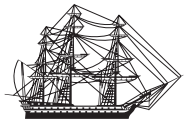
China's Economic Slowdown: A Risk Assessment for Investors

Vanguard Investment Counseling & Research



Vanguard®

Author

Joseph H. Davis, Ph.D.

Executive summary

- China's economic growth has been so exceptional that Chinese officials are endeavoring to cool the country's investment and credit boom. Indeed, China's inevitable slowdown represents a significant downside risk to the global economy and financial markets. How will the fate of China's economy affect near-term business prospects worldwide?
- Using econometric simulation techniques, we find that the implications of a slowdown, or "soft landing," in China are relatively benign for the global economy. The simulated reduction in U.S. inflation is so slight that a Chinese soft landing should not meaningfully affect the course of U.S. short-term interest rates.
- While recent Chinese policy suggests that a soft landing is the most likely outcome, the risks in this assessment lie overwhelmingly on the downside. Our simulation indicates that a "hard landing" in China would have more deleterious effects on the broader Asian economy. As with past emerging-market crises, however, economic output in the United States and Eurozone would decline only minimally. This is because the feedback effects of lower commodity and import prices would counteract the initial falloff in Chinese demand.

China's soaring growth

During the past 15 years, one of the world's most dramatic economic developments has been the rapid industrialization of China. In less than a generation, China has evolved from a largely self-contained agrarian economy to a manufacturing giant playing major roles in global trade and finance (see "China's Great Awakening" below). For more than a decade, China's real GDP growth has officially expanded at an annualized rate above 9%, nearly double the rate of the United States.

China's outsized contribution to the accelerating global expansion has been even more impressive (see Figure 2). Over the past five years, China has directly accounted for approximately 15% of global output growth, and has emerged as a significant source of demand for various commodities and other raw materials necessary for its burgeoning factory sector.[1] Indeed, China's roaring economy has boosted the fortunes of economies worldwide, including that of Japan, whose exports to China are enabling the Japanese economy to finally shake off its decade-long deflationary stupor.

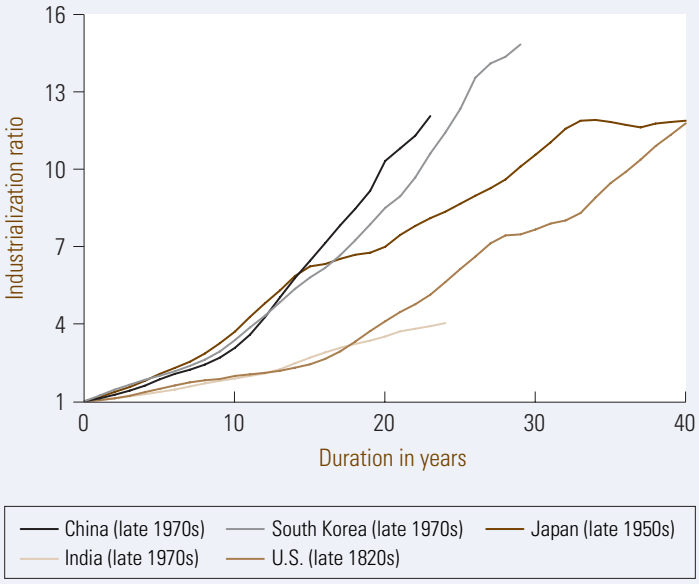
China's great awakening

While media attention has focused on China's remarkable recent growth, in reality the nation's economic ascent has been underway since major pro-market reforms were initiated in late 1978. More comprehensive reforms adopted since the early 1990s—including tariff reductions and increased openness to foreign direct investment—have further stimulated the spread of industry in China.

According to our calculations, China's industrialization over the past 25 years is among the most impressive in the history of the world. Figure 1 demonstrates that the pace of China's industrial growth echoes the famous experiences of other now-developed economies while they were evolving from emerging markets, including the "takeoff" periods in 19th-century America and 20th-century Japan and South Korea.

As a result, the Chinese economy is now about eight times larger than it was 25 years ago—a span that is roughly equivalent to one-half of the average Chinese laborer's working lifetime.

