Three Essays on Emerging Capital Markets

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Abstract

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The theme of my dissertation is emerging capital markets behavior. I utilize three approaches: institutional, experimental and econometric to study the impact of reforms on capital allocation and stock market operation.

In Chapter one, using a unique data set on Chinese provincial savings and investment, I prove that the torrent of reports about the inadequacies of the Chinese financial system, accompanied by studies claiming product and capital market segmentation, overlooks real achievements. While my aggregate results parallel those of Boyreau-Debray and Wei (2002) and others, I am able to assess the impact of financial innovation on capital flows outside the government allocation mechanism. Stripping out foreign funds, government appropriations, and officially influenced bank loans, I discover that inter-provincial commercial capital flows present a strong trend toward market integration and their mobility pattern starts to bear resemblance to interstate flows in the U.S. and other advanced nations. This result undercuts the widespread view of China's economy as lacking in domestic integration.

Several emerging capital markets have adopted legally separated share markets (LSSM) in which local firms market separate claims to the same underlying dividend flow to two distinct sets of investors, domestic shareholders trading "A" shares with domestic currency and foreign investors trading "B" shares with foreign currency. I utilize an experimental approach to show that information transference across these segmented markets may have caused the covariance in A and B shares' price movements. Our hypothesis is that. My results not only suggest that there is indeed information transmission across LSSM, but also indicate that the quality and clarify of signals sent out by the market with more information directly impacts the success of information transference.

Chapter 3 takes an empirical approach to study the risk and return relationships of A and B shares with a standard CAPM model. I utilize CAPM models to directly estimate the *betas* of A and B shares listed in the Shanghai Stock Exchange. I find that domestic investors price asset risk as predicted by CAPM models, but foreign investors do so only for large and prominent Chinese firms with significantly better performance.

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I would like to dedicate this dissertation for my family both in China and in the U.S., especially for my husband, John, who is always supportive and understanding.

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PREFACE

Motivation

Creating large, deep and effective capital markets to replace the central planning system to allocate resources has become a huge task for many state-controlled economies. In compressing the development of these systems into a few short years, these countries often have unique institutional characteristics in their capital markets that are not observed in currently advanced nations. It is those unusual institutional characteristics that provide us with new perspectives to look at some of the existing finance and economic theories, and to comprehend the characteristics of the performance as well as the functions of the emerging capital markets.

The experience of emerging financial and capital markets also provides an opportunity to re-think the relationship between finance and development. Economists have studied the relationship between finance and economic growth for centuries. While recent empirical studies often support Schumpeter's classical argument that financial systems promote economic growth (e.g., King and Levine 1993), the simple coincidence of weak financial systems with record setting growth rates, observed almost everywhere in East Asia, remains puzzling.

Moreover, standard approaches studying East Asian growth experience ignore financial systems when discussing growth spurts, but focus on them when discussing slowdowns (such as the case of Japan in 1990s) and crisis (such as Korea in 1997/1998). The gap in fundamental theories applied to analyze East Asian development history suggests that we have employed one vision of what makes these countries grow, but another for what creates impediments and problems for the system. It is widely accepted that technology, education, high investment rates and export strategies played an important role in stimulating the initial growth spurts.

Meanwhile there is also a strong consensus on the weakness and inefficiencies in the financial systems in this region. But these conventional views seem to be unaware of the obvious gap in their vision of economic growth in the world's most dynamic region – how do we move from growth mode to crisis mode?

Such a gap also exists in the empirical studies on this region as well. Numerous studies have focused on elaborating the inefficiencies and wastefulness associated with government mandated lending, bad loans etc. But these repeated stories, though identifying serious problems in the system, catch only parts of the story. For example, problems in the banking industry in China have been well studied by many scholars (Lardy 1998). But domestic bank loans account for only 1/3 of total funds for fixed asset investment. Moreover, this feature is not only shared in China: Tsai (2002) reports that informal credit as percentage of total formal borrowings in Indonesia is greater than 80%, in Korea (rural areas) is greater than 50%, in Taiwan is 24 – 40%, and in Thailand is 21-50%.

