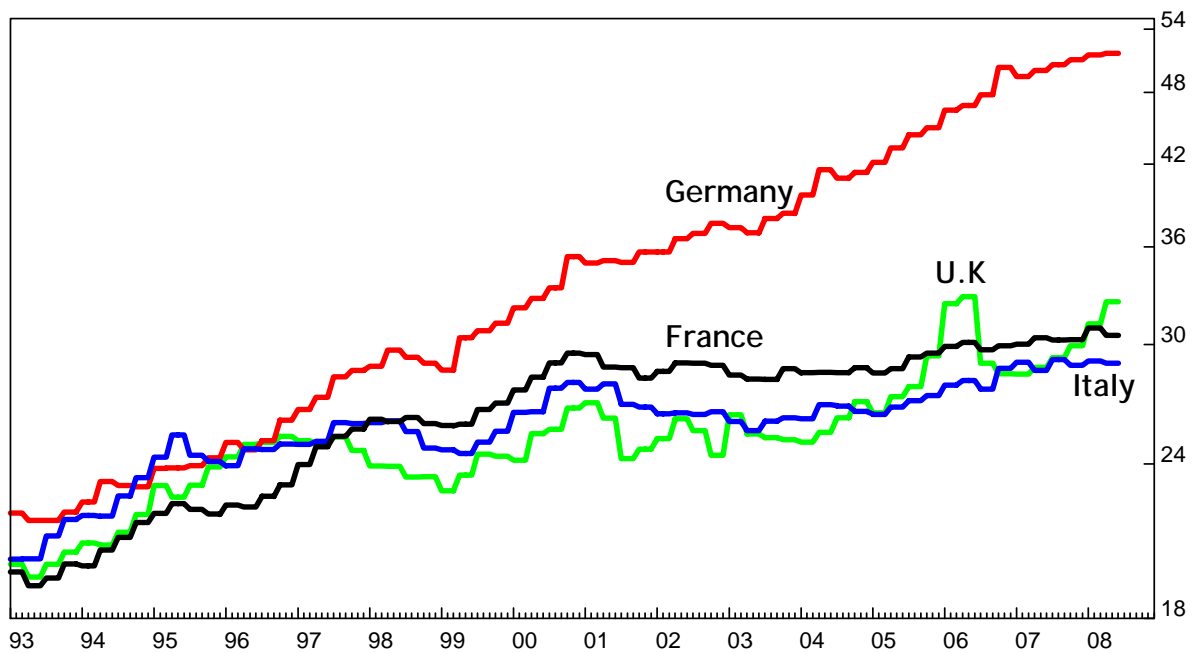
**Figure 3**  
**Diffusion Index of International Coincident Indexes**



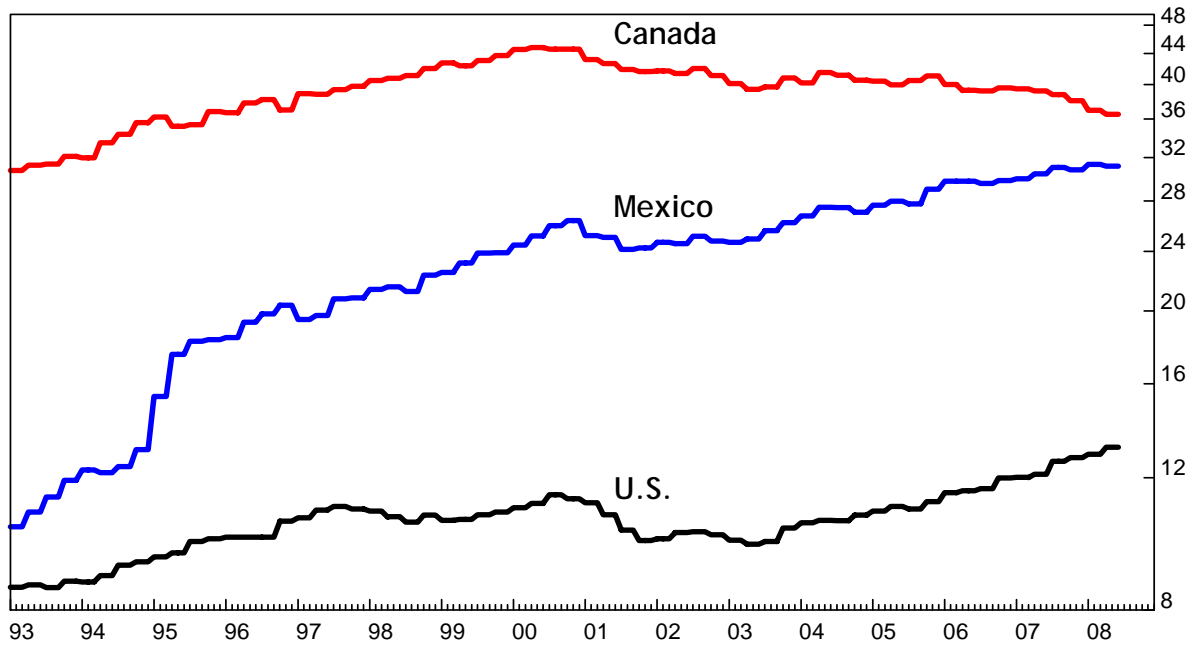
**Figure 4a**  
Exports as a Percentage of GDP in Asia-Pacific