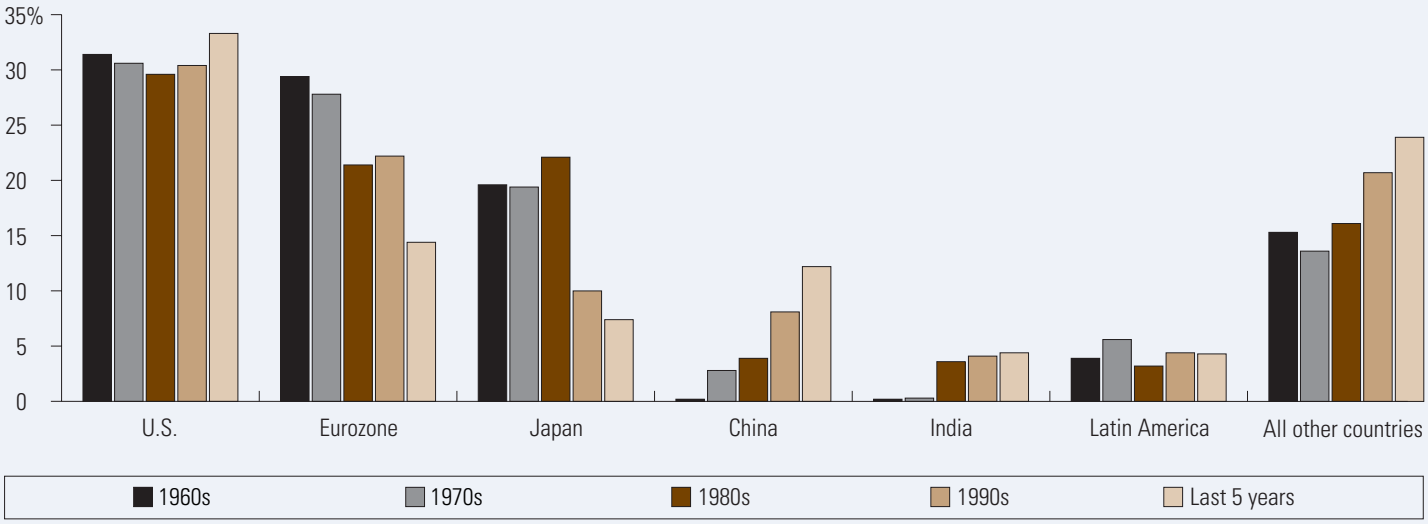
Figure 1. China's industrialization ranks as world's greatest



Notes: This chart defines the pace of industrialization as a ratio based on levels of industrial production. The first element in the ratio is the 5-year moving average of the production level centered at time t*; the second element is the 5-year average in the level beginning is base point* t=*1, the period when experts believe that a nation's industrialization definitively accelerated. India is indexed to the same year as China for comparison.*
Source: Author's calculations based on industrial production data from Davis (2004), the International Monetary Fund, Maddison (2001), and the Organization for Economic Cooperation and Development.

1 Measured in market exchange-rate terms.

Figure 2. China's rising importance in the global economy



Source: World Bank, HSBC, and Vanguard calculations.

China's economic growth has been so exceptional, in fact, that signs of overheating have appeared across various sectors of the economy as a result of years of double-digit increases in lines of credit and the nation's money supply. History has repeatedly shown that such torrid rates of investment and credit expansion reverse sharply when not deftly addressed by policymakers.

China's growth: The risks

More recently, Chinese government officials have attempted to cool the nation's apparent overheating without engendering a more serious "hard landing." Of course, this ongoing cooling process also represents a significant risk to the global economy and financial markets. Some analysts go so far as to warn of an impending Chinese financial crisis similar to the one that unfolded in East Asia in 1997. Others speculate direly that the coming slowdown in China's economy will adversely affect even the portfolios of U.S. and European investors who have no direct exposure to international equities. While some of this speculation is off-target, it is clear that China's success—or lack of it—in engineering a soft landing could have major ramifications for the global economy, which has benefited tremendously from China's expansion.