Perhaps the puzzle and gap in the standard growth story exaggerate the role of government and exaggerate the role of government-dominated (through ownership as in China and Korea, or direction, as in Japan) financial institutions. The conventional views fail to place the inefficiencies and apparent problems mainly arising from the "government-led sector" in perspective with the sectors outside strong government influence. If informal finance is important, and if informal finance avoids many of the traps that have hobbled major financial institutions, then perhaps we can see the beginnings of an explanation of growth spurts that includes finance. One possible resolution to the gap we discovered is to concentrate on the contribution of informal, unofficial, commercial financing.

This approach requires breaking the pattern of traditional aggregate level data analysis. We need to go beneath the surface to examine aggregates as well as components because analysis based on indicators such as total investments, total savings, total amount of bank loans etc. do not distinguish the behavior of sectors with and without strong government influence.

Objectives

Driven by the two themes mentioned above, I study the development of what I will define as the "business sector," which is outside government budget plans and beyond strong official influence, and analyze its impact on the real side of the economy. Starting with the country case study for China, this research below aggregate level data will help to understand the puzzle of "weak financial system" and real economic development as a result of reform policies. I also study the unique institutional features, functions and performance of Chinese stock markets and their implications to fundamental financial and economic theories. The specific objectives of my dissertation research are to: 1) re-evaluate conventional consensus on the fragmentation of Chinese financial markets with both aggregate level data and component level data to illustrate the distinct behavior of "business sector" and "official sector" (which is under official budget plan and strong official influence), thus proving that the "business sector" started to behave as the ones in more advanced nations with strong market characteristics; 2) examine and test some of the most fundamental financial theories utilizing the unusual institutional forms observed in transitional economies' capital markets; 3) apply widely used capital asset pricing models to field data obtained in emerging capital markets to understand investors' pricing behavior in an environment with institutional constraints.

Background Knowledge

My dissertation will focus on the capital market in China. In the following sections, I will introduce the background information of the financial theories engaged in my dissertation and the development of the Chinese capital market.

Financial Theories

The pioneer theoretical work on the financial market dates back to the beginning of the 20th century. But the first most famous breakthrough in financial theories is Harry Markowitz's optimal portfolio selection theory in the 1950s. Markowitz developed this theory in the context of trade-offs between risk and return, focusing on the idea of portfolio diversification as a method of reducing risk. James Tobin added money to Markowitz's theory and concluded that different risk attitudes will merely result in different combinations of money (the riskless asset) and a single portfolio of risky assets, which is the same for everyone. The portfolio theories can be carried to empirical studies by using CAPM model, which was credited to William Sharpe and John Lintner in 1960s. The CAPM model relates an asset's risk to its expected return and measures the risk by calculating the covariance of an asset with respect to a general market index. CAPM became the most popular empirical models. However, it was challenged by Richard Roll (1977, 1978) who argues that the CAPM model is impossible to test "unless the exact composition of the true market portfolios is known and used in the test." (Richard Roll, 1977) Meanwhile other models like Intertemporal CAPM and arbitrage pricing models were also developed as alternative models to address asset pricing issues. One best-known theory is Robert Lucas' one tree model (1978).

The experimental approach has also been adopted to test some of these fundamental financial theories. This method has become an important alternative to traditional econometric

methods because field data cannot identify fundamental factors employed in financial theories such as an individual's utility function and dividend flows generated by stocks. The central theme of capital asset market experiments is to test information efficiency. Experiments have focused upon information revelation, as in the degree to which information held by an insider becomes reflected in the market price, and on information aggregation, as when no individual knows the true state that will determine the dividend flow, but there is sufficient partial information distributed within the population that if all of the information were pooled the true state would be revealed.