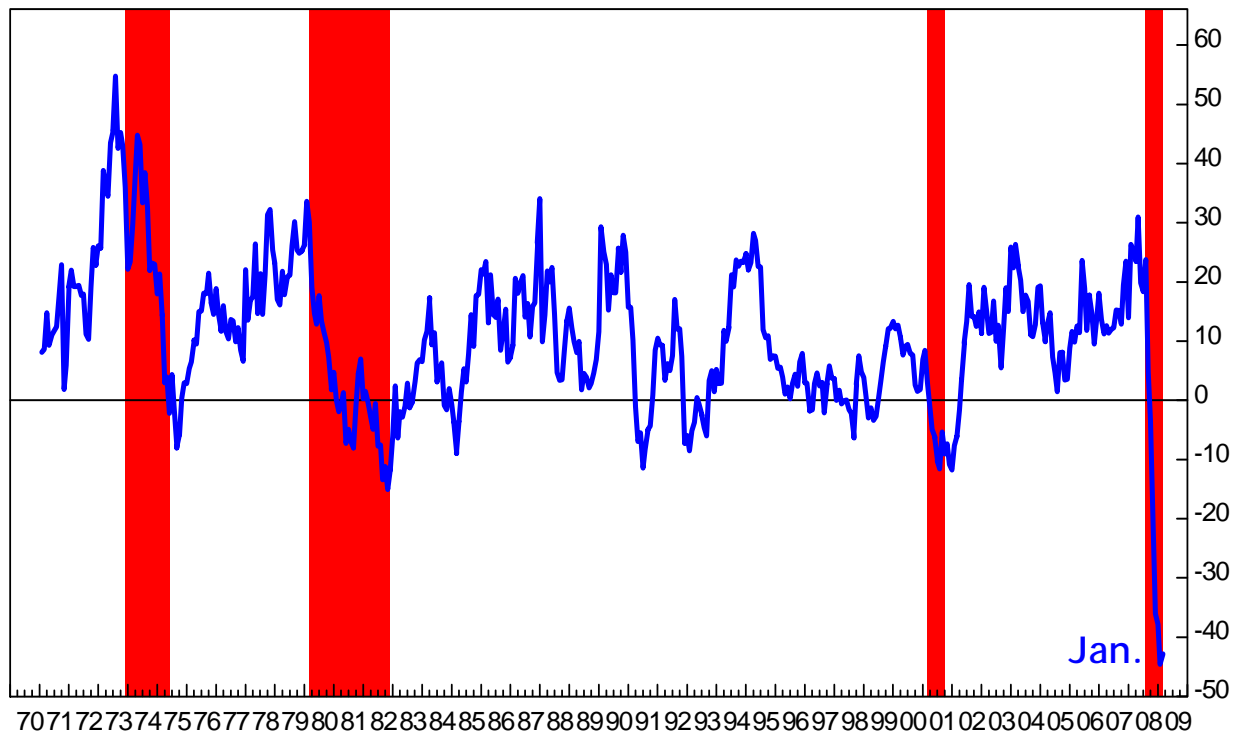
**Figure 4b**  
Exports as a Percentage of GDP in Europe