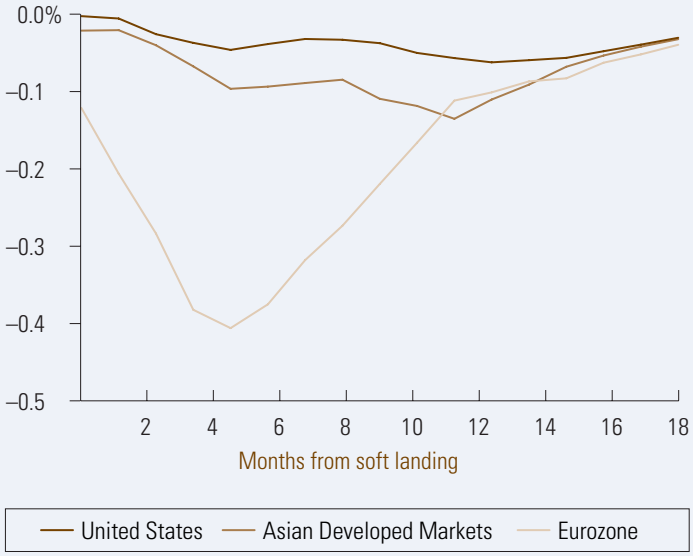
While the prospects for China's economy have been widely discussed, the ramifications for investors remain opaque. The goal of this paper is to provide investors with a more rigorous assessment of the

Renminbi and Yuan

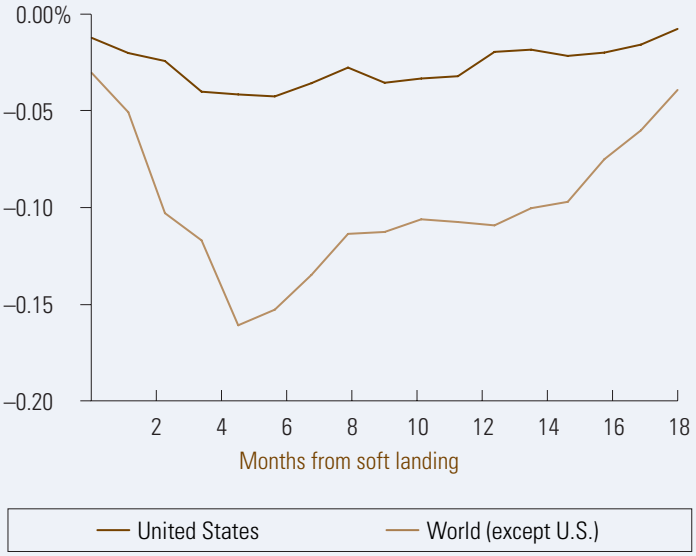
China's official currency is called the *renminbi* (sometimes abbreviated as RMB), which is expressed in units of *yuan*. *Renminbi* has no exact parallel in the United States, where the word *dollar* applies to both the national currency and its unit of value.

Figure 3. Scenario analysis of a Chinese soft landing

3a. Simulated impact on real GDP growth



3b. Simulated impact on CPI inflation rate



Notes: Scenario results are derived from the modal outcome of 10,000 Monte Carlo simulations generated from a dynamic simultaneous-equation VAR model. (See Appendix for details.) A soft landing is defined as a drop in China's real GDP growth rate from 9%–10% to 7%. Lines represent the deviation (in percentage points) from mid-2004 growth rates in three major regional economies over an 18-month period following the drip.

Sources: Author's calculations based on data from various sources (see Appendix).

risks involved. Using a vector autoregressive system to model the world economy, we explore the potential ramifications of soft and hard landings in China.[2] Our analysis focuses on two fundamental risk factors: global demand and inflation.

The implications of a Chinese soft landing

Engineering an economic soft landing

Since China's admission into the World Trade Organization (WTO) in late 2001, its pegged currency—which some foreign-exchange models suggest is fundamentally undervalued by as much as 40%—has boosted export growth and made foreign direct investment less expensive. However, as capital from foreign investors and other sources has flowed into China at an accelerating pace, existing capital controls have forced China's central bank—the People's Bank of China (PBOC)—to sell yuan for U.S. dollars in order to maintain the official yuan-to-dollar ratio. This increase in foreign reserves has boosted the nation's money supply, induced banks to expand lending dramatically, and kept interest rates lower than they would be in a purely market-based economy.

