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Chinese Stocks during 2000–2013: Bubbles and Busts or Fundamentals?

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Although the Chinese economy has weathered the recent global financial crisis well, Chinese financial markets performed poorly from late 2007 through the end of our sample period in 2013. This apparent disconnect between measured economic fundamentals and stock market performance has attracted considerable attention. However, it is important also to investigate whether this disconnect is only short-term with macroeconomic variables continuing to have important equilibrium relationships over the longer term. This article uses a multivariate cointegration and vector error correction model to test whether domestic macroeconomic fundamentals are important forces in explaining Chinese stock fluctuations. Test results show that economic factors in China have a long-term equilibrium relationship with stock market performance. Stock prices responded consistently negatively to changes in the real exchange rate during 2000–2013. After the Chinese stock market crashed in 2007, stock variations became more responsive to changes of economic fundamentals suggesting that there had been a bubble. Policy-driven factors, such as bank deposits and bank loans, had strong impacts on stock performance. Real economic factors, such as industrial production and exports, also became significant in explaining Chinese stock returns, but their economic impacts were smaller.

Keywords: financial and economic policies, VECM, China, stock performance, bubble, macroeconomic fundamentals

INTRODUCTION

The behavior of China's stock market has become a major topic of interest not only for the Chinese but also for investors and researchers from around the globe. The main Chinese national stock index, the Shanghai Composite Index, gained only 3.4 percent over the entire 2000–2012 period while China's economic growth was booming at an average of 10 percent per year during the same time (Figure 1). However, around this low rate of appreciation,

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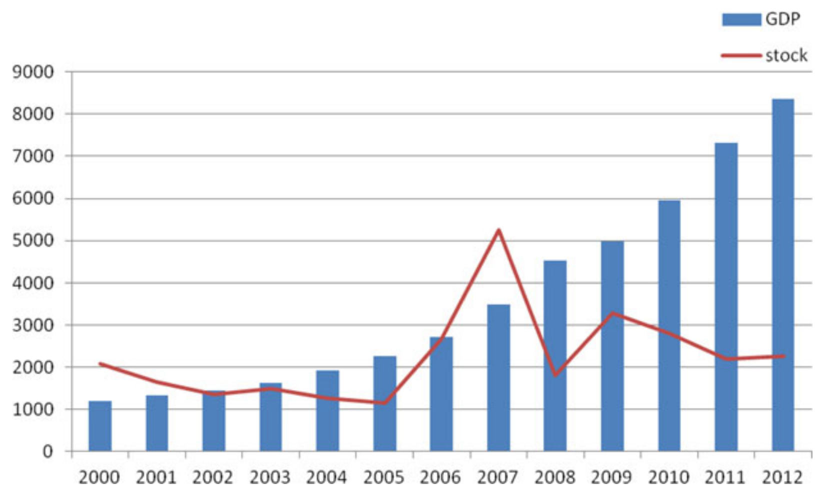

FIGURE 1 GDP and stock performance comparison in China (2000–2012). *Source*: Yahoo. Finance and World Bank.

China's financial markets have had quite sizeable booms and busts. The extent to which these movements in the market are related to changing rates of economic growth in China has become an interesting question. This, in turn, is related to the more general question of the extent to which movements in China's stock market are due to quantifiable domestic economic and financial fundamentals. Previous studies have made clear that the Chinese government often has major direct effects on the stock market through measures such as the issuance of stock to the general public by the massive state-owned companies as well as monetary and fiscal policies. This may be expected to reduce the explanatory power for stock prices of the standard domestic macroeconomic and financial variables.

Interest in Chinese financial markets heightened when the Shanghai Composite Index dropped nearly 22 percent during 2011. China's GDP increased at a sizzling 9.3 percent during the same year, and the forecasted growth was a solid 8 percent for 2012 (Yang 2011). According to some fund managers, it appeared that "Chinese stock performance has decoupled from its macroeconomic fundamentals" (*Bloomberg* 2012). Despite this short term disconnect, it is important to consider whether there is a long-term relationship between the major macroeconomic fundamentals and financial performance in China. This article investigates this question using a multivariate cointegration and vector error correction model over the period 2000 to 2013 and compares behavior before and after the 2007 stock market crash in China.

The rest of this article reviews literature about the relationship between economic variables and financial performance. It then describes data and methodology and explains testing results.

LITERATURE REVIEW

Studies of the relationship between macroeconomic fundamentals and financial market performance have a long history. For example, Chen, Roll, and Ross (1986) proposed that a long-run equilibrium exists between stock prices and economic variables, while Fama (1981) showed that macroeconomic forces affect corporations' expected future cash flows, dividend payments, and discount rates, therefore, indirectly determine stock prices at the firm level. Studies focused on developed countries usually confirm such relationships. Kim (2003) found that the S&P 500 stock price is positively correlated with industrial production, but negatively with the real exchange rate, interest rate, and inflation. More recent studies (Mun 2012; Hsing 2011) also found that financial markets are responsive to macroeconomic changes in established markets.