**Figure 4c**  
**Exports as a Percentage of GDP in North America**

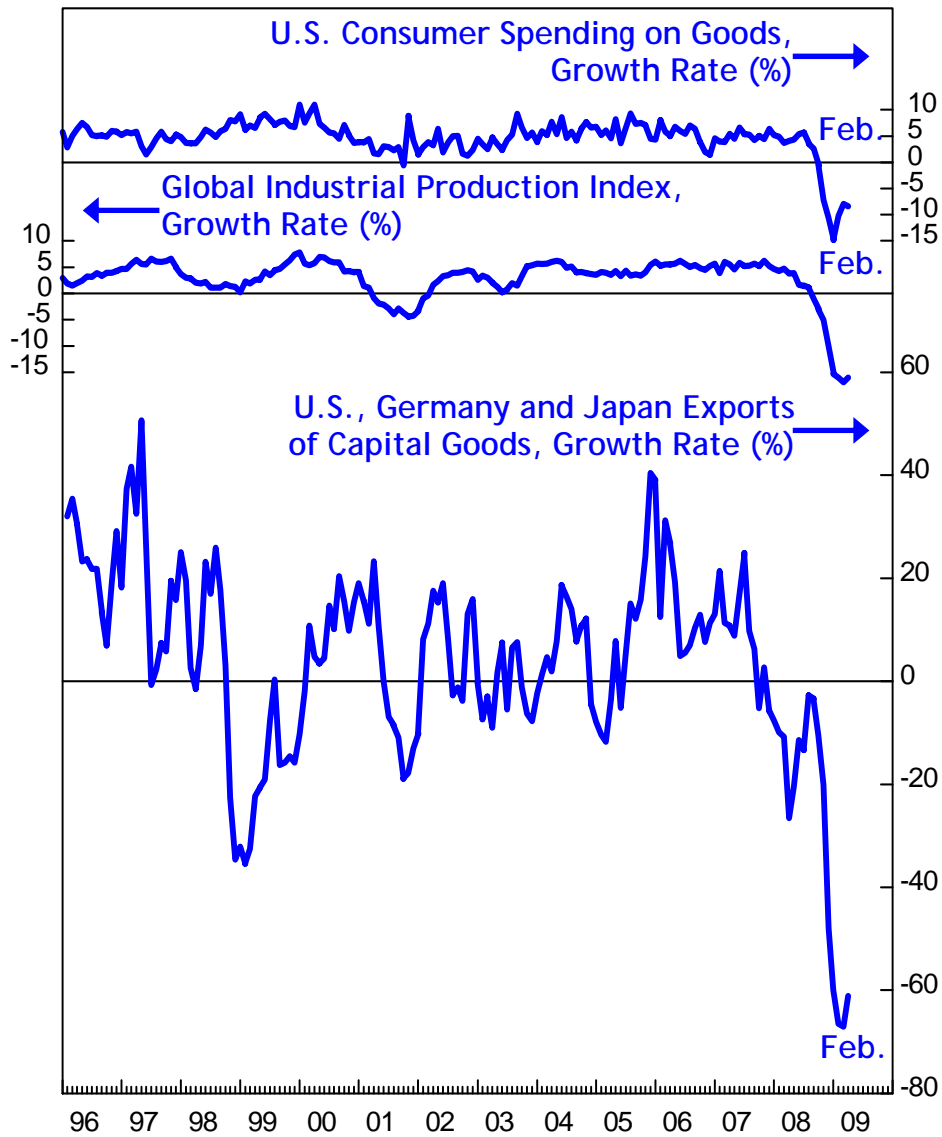


**Figure 5**  
**Global Exports of Goods, Growth Rate (%)**



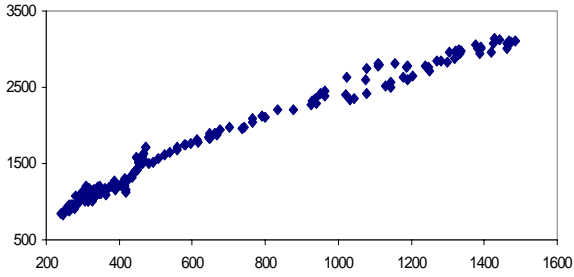
Shaded areas represent global recessions.