While its currency policy has served China's economic (and political) interests exceedingly well over the past several years, the country's double-digit expansion in bank loans is fostering over-heating in the economy. Classic signs of a bubble are appearing in sectors ranging from steel to real estate.[3]

2 Vector autoregression, or VAR, is a statistical method of summarizing the dynamic correlations among several data series. Policymakers—including central bankers—have applied VAR models for years to estimate the dynamic impact of random disturbances (or "shocks") on a broader, interrelated system of variables. See, for instance, Bernanke and Blinder (1992).

3 Reflecting the capital controls attendant on China's pegged currency policy, Chinese residents still face considerable obstacles to investing abroad. The country's domestic equity and bond markets are small and illiquid. Hence the Chinese banking system controls the vast majority of financial assets and investment opportunities. As a result, some Chinese investors have turned to real estate to gain higher returns or for diversification, in the process driving up real estate valuations to record levels.

As a result, Chinese officials are endeavoring to slow real GDP growth from its current rate of more than 9% to a more sustainable 7%–8%.[4] For more than three years, Chinese authorities have been implementing targeted administrative measures to slow the nation's rapid credit expansion. In July 2005, China's central bank permitted a 2.1% appreciation in the value of its currency versus the U.S. dollar. More recently, China's central bank modestly raised its benchmark one-year lending rate to 5.85%, the first such increase since late 2004.

Given these and other gradual adjustments of China's financial system, many economists believe that Chinese policymakers will be successful in achieving an economic soft landing by 2007. Of course, analysts have been anticipating an economic soft landing in China for at least 3 years, only to witness a slight acceleration in bank credit and output growth. Indeed, since the pegging of China's currency blunts the efficacy of traditional monetary-policy tools, the possibility of a hard landing remains very real.[5] Consequently, to help investors gauge how they might be affected by events in China, this paper examines the implications of both a soft-landing and hard-landing scenario.

Simulating a soft landing

Our simulation quantifies the potential effect of a Chinese soft landing on the world's major economies, in particular the United States, the Eurozone, and broader Asia. Given the level of integration in global financial and economic markets, we employ well-established vector autoregression (VAR) techniques to capture the dynamic linkages among these various regions in terms of trade, output, inflation, and exchange rates. This estimated VAR system of equations enables us to simulate the impact of a Chinese soft landing on two key economic forces: *inflation* and *real GDP growth*. A more complete description of these techniques and the model specifications are provided in the Appendix at the end of this paper.

Let us first consider real output. Figure 3 shows the most likely impact of a Chinese soft landing on real GDP growth in the three economic regions, according to our simulation. The lines in the left-side figure represent the basis-point deviation over time from each region's current annualized real GDP growth rate.

The salient feature of Figure 3 is that a Chinese soft landing would have a very minor negative impact on world business activity. Specifically, a soft landing would subtract roughly 10 basis points (0.1%) from real GDP growth in the United States and the Eurozone one year after it was underway. The magnitudes are so slight that after one year the simulated values are statistically insignificant (meaning that they very well could be zero). The near-term economic impact on Asia is somewhat larger in absolute terms, because of the region's greater trade dependencies with China. However, the relative impact would be very modest given that the broader Asian economy is growing at an annual rate exceeding 5%.

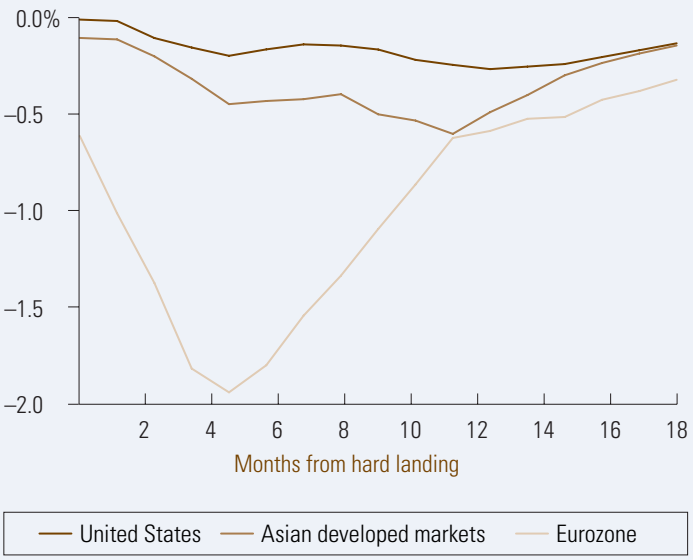
Our soft-landing analysis yields similar conclusions about inflation. A Chinese soft landing would exert minor disinflationary pressures through lower commodity and import prices in the United States and throughout the rest of the world. About six months into the soft landing, global inflation (now at about 3%) would have fallen by approximately 15 basis points. In the United States, the likely effect on inflation would be slight because commodity and import prices play a comparatively small role in the U.S. economy and its broad inflation metrics, such as the Consumer Price Index (CPI). Consequently, a Chinese soft landing should not meaningfully influence the path of U.S. short-term interest rates.