Research results from emerging and developing nations are mixed, however. Gay (2008) found insignificant relationships between economic factors and stock returns of Brazil, Russia, India, and China. Others, however, found that macroeconomic variables such as interest rates, inflation, exchange rates, money supplies, and GDP growth, have significant impacts on developing country stock markets, regardless of their relative inefficiency (Frimpong 2009; Omran 2003).

Mixed results have also been found for the Asia-Pacific region. Muradoglu, Metin, and Argac (2001) did not find macroeconomics to have a strong impact on Asian stock markets. But Vuyyuri (2005) found a causality relationship between the financial and the real sectors of the Indian economy. Wongbanpo and Sharma (2002) found that stock prices are related positively to output growth and negatively to increases in inflation for Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Chong and Goh (2005) derived similar results in Malaysia. Singh, Mehta, and Varsha (2011) found that the exchange rate and GDP growth affect stock returns in Taiwan, but inflation rate, exchange rate, and money supply negatively impact the portfolio composed of only big and medium Taiwanese companies.

Chinese stock markets have attracted considerable research attention because of their dynamic and rapidly evolving characteristics. Quite a few articles have focused on market efficiency as well as the degree of integration between Chinese stock markets and the rest of the world (Johansson 2010; Willett, Liang, and Zhang 2011; Yi, Heng, and Wong 2009). A number of studies examined the relationship between stock performance and economic fundamentals, but the fundamentals under investigation were often microeconomic factors such as dividend yields and price-to-earnings ratios (deBondt, Peltonen, and Santabárbara 2011). Only a handful of articles examined the impact of macroeconomic fundamentals on stock performance in China, and results were scattered and inconclusive. For example, Zhao (2010) studied the relationship between exchange rates and stock prices and found no long-term equilibrium relationship between the two from January 1991 to June 2009. However, Cao (2012) showed that such a relationship existed from July 2005 to January 2012. Cong, Wei, Jiao, and Fan (2008) tested a different set of variables and found that oil price volatility had no significant effect on Chinese stocks from July 1997 to September 2008. Cong and Shen (2013) found that increases in energy prices depressed stock prices from 2000 to 2010. A few authors conducted more comprehensive studies by including several macroeconomic independent variables. By employing heteroscedastic cointegration, Liu and Shrestha (2008) found that inflation, exchange rates, and interest rates have a negative relationship with the Chinese stock index. Chen and Jin (2010) discovered that bank loans and deposits, inflation, exchange rates, and money supply influence Chinese stock returns from 2005 to 2009. Using an autoregressive distributive lag cointegration approach, Bellalah and Habiba (2013) showed that interest rates, industrial production, and money supply are positively related to Chinese stock prices both in the long and short run during 2005 to 2010.

Given that earlier research on the topic is not only limited but also produced conflicting results, further research is warranted. This article goes beyond previous studies in several directions. First, it includes a wide range of macroeconomic factors to study the relationship between stocks and macroeconomic fundamentals. Second, both China and the rest of the world have experienced huge economic ups and downs in the new millennium; this study uses monthly data ranging from January 2000 to March 2013 to observe changes of financial performance. It splits the data into two time periods to investigate whether the influence of macroeconomic factors differ over China's stock market boom and bust. The article uses a multivariate cointegration and vector error correction model to capture the dynamic relationship between stock market performance and macroeconomic fundamentals in China, both in the short and long term.

DATA AND METHODOLOGY

Data

Seven macroeconomic variables are used to test the impact of domestic economic fundamentals on China's main stock market: Consumer Price Index, domestic credits and deposits of Chinese commercial banks, interest rate, real exchange rate, exports, and the Industrial Production Index. The MSCI All Country World Index is used to control for the influences of global financial markets on Chinese stocks. It includes roughly 14,000 stocks including large, medium, and small cap sizes for both advanced and emerging markets and also some micro caps for the advanced economies. We also use the S&P 500 Index to check for robustness of testing results. Overall Chinese stock performance is measured by the Shanghai Composite Index, a stock index that includes all stocks (both A shares and B shares) that are traded on the Shanghai Stock Exchange.[1] Chinese stock markets were not established until 1990. They seem to have become more efficient and responsive to domestic and global shocks since the new millennium (Liang 2007), so we select monthly data from January 2000 to March 2013 to investigate whether there are robust, long-term relationships between economic variables and stock performance in China. Table 1 and Figure 2 describe the variables used. All variables are transformed into natural logarithms.