**Figure 6**  
**Bullwhip Effect**

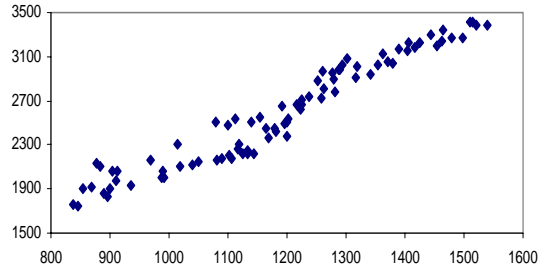


**Figure 7**  
**US Stock Prices vs. UK, Germany, Hong Kong and India Stock Prices**

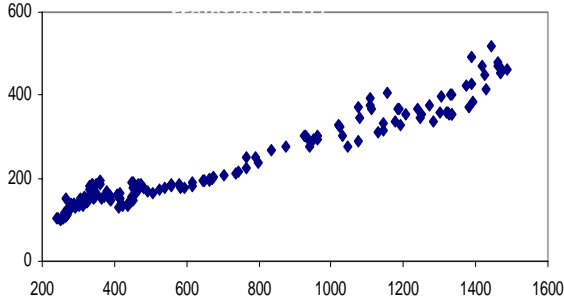
**S&P500 vs. FTSE, 1987-2001**  
 Correlation: 0.99



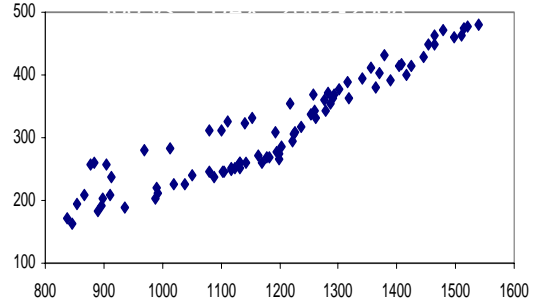
**S&P500 vs. FTSE, 2002-2008**  
 Correlation: 0.97



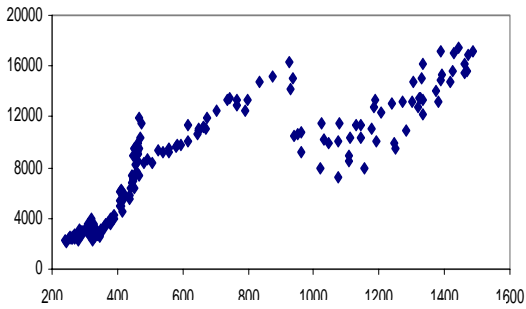
**S&P500 vs. CDAX, 1987-2001**  
 Correlation: 0.97



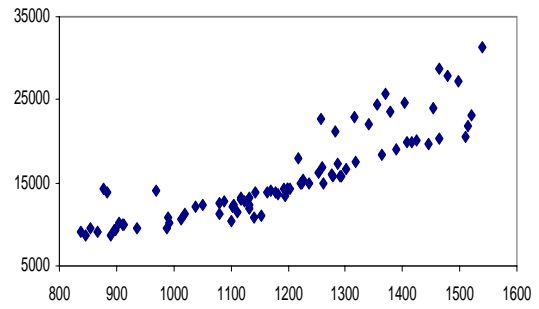
**S&P500 vs. CDAX, 2002-2008**  
 Correlation: 0.94



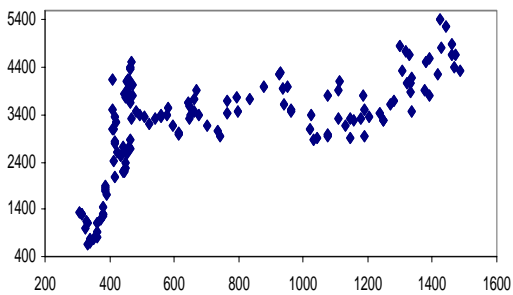
**S&P500 vs. Hang Seng, 1987-2001**  
 Correlation: 0.85