4 An economy's potential long-run growth rate in real GDP can be loosely defined as the sum of assumed growth rates in productivity and in the nonfarm labor force. In the United States, these factors are widely thought to sum to roughly 3.5% per year. While China's growth rates in productivity and nonfarm labor are roughly similar to those in the United States, experts estimate that the Chinese economy must expand at *twice* the U.S. rate over the long run if the nation is to successfully employ the millions of workers leaving the farm sector.

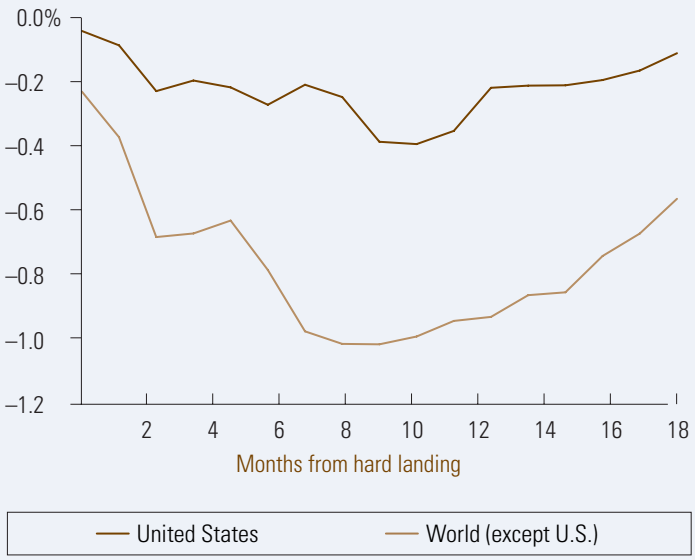
5 For details, see Vanguard's related publication, *Implications of a Chinese Currency Revaluation* (Davis, 2004).

Figure 4. Scenario analysis of a Chinese hard landing

4a. Simulated impact on real GDP growth



4b. Simulated impact on CPI inflation rate



Notes: Scenario results are derived from the modal outcome of 10,000 Monte Carlo simulations generated from a dynamic simultaneous-equation VAR model. (See Appendix for details.) A soft landing is defined as a drop in China's real GDP growth rate from 9%–10% to 7%. Lines represent the deviation (in percentage points) from mid-2004 growth rates in three major regional economies over an 18-month period following the drip.
Sources: Author's calculations based on data from various sources (see Appendix).

Implications of a Chinese hard landing

The Chinese banking system and its undervalued, pegged currency leaves little margin for error in orchestrating a soft landing. In their efforts to regain control of the nation's economy, Chinese officials face significant challenges.

On the one hand, the policy measures already enacted to rein in China's extraordinary growth could prove too heavy-handed. If so, China's lending boom could end abruptly, thereby placing considerable strain on the portfolios of the nation's already-weak banks. Indeed, credit-rating agencies such as Moody's rank China's banking system among the last in the world, ahead of only Argentina and some African nations.[6] A collapse of the Chinese banking system would engender the very troubles that policymakers are seeking to avoid.

On the other hand, China's policy mandates may prove insufficient in moderating growth because they do not address the root of the problem: the fundamental undervaluation of the Chinese currency. If economic growth fails to slow sufficiently, it is probable that the PBOC will resort to raising short-term interest rates for the first time in more than a decade.[7] Yet how can Chinese officials know the most appropriate level for interest rates when the economy is governed more by political motives than by market forces?