TABLE 1
Definitions of Variables

Variables	*Definitions of variables*	*Sources of data*
LCPI	Natural logarithm of the month-end Consumer Price Index of China	IFS
LCR	Natural logarithm of the month-end domestic credit of Chinese Commercial banks	IFS
LDP	Natural logarithm of the month-end deposit of Chinese Commercial banks	IFS
LIR	Natural logarithm of the month-end Bank-Rate: Rate charged by the People's Bank of China on 20-day loan to financial institutions.	IFS
LRER	Natural logarithm of the month-end real effective exchange rate of China	IFS
LEX	Natural logarithm of the month-end exports of China	IFS
LIP	Natural logarithm of the month-end Industrial Production Index of China	World Bank
LACWI	Natural logarithm of the month-end MSCI All Country World Index	www.msci.com
LSHCI	Natural logarithm of the month-end Shanghai Composite Index of China	Yahoo.Finance

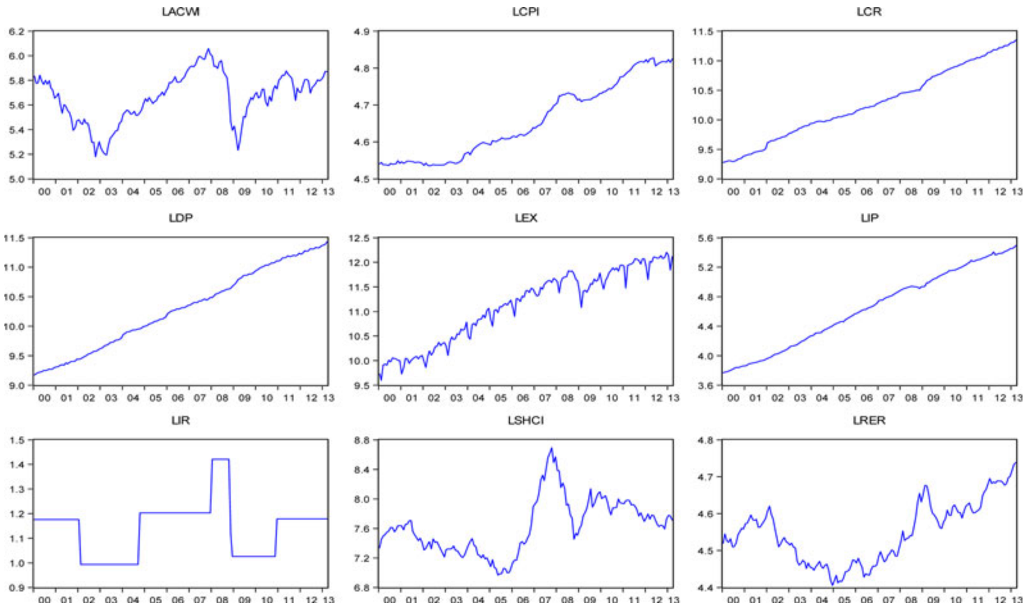

FIGURE 2 Graphs of variables.

There was a sharp rise and fall of the Shanghai Composite Index during the sample period. The index experienced six-fold gains during 2005–2007 then quickly lost more than 70 percent of its value in less than one year. Many argue that the Chinese stock market was in a bubble before it crashed (Jiang et al. 2010). Yao and Luo (2009) suggest that the primary cause of the beginning of the fall, which started before the U.S. subprime crisis began to have major effects on global financial markets, was that households were reaching the limits of the proportions of their savings that they were willing to put into the market. The proximate cause of the timing was the decision by Petro China to switch its listing to the Hong Kong Stock Exchange.[2] Once the momentum of the rapid rise in stock prices was broken, many investors began to engage in fundamental analysis. Yao and Luo argued that many of the major stocks had become overvalued by as much as six to eight times. Once a substantial decline begins, momentum trading and herd instincts contribute to its continuation.

Given that speculative activities may have disconnected stock performance from fundamentals, we split the data into two periods to study to what extent economic fundamentals caused the boom and bust in Chinese financial markets. The first period dates from January 2000 to October 2007, representing the strong appreciation of the Chinese stock market; the second dates from November 2007 to March 2013, the period of its dramatic fall. Tests are conducted using the whole sample (January 2000 to March 2013) as well as two split sample period data.

Methodology

A variety of methodologies are available to examine the dynamic relationships between domestic macroeconomics and stock performance. Commonly used methods include different variations of Vector Autoregressive (VAR), multivariate Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models, Granger Causality, asset pricing models, correlation models, common factor models, event studies, and many others.

This article utilizes the Johansen-Juselius (1990) Multivariate Cointegration and Vector Error Correction Model (VECM). VECM has several advantages compared to other econometric methods. It is a system of equations estimated in one step without carrying over the error term. It does not make a priori assumptions of arbitrary exogeneity or endogeneity. VECM corrects for disequilibria that may cause the system to deviate from its long-run equilibriums, and helps capture the dynamic and interdependent relationships among tested variables, both in the short and long term.