Development of the Capital Market in China

Although the Chinese capital market is still at a primitive stage, it has a long history. The Shanghai Stock Exchange (SSE) was the biggest stock exchange in Asia prior to World War II. The SSE was terminated after the establishment of People's Republic of China in 1949. Until the reforms started in 1978, China had no capital market because the state exercised virtually full control over the collection and disbursement of funds.

But since the start of reform in the late 1970s, elements of a capital market began to appear. Banks emerged from government departments (for example, the giants in China's banking system are the four state-owned commercial banks: China Construction Bank, Industrial and Commercial Bank of China, Agricultural Bank of China and Bank of China). A central bank, the People's Bank of China, was established. Insurance companies emerged. By the end of 2002, there were 16 domestic funded insurance institutions and 28 joint venture and foreign investment insurance institutions. The total figure of insurance premium reached 305.4 billion Yuan in 2002.[1] Firms have gained a growing degree of independence and turned their attention to profit seeking. In early 1990s, two stock exchanges opened. Business behavior based on

[1] *China Statistical Yearbook 2003*, p. 709.

strategies encompassing capital markets becomes feasible. Chinese firms can attempt to list abroad and raise funds from overseas. In 2001, China's stock market raised 125.23 billion Yuan, among which, 7.13 billion Yuan were raised abroad (through companies listed in Hong Kong and New York Stock Exchanges). Capital raised domestically through China's securities market accounts for 4.25 percent of the fixed asset investment in 2001. More than 6 million stock accounts were opened in China by the end of 2001.[2] The total number of listed companies grew to 1224 by the end of 2002.[3]

Tables 1 and 2 demonstrate part of the Chinese capital market development. As shown in table 1, both the indirect financing through the banking sector and the self finance (which includes equity financing through securities market and other forms of self finance) have increased significantly during the past two decades of economic growth. On the contrary, the proportions of state appropriations in the fixed asset investment have decreased over the years, indicating that the government tends to use the market tools (for example, directed bank loans instead of lump-sum appropriations) to affect the economy. Table 2 shows the rapid development of the stock market in China since its establishment in early 1990s.

Readers can also compare indicators of the development of China's financial market with more advanced nations such as OECD countries, United Kingdom and the U.S in table 3.

Outline of Dissertation

My dissertation is composed of three chapters. Chapter 1 concentrates on the institutional perspective to re-evaluate the conventional view on the fragmentation of Chinese financial markets by examining both aggregate and component level data on provincial savings and investment. Stripping out foreign funds, government appropriations, and officially

[2] *Almanac of China's Finance and Banking* 2002, pp. 491-492.
[3] *China Statistical Yearbook 2003*, pp. 707-708.

influenced bank loans, I discover that inter-provincial commercial capital flows behave like interstate flows in the US and other advanced nations. This result undercuts the widespread view of China's economy as lacking in domestic integration. Chapter 2 and Chapter 3 are based on the studies of separated share markets phenomenon in China's security market. In China, a firm can sell claims to the same dividend flows to both foreign investors and domestic investors by issuing two classes of shares – A shares and B shares. Each class of investors can buy and trade only one of these two types of shares.[4] This type of institutional constraint is also observed in other developing countries' security markets. For example, the Philippines and Mexico have similar designs in their stock markets to control the influence of foreign investment on fundamental domestic industries such as banking and financial sectors. The second chapter of my dissertation provides explanations (based on information use and transference across A and B share markets in China) for the price co-movements observed in A and B shares. Using a simple experimental design, we are able to validate, both theoretically and empirically, preliminary "conjectures" suggested by previous studies on the causes of A and B share price co-movements. The third chapter utilizes the empirical analysis of separated share markets to understand how the Chinese security market functions and how domestic and foreign investors price assets in this environment. I find that domestic investors price asset risk as predicted by CAPM models, but foreign investors do so only for large and prominent Chinese firms with excellent performance.