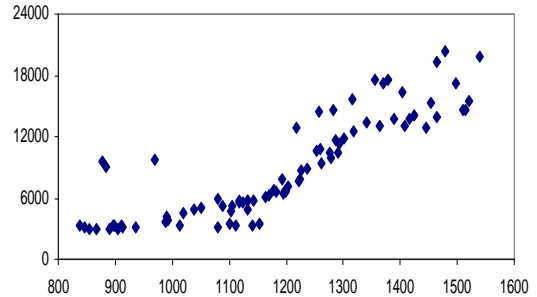
**S&P500 vs. Hang Seng, 2002-2008**  
 Correlation: 0.88



**S&P500 vs. SENSEX, 1990-2001**  
 Correlation: 0.66



**S&P500 vs. CDAX, 2002-2008**  
 Correlation: 0.86



**Table 1: BUSINESS CYCLE CHRONOLOGY**

Period	Peak or Trough	AMERICA				EUROPE							
		United States	Canada	Mexico	Brazil	Germany	France	United Kingdom	Italy	Spain	Switzerland	Sweden	Austria
1948-1950	P T	11/48 10/49											
1951-1952	P T							8/52					
1953-1955	P T	7/53 5/54	5/53 6/54										
1956-1959	P T	8/57 4/58	10/56 2/58				11/57 4/59						
1960-1961	P T	4/60 2/61											
1962-1966	P T					3/66			1/64 3/65				
1967-1968	P T					5/67							
1969-1973	P T	12/69 11/70							10/70 8/71			10/70 11/71	
1973-1975	P T	11/73 3/75				8/73 7/75	7/74 6/75	9/74 8/75	4/74 4/75		4/74	7/75	8/74 6/75
1976-1978	P T										3/76	11/77	
1979-1980	P T	1/80 7/80				1/80	8/79 6/80	6/79	5/80	3/80		2/80	2/80
1981-1983	P T	7/81 11/82	4/81 11/82	3/82 7/83	12/83	10/82	4/82	5/81	5/83		9/81 11/82	6/83	1/83
1984-1986	P T			10/85 11/86			12/84			5/84			

1986-1989	P T				2/87 7/87								
1989-1991	P T	7/90 3/91	3/90		8/89	1/91		5/90		11/91	3/90	6/90	
1992-1994	P T		3/92	10/92 10/93	3/92	4/94	2/92 8/93	3/92	2/92 10/93	12/93	9/93	7/93	4/92 6/93
1994-1997	P T			11/94 7/95	3/95 9/95						12/94 9/96		5/95 3/96
1997-1999	P T				10/97 4/99								
1999-2001	P T	3/01 11/01		8/00	2/01 12/01	1/01					3/01		1/01 12/01
2002-2003	P T			8/03	10/02 6/03	8/03	8/02 5/03				3/03		
2004-2008	P T	12/07	1/08	4/08	9/08	4/08	2/08	5/08	8/07	2/08		4/08	

**Source:** Economic Cycle Research Institute (ECRI) (except for United States, NBER)

**Note:** Shaded cells represent periods for which data are not available.

**Table 1 - cont'd: BUSINESS CYCLE CHRONOLOGY**

		ASIA PACIFIC							AFRICA	MIDDLE EAST
Period	Peak or Trough	Japan	China	India	Korea	Australia	Taiwan	New Zealand	South Africa	Jordan
1948-1950	P T									
1951-1952	P T					6/51 9/52				
1953-1955	P T	1/53 12/54				12/55				
1956-1959	P T					8/56				
1960-1961	P T					12/60 9/61				
1962-1966	P T			11/64 11/65				6/66		
1967-1968	P T			4/66 4/67				3/68		
1969-1973	P T			6/72 5/73						
1973-1975	P T	11/73 2/75		11/73 2/75		6/74 1/75	12/73 1/75	4/74 3/75		
1976-1978	P T							3/77 3/78	6/76 11/77	
1979-1980	P T			4/79 3/80	3/79 10/80					
1981-1983	P T					6/82 5/83		4/82 5/83	11/81 1/83	
1984-1986	P T							11/84 3/86	6/84 2/86	



1986-1989	P T		8/88 12/89					9/86	2/89	11/87
1990-1991	P T			3/91 9/91		6/90 12/91		6/91		2/91
1992-1994	P T	4/92 2/94							8/92	
1994-1997	P T			5/96 11/96						11/95
1997-1999	P T	3/97 7/99			8/97 7/98			10/97 5/98	4/97 11/98	
2000-2003	P T	8/00 4/03			12/02 9/03		8/00 9/01			
2004-2008	P T	2/08			7/08		7/08	11/07		