Stationarity Testing

Only stationary variables or a linear combination of variables that are stationary will ensure the existence of long-run equilibrium. Because most of the time series variables are nonstationary, they would generate spurious regression results unless differenced. Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) tests are used to perform unit roots test for stationarity. Akaike Information Criterion and Newey-West are used to choose lag lengths and select bandwidth.

Multivariate Cointegration Testing

When variables are cointegrated and share a common stochastic trend, a long-term equilibrium relationship exists among them. Variables are cointegrated if they are integrated of the same order or if a linear combination of them is stationary.

The Johansen-Juselius Multivariate Cointegration model is given below:

$$\Delta X_t = \sum\nolimits_j^{k-1} \Gamma_j \Delta X_{t-j} + \prod X_{t-k} + \mu + \epsilon_t$$

where X_t presents a p $\times$ 1 vector of I (1) variables. $\sum\nolimits_j^{k-1} \Gamma_j \Delta X_{t-j}$ and ΠX_{t-k} are the vector autoregressive component and error-correction components that represent short- and long-run adjustment to changes in X_t. μ is a p $\times$ 1 vector of constants. ϵ_t is a p $\times$ 1 vector of error terms. Γ_j is a p $\times$ p matrix that represents short run adjustments among variables across p equations at the jth lag. K is a lag structure. ΠX_{t-k} is the error correction term. Π is two separate matrices such that $\Pi = \alpha\beta'$, where β' denotes a p $\times$ r matrix of cointegrating parameters, and α is a p $\times$ r matrix of speed of adjustment parameters, measuring the speed of convergence to the long-run equilibrium.

Even if the testing variables share an equilibrium relationship in the long run, there still may be disequilibrium in the short term. With the error correction mechanism, deviations from equilibrium will be corrected over time so the variables maintain a long-run relationship and the stochastic trends of these time series will still be correlated with one another. The error correction procedure is a way to reconcile short-run and long-run behavior. Hence, a VECM is a restricted VAR that has cointegration restrictions built into the specification.

The model uses λtrace and λmax eigenvalue statistics to determine the number of cointegrating vectors, or the ranks of cointegration. The Akaike Information Criterion is used to select the appropriate lag lengths before running the VECM equations. If the long-run equilibrium condition is satisfied and the cointegrating relationship is significant, the VECM coefficients will examine the dynamic relationship between economic factors and stock performance.

TEST RESULTS

Stationarity Tests

The ADF/PP test results are reported in Table 2. ADF results indicate that all variables are nonstationary in levels but stationary in first differences except for exports. However, the PP results cannot reject that the exports variable is not stationary in its first difference; hence, all variables are included in the cointegration test as first differences.

Cointegration Tests

Cointegration tests were conducted using three time frames: the entire sample (January 2000–March 2013), the first period (January 2000–October 2007), and the second period (November 2007–March 2013). Results are reported in Table 3. Cointegration ranks from both λtrace and λmax are used to conduct the VECM. Minimized Akaike information and Schwartz criteria are used to select the lags for the VECM. Final results presented are from the best fitted models with the highest R-squared and adjusted R-squared values. Robustness tests are conducted using other possible cointegration ranks and lags.

Because both λtrace and λmax yielded cointegrating vectors significant at the 5 percent level or better, the variables tested are cointegrated for all three sample periods, which mean that the tested series share a common stochastic trend and will grow proportionally in the long term. This implies that both domestic macroeconomic fundamentals and the global stock index influence Chinese stock performance in the long term.

TABLE 2
Results of Unit Root Test

	ADF	*PP*		*ADF*	*PP*
	Levels			*First Differences*	
LSHCI	0.5492	0.2977	D(LSHCI)	0	0
LCPI	0.9974	0.9911	D(LCPI)	0	0
LCR	0.9925	0.9925	D(LCR)	0	0
LDP	0.9667	0.9682	D(LDP)	0	0
LEX	0.6367	0.5298	D(LEX)	0.1354	0
LIP	0.941	0.9412	D(LIP)	0	0
LIR	0.1993	0.1246	D(LIR)	0	0
LRER	0.8996	0.9313	D(LRER)	0	0
LACWI	0.3905	0.3036	D(LACWI)	0	0