Finally, the concluding section will summarize findings and introduce topics that can be expanded and addressed from the dissertation and future research plans.

[4] Starting on Feb 19, 2001, Chinese citizens were allowed to trade B shares with U.S. dollars (*Almanac of China's Finance and Banking 2002*, p. 298).

Table 1 Growth of China's Financial Market

(Unit in RMB, 100 millions)

	GNP	GNP Growth Rate[c]	Total Fixed Asset Investment	Components of Total Fixed Asset Investment			
				State Appropriations	Domestic Loans	Foreign Investment	Self Finance
1981	4860.3	5.2%	839.01	269.76 (28%)	122.00 (12.7%)	36.36 (3.8%)	532.89 (55.45%)
1985	8989.1	13.2%	2543.19	407.8 (16%)	510.27 (20.1%)	91.48 (3.6%)	1533.64 (60.3%)
1990	18598.4	4.2%	4517.5	393.03 (8.7%)	885.45 (19.6%)	284.61 (6.3%)	2954.41 (65.4%)
1995	57494.9	9%	20524.86	621.05 (3.0%)	4198.73 (20.5%)	2295.89 (11.2%)	13409.19 (65.3%)
2000	88189.6	8.3%	33110.1	2109.45 (6.4%)	6727.27 (20.3%)	1696.24 (5.1%)	22577.14 (68.2%)

Note. Readers should be aware that there have been extensive debates on the reliability of China's GDP statistics (see Rawski 2001, Holz 2001, 2003). However, the GDP and other data reported and used in this dissertation are obtained from published official Chinese statistics.

I could not find information about what is precisely included in Foreign Investment. I believe the figures are only the direct investment in foreign investment. In other words, the capital raised through the sales of stocks to foreign investors is not included in this column, but is included in the Self Finance column. The percentage figures in parentheses are the proportions of the source of fund to the total fixed investment. The 1981 data were reported because the investment data for 1980 were not available. The GNP growth rate is the real annual growth rate with the previous year's GNP as the base.

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c. The GNP growth rate is the real annual growth rate with the previous year's GNP as the base.

Source: Almanac of China's Finance and Banking 2001, p. 540.

Table 2 Development of China's Security Market

(Unit in RMB, 100 millions)

Year	GDP	Total Market Capitalization	% To GDP	Negotiable Market Capitalization	% To GDP	Total Fixed Asset Investment	Capital Raised Domestically	% To Total Fixed Asset Investment
1992	26 638.1	1 048.13	3.93	N.A.	N.A.	8 317.0	50.00	0.6
1993	34 634.4	3 531.01	10.20	N.A.	N.A.	12 980.0	276.41	2.13
1994	46 759.4	3 690.62	7.89	964.82	2.06	16 856.3	99.78	0.59
1995	58 478.1	3 474.00	5.94	937.94	1.60	20 300.5	85.51	0.42
1996	67 884.6	9 842.37	14.50	2 867.03	4.22	23 336.1	294.34	1.26
1997	74 772.4	17 529.23	23.44	5 204.43	6.96	21 154.2	856.06	3.40
1998	79 552.8	19 505.64	24.52	5 745.59	7.22	27 630.8	778.02	2.82
1999	82 054.0	26 471.17	31.82	8 213.97	9.87	29 475.2	896.83	3.04
2000	89 404.0	48 090.94	53.79	89 404.0	17.99	N.A.	1 498.52	N.A.

Note. Total Market Capitalization is the market value of all the shares. Negotiable Market Capitalization is the market value of the tradable shares only. See Chapter 2 for the description of the tradable and non-tradable shares.

Source: Almanac of China's Finance and Banking 2001, p. 382.

Table 3 Indicators of the Development of the Financial Markets in China, OECD Countries, U.K. and U.S.