**Source:** Economic Cycle Research Institute (ECRI) (except for United States, NBER)

**Note:** Shaded cells represent periods for which data are not available.

**Table 2: GROWTH RATE CYCLE CHRONOLOGY**

Period	Peak or Trough	AMERICA				EUROPE							
		United States	Canada	Mexico	Brazil	Germany	France	United Kingdom	Italy	Spain	Switzerland	Sweden	Austria
1949-1950	P T	10/49											
1950-1952	P T	8/50 7/52	11/50 12/51										
1952-1954	P T	3/53 1/54	10/52 1/54										
1955-1957	P T	5/55	8/55 11/57				6/56						
1957-1958	P T	4/58						2/57 4/58					
1959-1961	P T	5/59 12/60	4/59 2/61				9/60	10/59					
1961-1963	P T	11/61 12/62	2/62 3/63										
1963-1966	P T		1/64 11/64			1/65		7/63 9/66	7/63 3/65		2/64		3/66 1/68
1966-1968	P T	1/66 5/67	2/66 2/68				3/67	7/66 5/68	11/67			10/67	
1968-1969	P T	7/68	1/69			1/69	11/68	3/68			7/69		
1969-1971	P T	11/70	5/70			9/71	2/71	2/71	3/71				1/71 12/71
1971-1972	P T		8/71 9/72										12/72
1973-1975	P T	1/73 3/75	4/73 1/75			1/73 12/74	2/73 3/75	1/73 5/75	11/73 4/75	1/73 1/75		3/75	6/74 5/75
1975-1979	P T	2/76	5/76 9/77	1/79		4/76 7/77	7/76	7/76 4/77	1/77 10/77	7/76 3/79			11/76 2/78
1978-1981	P T	6/80	4/79 5/80	12/80		5/79		6/79 5/80	12/79 6/81	3/80 9/81	1/80	2/80	12/79
1981-1982	P T	1/81 7/82	1/81 7/82				10/82	4/82	4/82			8/82	6/81 1/82
1983-1984	P T	1/84	11/83	1/83				10/83 8/84	8/84	5/83 5/84		7/84	12/84
1985-1986	P			1/85				11/85	5/85				

	T		11/86	8/86				12/85	4/86			6/86	
1986-1987	P				8/86	4/86			9/86		5/86		
	T	1/87			8/87	1/87	3/87				3/87		3/87
1987-1988	P	12/87		11/87						8/87		4/87	
	T			7/88					8/87	11/88		2/88	
1988-1989	P		1/88					2/88	1/88			10/88	
	T												
1989-1991	P			8/89	5/89				6/90	5/89		5/89	2/90
	T	2/91	2/91		4/90			4/91				10/91	
1991-1994	P				3/93	1/91			2/92			3/92	
	T			8/93	4/94	1/93	5/93		11/92	2/93	11/92	4/93	3/93
1994-1996	P	5/94	11/94	6/94	12/94	12/94	1/95	7/94	2/96	12/94	12/94	11/94	11/94
	T	1/96	6/96	4/95	9/95	3/96	9/96	8/95	11/96	3/96	10/95	8/96	3/96
1996-1998	P		7/97	6/97	9/96			7/97	10/97	9/97	10/97		5/98
	T		7/98		10/98				12/98				
1998-1999	P	1/98				3/98	1/98					11/98	
	T	9/99		1/99		4/99	2/99	2/99		2/99	1/99	8/99	2/99
1999-2002	P	4/00	1/00	2/00	12/00	5/00	5/00	1/00	2/01	2/00	11/99	4/00	7/99
	T	11/01	9/01	3/02	12/01	3/02			11/01	6/02		10/01	12/01
2002-2003	P	7/02	6/02	10/02	10/02	9/02			3/02			3/02	1/03
	T	2/03	6/03	8/03	6/03	8/03	5/03	2/03	1/03		3/03	2/03	12/03
2003-2005	P	3/04	4/04	11/04	7/04	4/04	6/04	3/04	5/03	10/03	1/04	8/04	8/04
	T	8/05	3/05	3/05		2/05	5/05	5/05	12/04	8/04	1/05	5/05	1/05
2006-2007	P	1/06	1/06	5/06		11/06	3/07	9/07	4/06	1/07		10/06	1/07
	T		9/06	12/06	5/06								9/07
2007-2008	P		5/07	10/07	4/08						8/07		2/08
	T												