TABLE 3
Results of Johansen Cointegration Ranks

Hypothesized No. of CE(s)	*Eigenvalue*	*Trace Statistic*	*0.05 Critical Value*	*Prob.***	*Hypothesized No. of CE(s)*	*Eigenvalue*	*Max-Eigen Statistic*	*0.05 Critical Value*	*Prob.***
				1/2000–3/2013					
None*	0.337.925	288.654	215.1232	0	None*	0.337.925	63.50601	61.8055	0.034
At most 1*	0.311.693	225.148	175.1715	0	At most 1*	0.311.693	57.52222	55.72819	0.0327
At most 2*	0.258.245	167.6258	139.2753	0.0004	At most 2	0.258.245	46.00547	49.58633	0.1127
At most 3*	0.201.258	121.6203	107.3466	0.0041	At most 3	0.201.258	34.60646	43.41977	0.3268
At most 4*	0.193.996	87.01387	79.34145	0.0117	At most 4	0.193.996	33.21263	37.16359	0.133
At most 5	0.148.249	53.80124	55.24578	0.0667	At most 5	0.148.249	24.71096	30.81507	0.2319
At most 6	0.111.486	29.09028	35.0109	0.1869	At most 6	0.111.486	18.20358	24.25202	0.2573
At most 7	0.064994	10.8867	18.39771	0.399	At most 7	0.064994	10.34916	17.14769	0.3658
At most 8	0.003484	0.537539	3.841466	0.4635	At most 8	0.003484	0.537,539	3.841466	0.4635
				1/2000–10/2007					
None*	0.629,381	315.039	215.1232	0	None*	0.629,381	90.32496	61.8055	0
At most 1*	0.461,145	224.714	175.1715	0	At most 1*	0.461,145	56.26608	55.72819	0.0441
At most 2*	0.406,869	168.4479	139.2753	0.0003	At most 2	0.406,869	47.53289	49.58633	0.0806
At most 3*	0.324,539	120.915	107.3466	0.0048	At most 3	0.324,539	35.70471	43.41977	0.2696
At most 4*	0.268,723	85.21031	79.34145	0.0168	At most 4	0.268,723	28.47961	37.16359	0.3489
At most 5*	0.212,663	56.7307	55.24578	0.0368	At most 5	0.212,663	21.75794	30.81507	0.4153
At most 6	0.198,134	34.97276	35.0109	0.0505	At most 6	0.198,134	20.09403	24.25202	0.1615
At most 7	0.14,786	14.87873	18.39771	0.1452	At most 7	0.14,786	14.56042	17.14769	0.1145
At most 8	0.003492	0.318309	3.841466	0.5726	At most 8	0.003492	0.318309	3.841466	0.5726
				11/2007–3/2013					
None*	0.787,923	302.4593	197.3709	0	None*	0.787,923	102.3533	58.43354	0
At most 1*	0.585,975	200.106	159.5297	0	At most 1*	0.585,975	58.20069	52.36261	0.0114
At most 2*	0.467,299	141.9053	125.6154	0.0035	At most 2	0.467,299	41.56648	46.23142	0.1454
At most 3*	0.379,886	100.3388	95.75366	0.0233	At most 3	0.379,886	31.5382	40.07757	0.3289
At most 4	0.302,016	68.80061	69.81889	0.0601	At most 4	0.302,016	23.73093	33.87687	0.4753
At most 5	0.223,942	45.06968	47.85613	0.0893	At most 5	0.223,942	16.73286	27.58434	0.603
At most 6	0.172,082	28.33682	29.79707	0.073	At most 6	0.172,082	12.46348	21.13162	0.5026
At most 7	0.152,414	15.87334	15.49471	0.0438	At most 7	0.152,414	10.91397	14.2646	0.1586
At most 8	0.072388	4.95937	3.841466	0.0259	At most 8*	0.072388	4.95,937	3.841466	0.0259

VECM Results

The Johansen-Juselius cointegration tests showed that long-term equilibrium relationships exist during the full period as well as during both subperiods. Judged by the R^2, the adjusted R^2, and numbers of significant independent variables, the model fits best during the second sample period, indicating that the explanatory power of economic variables becomes stronger after the Chinese stock market crashed in late 2007. This finding is consistent with beliefs that the market had displayed a substantial element of bubble in the earlier period.

Whole Sample (January 2000–March 2013)

A long-term relationship exists between Chinese stock performance and the economic variables during the whole sample period of 2000–2013. However, the explanatory power of these independent variables is small, and the model only has an R-squared of 0.31. This outcome could be due in part to different relations over different periods and our analysis of subperiods suggests that this is indeed a factor.

In contrast to results found by Cao (2012), we find that the real exchange rate has a negative impact on Chinese stock performance. A 1 percent appreciation[3] of the real exchange rate decreases stock performance by 1.96 percent (Table 4). This finding seems reasonable, as appreciation of the real exchange rate makes Chinese goods more expensive in the global markets, reduces competitiveness of its exports, and lowers Chinese company earnings. Thus, we would expect that their stock returns would fall. Robustness tests confirm the negative effect.[4]

While Chinese stock markets are relatively new, they have become gradually more integrated with the rest of the global financial markets, and there is substantial evidence that

TABLE 4
Significant VECM Coefficients with MSCI All Country World Index and Global Financial Crisis Dummy