Country	GDP Per Capita Annual Growth	Domestic Credit Provided by Banking Sector (% to GDP)	Foreign Direct Investment, Net Inflows (% to GDP)	Liquid Liabilities (M3) As % to GDP	# of Listed Domestic Companies	Market Capitalization of Listed Companies (% to GDP)
China						
1980	6.46	53.62	N.A.	31.91	N.A.	N.A.
1985	11.96	66.14	.54	54.38	N.A.	N.A.
1990	2.29	89.99	.98	79.16	N.A.	N.A.
1995	9.31	91.18	5.12	103.87	323	6.01
2000	7.24	132.71	3.55	151.97	1086	53.76
OECD						
1980	.55	101.19	.58	76.11	N.A.	N.A.
1985	2.95	114.72	.46	81.96	N.A.	N.A.
1990	2.43	132.5	.99	93.21	145	N.A.
1995	1.83	154.18	.86	103.72	212	N.A.
2000	2.86	175.23	4.24	102.33	329	N.A.
U.K.						
1980	-2.26	36.59	1.89	N.A.	N.A.	N.A.
1985	3.28	54.33	1.2	N.A.	N.A.	N.A.
1990	.43	121.18	3.39	N.A.	1701	85.8
1995	2.73	122.37	1.91	N.A.	2078	124.04
2000	2.82	133.80	8.34	N.A.	1904	179.21
U.S.						
1980	-1.2	94.44	.61	61.46	N.A.	N.A.
1985	2.9	106.02	.48	67.09	N.A.	N.A.
1990	.68	110.77	.84	65.51	6599	53.21
1995	1.39	124.66	.79	57.8	7671	93.45
2000	2.47	162.91	3.29	62.58	7524	154.72

Source: World Development Indicators Database.

1. Capital Flows and Domestic Market Integration in China

1.1. Introduction

Capital markets and financial systems are essential in an economy because they are responsible for allocating scarce resources in a society, which is the core question addressed in economics. The function and operation of capital markets are especially important for China because of China's long tradition of high savings and investments rates. Compared with many advanced nations, China enjoys a much higher savings rate (as some other East Asian economies). Therefore, investment (or capital formation) takes a large percentage of China's GDP each year. Figure 1 demonstrates the dramatic differences in the ratio of gross fixed capital formation as a percentage of GDP in China, OECD countries, Japan, U.K. and U.S.

Individuals and other economic entities certainly can play a role of directing savings to investment outside the arena of capital markets but it is the capital market that directs large amount of resources. Therefore, the outcome of resource allocation through financial systems largely determines the future structure and productivity path of the economy as well as the pace of technical change.

China has achieved huge economic growth since the reforms in 1978. In the active forum of explaining this phenomenon, there is a broad agreement on the positive impact of reforms on growth. But mystery remains when we appraise the impact of reforms on China's capital market, its connection to economic growth and domestic market integration.

Many signs show that 20 years' reforms did not fundamentally change the operation and behavior of China's capital market. For example, Laurenceson and Chai (2003, p. 3) point out that "the standard view holds that China's financial sector, in contrast to most other areas of the economy, remains, 'essentially unreformed' (Cheng et al., 1997, p. 204). In particular, the

central government continues to exercise considerable control over the financial sector…the activities of state-owned banks (SOBs) have changed little in that most of their lending continues to be directed towards the state sector…Second, the interest rates that SOBs levy on loans and offer on deposits are still controlled by the central government connected central bank, the People's Bank of China (PBC)". Another phenomenon typically observed in a planned economy is the seasonal fluctuations of investment activities. Because of the significant role played by government's budget and credit plans under a planned system, normally the investment is dormant in the beginning of the year (while the plan is being made and distributed vertically from the government to banks and enterprises) and starts to be frantic towards the end of the year. We compare figures of monthly-completed investment in fixed asset in 1975, 1990 and 2000, but find no change at all in the pattern of seasonal fluctuations (see Figure 2).