6 Standard and Poor's estimates that more than 40% of the nation's outstanding loans are nonperforming and will likely never be repaid. Key reasons are poor risk control and misaligned lending incentives in the Chinese banking system. It is estimated that roughly 50% of all Chinese bank loans go to less-efficient state-controlled enterprises, an allocation that tends to lower bank profitability and raise loan default rates.

7 While the PBOC could reduce the money supply by selling yuan-denominated bonds, the resulting higher interest rates would surely attract additional capital inflows from speculators who have been depositing funds in Chinese banks in hopes of a currency revaluation. Such capital inflows would reinforce the "excessive liquidity" at the heart of the inflationary process; they also would serve to counteract the initial rate hikes. The PBOC could respond with further rate increases, which would only encourage further speculative inflows, and so on. It is for these reasons that textbooks commonly describe monetary policy as ineffective in an economy with a fixed exchange rate. While Chinese authorities have stepped up efforts to prevent such "hot money" from entering the financial system, the capital controls have thus far proven inadequate.

In the past, the combination of a weak banking sector, a misaligned currency, and the need for domestic financial reform has been associated with emerging-market crises (Kaminsky and Reinhart, 1999). This is yet another reason for investors to consider the implications for world economies should the efforts of the Chinese government fail.

Simulating a hard landing

To explore the potential ramifications of a hard landing, we employ the same basic VAR model used in the soft-landing analysis. We define this scenario as a drop in real Chinese GDP from the current 9%-plus to 3%. Figure 4 illustrates the impact on the rates of output and inflation in the world's major economies.

As one would expect, a hard landing would have a more severe impact on world output. The timing, however, would be similar to that of a soft landing. Indeed, *the initial and direct transmission mechanism of a Chinese slowdown is the same regardless of its magnitude:* a reduction in Chinese demand for imported products. Consequently, a Chinese hard landing would most adversely affect the regional economies of Asia, subtracting nearly 2% from this area's current real growth rate exactly six months later.

The VAR model indicates that an initial reduction in China's growth rate from roughly 9% to 3% would lead to an immediate drop in world commodity prices of more than 25%. The pace of import-price inflation worldwide would generally decelerate, in part because of the falling commodity prices and reduced Chinese demand, but also the dynamic feedback effects of lower growth across the rest of the world. Indeed, the Chinese hard landing would ultimately lead to a decline of nearly 1% in world inflation, with deflationary pressure concentrated in commodity-dependent developing economies.

Contrary to popular views, however, a Chinese hard landing would exert minimal downward pressure on U.S. business activity and inflation. Our simulation, represented in Figure 4, indicates that output and inflation in the United States would decline by less than 0.5%. For the United States and the Eurozone, the real effects produced by a Chinese hard landing would resemble those of the emerging-market crises of the 1990s: a modest initial reduction in export demand, eventually offset by a secondary rebound in domestic demand in response to lower rates of inflation both at home and abroad.

The simulations indicate that, because of the economic interrelationships involved, still-robust growth in the United States and Europe would recoup the initial decline in Chinese demand for the broader Asian economy, engendering a V-shaped economic recovery. In turn, a rebounding Asian economy outside China would reinforce the momentum of the global recovery, bolstering even China's prospects in a perpetuating cycle.

Overall, our simulations indicate that a Chinese hard landing would have a minimal impact on the U.S. economy. There would be the usual temporary effects of dramatic economic news—a few days or weeks of market swings, together with much dire prophesizing in the media. But, as stated above, the true result of a sharp drop in China's GDP should be much like that of past emerging-market hard landings, which have not significantly detracted from U.S.—and hence, global—economic growth. Despite the initial drop-off in local demand, global deflationary pressures would quickly act to stimulate demand worldwide. Indeed, the VAR model demonstrates that the second-round feedback effects of lower commodity and import prices would reduce input costs worldwide sufficiently to create a bounce-back effect: The lower costs eventually would counteract the first-round fall-off in Chinese demand.