	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*
		1/2000-3/2013		
$\Delta\ln RER_{t-1}$	−1.96	0.599	−3.271	0.001
$\Delta\ln ACWI_{t-2}$	0.276*	0.165	1.672	0.097
		1/2000-10/2007		
$\Delta\ln RER_{t-1}$	−1.582	0.678	−2.334	0.023
		11/2007-3/2013		
$\Delta\ln DP_{t-4}$	−7.074	2.766	−2.558	0.02
$\Delta\ln CR_{t-4}$	6.989	3.168	2.206	0.041
$\Delta\ln EX_{t-1}$	0.409*	0.198	2.068	0.053
$\Delta\ln EX_{t-2}$	0.612	0.216	2.832	0.011
$\Delta\ln EX_{t-3}$	0.582	0.231	2.524	0.021
$\Delta\ln EX_{t-4}$	0.686	0.229	2.996	0.008
$\Delta\ln IP_{t-3}$	6.635	2.951	2.248	0.037
$\Delta\ln ACWI_{t-1}$	−1.151	0.434	−2.652	0.016
$\Delta\ln ACWI_{t-4}$	−0.742	0.353	−2.104	0.05

The coefficients without mark are statistically significant at the level equal to or less than 5%.
The coefficient with *are statistically significant at the level greater than 5% but less than 10%.

long-run linkages exist between the Shanghai, the U.S., and other regional financial exchanges (Burdekin and Sklos 2012). This article also shows that a significant positive relationship exists between the Shanghai Composite Index and MSCI All Country World Index during 2000–2013. However, the effect is small and lagged. Given the maintenance of substantial capital controls, it is not surprising that the international linkages are fairly weak.

First Period (January 2000–October 2007)

The VECM model produces an R-squared of 0.45, indicating that the testing variables combined explain Chinese stock performances slightly better during 2000–2007 than for the whole period. This finding suggests that there were important structural breaks between the first and second periods.

The real exchange rate is the only variable of statistical significance that explains the Shanghai Composite Index movements during this time period. The effect is still negative and large but to a slightly lesser degree than for the full sample. A 1 percent appreciation of the real exchange rate decreases stock performance by 1.582 percent. On July 21, 2005, the Chinese central bank revalued the yuan from 8.27 to 8.11 per U.S. dollar, and the Chinese yuan has been appreciating with stops and starts ever since. Interestingly, the Chinese stock market began to skyrocket in mid-2005 when the exchange rate peg was loosened. Thus, the negative short-run relationship would be missed if one looked at just the total changes over this period. Many considered the Chinese currency still to be significantly undervalued over this period, and the daily adjustment bands may have been set too low.[5] As a result of continued undervaluation, the dampening effect from exchange rate appreciation was much too small to stop the Chinese stock boom in 2005–2007.

Second Period (November 2007–March 2013)

The R-squared for the second period model increases to 0.85, indicating the long-term relationship among economic variables and Chinese stocks became much stronger. Not only do the combined independent variables explain Chinese stocks better, but five out of the eight independent variables tested also have significant explanatory power for Chinese stock price variations.

Changes in bank flows, both bank deposits and credits, have statistical significance and economic importance for Chinese stock performance. Coefficients for both variables are quite large, which is consistent with Burdekin and Tao's (2014) finding of the importance of credit conditions for both China's stock and housing prices and with Chen and Jin (2010)'s findings that credit supply and demand are the most important factors in determining Chinese stock returns. A 1 percent increase of bank loans leads to an increase of 6.99 percent in stock returns. The positive effect is realized with a four month lag instead of instantaneously. This suggests that the additional supply of funds from credit expansion did not immediately flow into the stock market. The result implies that expansions of credit supplies initially increase capital injections to companies, increasing firm level expenditures and corporate earnings, and fueling overall stock market growth later on.

An increase in bank deposits has a strongly negative influence on stock performance after 2007. This suggests that agents are putting more of their funds into deposits because they see less promise from investing in the stock market. The test results find that a 1 percent increase of bank deposits decreases stock performance by 7.07 percent, with the negative effect being realized with a four-month lag. When investors are more risk averse, they are less willing to invest in risky financial assets such as stocks. Thus, the supply of funds in the stock markets goes down and so does the stock performance. One possible explanation of the lag is that it takes several months to absorb the unfavorable effect. This explanation suggests that most investors did not withdraw their funds from the stock markets in a panic; instead, there is less capital supplied to the stock market and more deposits made at banks over a period of time. The transitional process appears to be gradual and worthy of further study.

Real economic variables, such as export and industrial production, also played a role in determining Chinese financial performance after 2007 even though they did not do so during the earlier period. China has pursued export-led economic growth since its economic reform in 1978. During 2000–2012, exports as a percentage of GDP averaged approximately 36 percent, and exports have been a significant driving force of the Chinese economy. Test results indicate that an increase in export growth has a small but prolonged effect on stock market performance. A 1 percent increase of exports has positive effects of 0.41, 0.61, 0.58, and 0.69 percent for the four-month period.

Increases of industrial production also generate stock market increases. As the *world's manufacturer*, China's industrial production has been growing at an impressive rate, averaging 13.4 percent from 1990 to 2012. Increases of industrial production indicate an increase of overall economic activity and should help stock market performance. The test results find that a 1 percent rise in the growth of industrial production increases stock returns by 6.64 percent after three months.