**Source:** Economic Cycle Research Institute (ECRI) (except for United States, NBER)

**Note:** Shaded cells represent periods for which data are not available.

**Table 2- cont'd: GROWTH RATE CYCLE CHRONOLOGY**

Period	Peak or Trough	ASIA PACIFIC							AFRICA	MIDDLE EAST
		Japan	China	India	Korea	Australia	Taiwan	New Zealand	South Africa	Jordan
1949-1950	P T									
1950-1952	P T					8/52				
1952-1954	P T					5/54				
1955-1957	P T					7/56				
1957-1958	P T	6/58				3/57 1/58				
1959-1961	P T	2/60		9/60 7/61		10/59 6/61				
1961-1963	P T	1/63		2/62 11/62		5/62 5/63				
1963-1966	P T	10/63 4/65		5/64 11/65		4/64 1/66	12/65			
1966-1968	P T	7/67		4/66 3/67		2/67 1/68	5/67	1/68		
1968-1969	P T	9/69		4/69	6/68 3/69	10/68	10/69		1/68 11/69	
1969-1971	P T	5/70 12/71			12/69 12/71			10/69 11/71		
1971-1972	P T					1/72			6/71 7/72	
1973-1975	P T	2/73 2/74		2/74	8/73 6/75	10/73 1/75	8/73 11/74	10/73 1/75		
1975-1978	P T	12/76 7/77		2/76 9/77	4/76 3/77	8/76 10/77	12/75 8/77	1/76 1/78	10/75 11/77	
1978-1980	P T	2/79 11/80		5/78 12/79	1/78 10/80		8/78	1/79 8/80	2/80 11/80	
1980-1983	P T	7/81 5/83		10/80 2/83	4/81 3/82	12/80 5/83		7/81 1/83	7/81 11/82	
1983-1985	P T			8/84 9/85	10/83 1/85		11/83 8/85	1/84	5/84 5/85	
1985-1986	P T	1/85 7/86				9/85 10/86		1/86		8/86

1986-1987	P T		10/86	10/86 12/87	8/86		11/86	9/86		7/87
1987-1988	P T						1/88			7/88
1988-1989	P T	2/88 5/89	12/89	6/88 5/89	4/89		9/88		8/88	8/89
1989-1991	P T	3/90	2/91 12/91	3/90 9/91	1/90	1/89 4/91	1/90	4/91	2/91	2/91
1991-1994	P T		4/93 12/93	4/92 4/93	12/92		6/91 1/94		2/92 8/92	10/91 11/93
1994-1996	P T	12/94 1/96	2/95	4/95 11/96	1/95	10/94 10/96	11/94 8/96	10/94	5/95	1/95 5/96
1996-1998	P T	3/97	12/96 1/98	9/97 10/98			7/97		12/98	6/97 4/98
1998-1999	P T		10/98 6/99		7/98		1/99	5/98		9/98 9/99
1999-2000	P T	8/00	1/00	12/99	11/99 12/00	3/99 11/00	6/99	10/99 9/00		2/00
2000-2002	P T		12/01	6/01	9/01			7/02	3/00 9/01	
2002-2003	P T	1/04 11/04	7/03 12/03		2/02 4/03	1/02 7/03	5/02 5/03	3/03	4/02 6/03	
2004-2005	P T	4/05 10/05		7/04 3/05	2/04 8/04	4/04	2/04 7/05	1/04	7/04 2/05	
2005-2006	P T	4/06 9/06	12/05 12/06	8/05 2/06	1/06 12/06		12/05	9/06	11/06	
2006-2007	P T	8/07	5/07	8/06	10/07	12/06		5/07		
2007-2008	P T						3/07 8/07			

**Source:** Economic Cycle Research Institute (ECRI) (except for United States, NBER)

**Note:** Shaded cells represent periods for which data are not available.