Conclusion

While recent Chinese policy responses suggest that a soft landing is the most likely outcome for the nation's economy, the risks to this assessment lie overwhelmingly on the downside. Regardless of the path that China's economy takes over the next year, our analysis shows that the potential ramifications for long-term investors are more modest and short-lived than commonly feared. Using quantitative techniques, we find that the implications of a soft landing in China are relatively benign for the global economy. A potential hard landing would have more deleterious effects on the Asian economy and emerging markets generally, but relatively minor impact on the U.S. economy.

References

Bernanke, Ben S., and Alan S. Blinder, 1992. The Federal Funds Rate and the Channels of Monetary Transmission. *American Economic Review* 82:901-921.

Davis, Joseph H., 2004. An Annual Index of U.S. Industrial Production, 1790-1915. *Quarterly Journal of Economics* 119:1177-1215.

Davis, Joseph H., 2004. Investment Implications of a Future Chinese Currency Revaluation. Valley Forge, Pa.: Investment Counseling & Research, The Vanguard Group. 12 p.

Kaminsky, Graciela L., and Carmen M. Reinhart, 1999. The Twin Crises: The Causes of Banking and Balance-of-Payment Problems. *American Economic Review* 89:473-500.

Lardy, Nicholas R., 2003. *The Economic Rise of China: Threat or Opportunity?* Federal Reserve Bank of Cleveland. 4 p.

Maddison, Angus, 2001. *The World Economy: A Millennial Perspective*. OECD: Paris, France. 383 p.

Appendix

VAR model: The theory

This paper employs standard macroeconomic and financial simulation tools known as *vector autoregression*, or VAR. Economists widely use the VAR framework to identify the statistical (rather than structural) dynamic interactions in an equilibrium system. Policymakers—including central bankers—have applied VAR models for years to estimate the dynamic impact of random disturbances (or "shocks") on an interrelated system of variables.

The framework of a VAR model is straightforward. Since a VAR model treats every endogenous variable in the system as a function of the lagged values of *all* endogenous variables, model-generated simulations are consistent (in a statistical sense) across model equations over time. For illustration, suppose one has three time series, labeled y_1, y_2, and y_3, whose period-to-period movements are dynamically interrelated. The three time series may be represented by three regression equations that are jointly estimated in a VAR model such that:

$$y_{1t} = \alpha + a_{11}y_{1,t-1} + a_{12}y_{1,t-2} + \cdots + b_{11}y_{2,t-1} + b_{12}y_{2,t-2} + \cdots + c_{11}y_{3,t-1} + c_{12}y_{3,t-2} + \cdots + \beta_1 X_t + \epsilon_{1t}$$

$$y_{2t} = \alpha + a_{21}y_{1,t-1} + a_{22}y_{1,t-2} + \cdots + b_{21}y_{2,t-1} + b_{22}y_{2,t-2} + \cdots + c_{21}y_{3,t-1} + c_{22}y_{3,t-2} + \cdots + \beta_2 X_t + \epsilon_{2t}$$

$$y_{3t} = \alpha + a_{31}y_{1,t-1} + a_{32}y_{1,t-2} + \cdots + b_{31}y_{2,t-1} + b_{32}y_{2,t-2} + \cdots + c_{31}y_{3,t-1} + c_{32}y_{3,t-2} + \cdots + \beta_3 X_t + \epsilon_{3t}$$

where a, b, c, and β designate regression coefficients, and where ϵ represents a vector of regression residuals, or "innovations." The term X_t represents a vector of exogenous variables that are assumed to influence the endogenous variables y_1, y_2, and y_3 in the short run, but not vice versa.

The VAR framework can trace the effect of a one-time shock to one endogenous variable, say y_1, on current and future values of y_1, y_2, and y_3 as dictated by the dynamic lag structure of the VAR model and the residual covariance matrix. This process can then be repeated, generating thousands of "what-if" scenarios in order to characterize the magnitude and uncertainty of the estimated responses of y_1, y_2, and y_3 to the calibrated shock. The following section provides details of the VAR models applied in this paper.