The relationship between Chinese stocks and the rest of the world has become interesting since November 2007. The Shanghai Composite Index and MSCI All Country World Index headed in opposite directions. On average, when the MSCI All Country World Index went up 1 percent, the Shanghai Composite Index fell 1.15 percent in one month and 0.74 percent over the four-month lag. Figure 2 also shows that the MSCI All Country World Index has gradually recovered after the global crisis, but the Shanghai Composite Index has definitely not. The dummy variable for the Global Financial Crisis was not significant. This is likely because the Chinese market had already begun its steep decline before the global crisis had begun to have its major effects on financial markets.

The Chinese economy has maintained healthy growth since the Global Financial Crisis. If macroeconomic variables explain Chinese financial performance better after 2007, why have Chinese stock markets not revisited their glory days in 2005–2007? One plausible explanation is that the ups and downs in Chinese stock markets were not always reflections of changes in fundamentals. While its performance may have reflected, in part, an adjustment from a previous undervaluation, the 2005–2007 stock boom appears to have had a substantial element of speculative bubble that could not have been sustained even in the absence of the Global Financial Crisis. Since Chinese financial markets are still in their infancy, it should not be surprising that they may have been prone to bubbles. A majority of investors in China are individual domestic residents instead of institutional investors. Individual investors, in general, are less sophisticated and more prone to the influence of market psychology.

A lack of investment alternatives also increased the attractiveness of Chinese stocks, making them vehicles of speculation and sensitive to policy changes and market sentiment shifts.

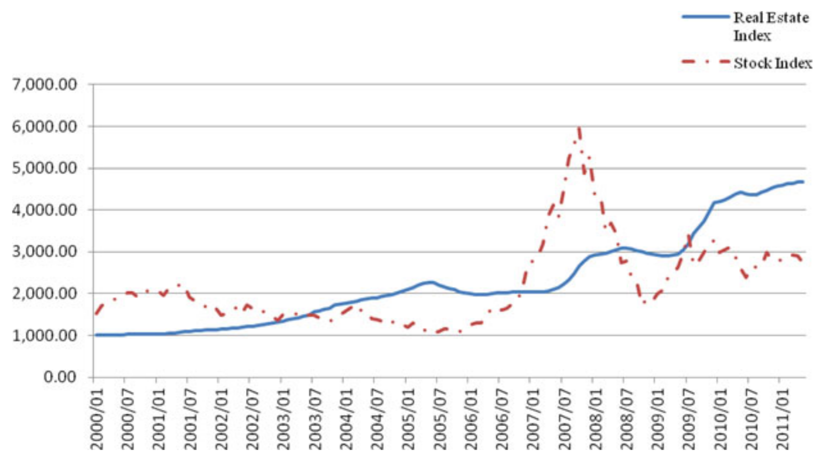

FIGURE 3 Shanghai Real Estate Index and Shanghai Stock Index comparison (1/2000–5/2011). *Source*: Shanghai Real Estate Index was provided by Richard Burdekin and Ran Tao.

As stressed in the new literature on behavioral finance, investor factors such as overoptimism, confirmation bias, and propensities for herd behavior can play a substantial role in market ups and downs, even in advanced economies (Barberis and Thaler 2003). Such propensities for bubbles seem even more likely to be important for a country like China. Herding and overoptimism likely helped build the bubble during 2005–2007, and panic and loss of confidence contributed to its sharp fall (Bellotti, Taffler, and Tian 2010; Yao and Luo 2009).

During the Global Financial Crisis, the Chinese government injected large capital spending to revive the domestic economy that should have increased the stock market activities but didn't. Some suspect that the extra liquidity may have largely stayed away from stocks and gone into the housing markets instead after the fear created by the stock bubble crash (Deng, Morck, Wu, and Yeung 2011). There was a linkage between stock and real estate markets and co-determination of stock and housing prices in China (Burdekin and Tao 2014). The real estate market benefits when the authorities tried to cool down stock prices, and vice versa. In addition, real estate ups and downs in China are largely driven by government policies. After a first round of property cooling measures in 2007, the Chinese government released a set of policies[6] that favored the property market and may have helped channel spending from the Chinese stimulus program more into housing than stocks. Figure 3 shows the behavior of the stock market alongside an index of house prices in Shanghai (cf. Burdekin and Tao 2014). As can be seen in this chart, the relationships differ substantially between our first and second periods. The correlation coefficient between real estate and stock index is a positive 0.24 in the first period but becomes a negative 0.12 in the second period. This change suggests that investors lost their appetite for stocks after the stock bubble burst, but shifted heavily toward real estate, generating what many today have judged also to be a bubble.