VAR model: The specification

The primary objective of this VAR model is to simulate the potential impact of a Chinese economic slowdown on three major developed economic regions: the United States, the Eurozone, and Asia. Given the level of integration in global financial and economic markets, the model must capture the dynamic interaction among each region's rate of output growth and inflation. Trade, exchange rates, and world commodity prices link these national concepts. Accordingly, we take a textbook approach in specifying 11 endogenous variables, listed below in their Cholesky ordering:

y_1 = U.S. industrial production
y_2 = Eurozone industrial production
y_3 = Asia (except China) industrial production[8]
y_4 = U.S. exports to the rest of the world
y_5 = Eurozone exports to the rest of the world
y_6 = Asia (except China) exports to the rest of the world
y_7 = Chinese imports from the rest of the world
y_8 = CRB commodity price index
y_9 = Broad nominal U.S. trade-weighted dollar index
y_{10} = U.S. CPI inflation
y_{11} = World (except the U.S.) CPI inflation

The endogenous variables reflect monthly data that were seasonally adjusted by the author and expressed in annualized percentage changes. The monthly trade data (reported in U.S. dollars) were obtained from the International Monetary Fund's *Direction of Trade Statistics* database. The VAR model also includes five exogenous control variables:

x_1 = A constructed measure of global excess capacity
x_2 = Current monthly average price of crude oil
x_3 = Lagged percentage change in crude oil prices
x_4 = U.S. federal funds rate (a monetary policy control variable)
x_5 = Linear time trend

The VAR model was estimated over the period from January 1981 to December 2003. Statistical tests determined 8 months as the appropriate maximum lag term to include in the VAR model. Statistics indicate the VAR model fits the data well: the R^2s of the 11 equations ranged from 68% to 97%, while F-statistics were significant at the 1% level.

8 Asia (except China) includes Japan, Singapore, South Korea, and Taiwan.

Calibrating the global VAR model to a Chinese economic slowdown

As one would expect, the primary transmission mechanism of a Chinese economic slowdown is through a reduction in China's demand for manufactured products from each major economic region (via variables y_4, y_5, and y_6), as well as for imported raw materials worldwide for China's own consumption (via y_7). In order to simulate a Chinese hard or soft landing, shocks to the above VAR model must be calibrated to reflect China's direct contribution to global export growth (as expressed in variables y_4 through y_7). These initial shocks will then feed dynamically through to the estimated VAR model, which through Monte Carlo simulation techniques produce thousands of impulse response functions, or "what-if" scenarios.[9]

The initial shocks to the VAR model were derived in three steps. First, we used regression techniques to estimate the percentage change in Chinese import demand that is associated with a one-percentage-point change in Chinese real GDP. This step enabled us to calibrate changes in Chinese import demand to a Chinese soft or hard landing, which are expressed conventionally in terms of real GDP growth. Second, we calculated the share in variables through that was directly attributable to China (and Hong Kong, its primary import distribution hub) in 2003, the last year in the sample. Third, the estimates from the first step were multiplied by the estimates in the second step, thereby appropriately calibrating the magnitude of the shock to variables y_4 through y_7 for econometric simulation.

9 For presentation purposes in the paper, the impulse response functions for percentage changes in industrial production for the three regions (variables y_1 through y_3) were converted to percentage changes in real GDP (which are only available at a quarterly frequency) based upon a simple linear regression over the same 22-year sample period.

Vanguard Investment
Counseling & Research

P.O. Box 2600
Valley Forge, PA 19482-2600

Connect with Vanguard™ > www.vanguard.com > 800-523-1036

Vanguard Investment Counseling & Research

Ellen Rinaldi, J.D., LL.M./Principal/Department Head

Joseph H. Davis, Ph.D./Principal
Francis M. Kinniry Jr., CFA/Principal
Daniel W. Wallick/Principal
Nelson W. Wicas, Ph.D./Principal

Frank J. Ambrosio, CFA
John Ameriks, Ph.D.
Donald G. Bennyhoff
Maria Bruno, CFP®
Scott J. Donaldson, CFA, CFP
Michael Hess
Julian Jackson
Colleen M. Jaconetti, CFP, CPA
Kushal Kshirsagar, Ph.D.
Christopher B. Philips
Glenn Sheay, CFA
Kimberly A. Stockton
Yesim Tokat, Ph.D.
David J. Walker, CFA

ICRCES 072006