Real economic factors, such as exports and industrial production, explained stock performance better after 2007, but their economic impacts were either small or delayed, which further explains why Chinese stocks have not been able to return to the 2005–2007 highs. There was

Table 5
Significant VECM Coefficients with S&P500 Index and Tradable Share Dummy

		Std. Error	*t-Statistic*	*Prob.*
		1/2000-3/2013		
$\Delta \ln RER_{t-1}$	−1.40	0.598	−2.348	0.02
Tradable_Dummy	0.05*	0.021	2.505	0.01
		1/2000-10/2007		
$\Delta \ln RER_{t-1}$	−1.366	0.678	−2.015	0.048
		11/2007-3/2013		
$\Delta \ln CR_{t-1}$	4.138*	2.142	1.932	0.059
$\Delta \ln IR_{t-2}$	0.534*	0.309	1.730	0.091
$\Delta \ln RER_{t-1}$	−3.893	1.086	−3.586	0.001
$\Delta \ln RER_{t-2}$	−2.930	0.985	−2.973	0.005
$\Delta \ln SP_{t-2}$	−0.631	0.263	−2.398	0.021

The coefficients without mark are statistically significant at the level equal to or less than 5%.
The coefficient with *are statistically significant at the level greater than 5% but less than 10%.
**Results became insignificant when robustness tests were conducted using different lags and cointegration ranks.

also evidence that even though China's post crisis growth has been robust in comparison with other countries, it was still substantially lower than before the crisis (see Willett, Liang, and Zhang 2011).

Changes of the real exchange rate do not explain Chinese stock performance after 2007, neither do inflation and interest rates. These results are fairly consistent when robustness tests are conducted using different lags and number of cointegration equations. However, when we substitute the S&P 500 Index for the MSCI Index, we do find significant negative effects for the exchange rate and a small positive effect for the interest rate over the second period (see Table 5). Credit growth retains a substantial coefficient and the global crisis dummy remains insignificant. We also tried a dummy variable for the government nontradable share reforms in 2005 and 2006, but the results were not robust. The relationship of the S&P 500 Index with the Shanghai Composite Index remains negative in the second period as it did with the MSCI All Country World Index. Using the S&P 500 Index, however, results in substantially lower explanatory power with the R squared falling from .31 to .22 for the whole period and from .85 to .54 for the second period. Thus we put less weight on the estimates using the S&P 500.

CONCLUSION

This article investigated the relationships between domestic macroeconomic fundamentals and Chinese financial performance. The test results suggest that, despite some important short-run disconnects, a number of economic factors do have a long-run equilibrium relationship with Chinese stock performance and these relationships became stronger after the stock market crash of 2007. Chinese stocks have become more sensitive to changes of bank capital flows and responsive to changes of real economic factors, such as exports and industrial production.

Even though macroeconomic variables helped explain financial performance better after 2007, China's impressive economic growth did not revive the stock market. One suspects that the great stock boom during 2005–2007 had a substantial element of unsustainable bubble.

In addition, financial reforms in China have been strictly controlled by the government, and financial variables responded not only to demands of economic growth but also to changes in political constraints (Xu and Oh 2011). Government policies often have substantial impacts on market performance. For example, since the vast majority of shares for companies listed on Chinese stock markets still remain state-owned, the news of a huge number of government shares coming onto the market has greatly depressed stock prices, regardless of the country's strong economic performance (*China Daily* 2008). Nonetheless, this test finds that over time the Chinese financial markets have become more responsive to economic fundamentals, as one would expect in a maturing market. Still, considerable scope remains for further improvements in the functioning of China's financial markets.

NOTES

1. We used the Shanghai Composite Index because it represents large enterprises. Another national stock index, the Shenzhen Composite Index, represents smaller, younger, and privately owned companies in China.
2. See also Burdekin and Redfern (2009) on the relationships between the stock market and savings deposits at this time.
3. We refer to appreciation as an increase in the exchange rate.
4. Note that under flexible exchange rates, there is no a priori expected relationship as the correlations should vary with the type of shock. For example, a development that increases the outlook for the economy would likely increase both the exchange rate and the value of the currency. With a fixed rate, revaluations are at least partially exogenous in the short run and, thus, we would expect normally to see a negative correlation which is what our results indicate.
5. For analysis and references to debate over China's exchange rate policy see Sinnakkannu 2010 and Willett, Ouyang, & Liang 2009.
6. For example, since mid-September 2008, China cut the preferential housing mortgage rate five times to boost the economy. On October 22, 2008, China announced a series of policy changes for the same purpose: lower mortgage rates, reduced down payments, lower transaction taxes. On November 7, 2008, China announced a 4 trillion yuan stimulus package. A tenth, or 400 billion yuan, is to be used on construction of affordable housing. On December 17, 2008, China announced measures to support the property market, including cuts in business and transaction taxes for real estate sales, and policies to make it easier for developers to obtain credit (*Reuters* 2010).

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