Although many fundamental issues such as capital mobility and allocation have not received extensive attention, or an objective examination,[5] this lack of formal investigation does not discourage the popular presumption that China's financial system is weak, inefficient, and lacking in market features in its operation. Such a view seems to fit into the classical argument raised by Krugman (1994) and Young (1995) over East Asian's government-led "input growth" instead of "efficiency growth." They point out that Asian miracles are not that mysterious after all because "the rapid growth in output could be fully explained by rapid growth in inputs: expansion of employment, increases in education levels, and, above all, massive investment in

[5]Genevieve Boyreau-Debray and Shang-jin Wei (2002) point out that the efficiency of regional allocation of capital and related questions are "of great importance but, as far as we know, have not received a formal investigation…no formal study is available on the degree of intra-national mobility in China, albeit available information supports the view of a high degree of capital market fragmentation."
Also, Laurenceson and Chai (2003, p. 3) point out that "Given the apparent importance of financial reform in determining the economic performance of a developing, transitional economy such as China, it is surprising then that the role of finance has been downplayed in the literature examining China's rapid economic growth during the reform period (1978-present)."

physical capital" (Krugman, 1994). High investment rates (average about 36% in 1990s)[6] and increasing incremental capital output ratios (Jun Zhang 2003) suggest that China may also fall into the category of "input growth." Recent studies (Boyreau-Debray and Wei 2002) not only argue that reforms did not make capital more mobile, leaving a fragmented capital market in China, but also suggest that less government intervention in capital market will accelerate growth. Further, the torrent of media reports about the inadequacies of the Chinese financial system also advocates the idea that reforms did not create dramatic improvements in the capital market.

But the coincidence of the weak financial system with high growth rates in China, as observed almost everywhere in East Asia, reminds us that economists still do not fully understand the impact of reforms on the capital market and its connection to economic growth and integration. As a start towards understanding these issues, we need a study that will answer key questions such as: "did 20 years of reforms create a commercial sector with market features in China's financial system?" and "did reforms induce changes in the capital market behavior in China?"

Our paper provides a direct answer to these questions. We focus on the most basic behavior issues in capital markets: capital mobility and capital efficiency. To assess capital mobility and capital market integration, we apply the model introduced by Feldstein and Horioka (1980) to study the relationship between provincial savings and investment rates in China. Their model implies that under the hypothesis of perfect capital mobility and financial market integration, the correlation between one country's savings and investment rates should be very low. Therefore, high correlation indicates financial market fragmentation. We apply their model

[6] This figure is calculated as the fixed asset investment rate, i.e., ((total fixed asset investment)/GDP)*100%. If we define investment rate as the rate of capital formation to GDP, this figure will go up slightly.

to study the inter-provincial capital mobility within a country. Our unique data set on provincial savings and investment allows us to examine components as well as aggregates. Stripping out foreign funds, government appropriations, and officially influenced bank loans, we discover that the correlation between savings and investment rates in what we define as the commercial sector is very low. This indicates that commercial capital flows in China have started to move towards market integration. In contrast to the conclusions made by Boyreau-Debray and Wei (2002), we find that the behavior of inter-provincial commercial capital flows after 1978 shares similar features with interstate flows in the U.S. and other advanced nations.

In building our data set, we construct categories under total provincial savings and investment data (which allows us to examine components as well as aggregate level savings and investment) to answer questions regarding the commercial sector's behavior. The difficulties in creating this unique data set are challenging because there are no complete nor 100 percent accurate data on each category needed. Therefore, there will be gap and noise in the data set we construct. It is possible that the imperfections in the data set may influence our results. To resolve this issue, we remove segments with heavy government influence from Boyreau-Debray and Wei's data set since the data set collected by Boyreau-Debray and Wei (2002) to study provincial capital mobility in China at aggregate level is complete and consistent. We find that the modified data set based on Boyreau-Debray and Wei (2002) also leads to a similar conclusion suggesting that commercial capital flows outside government budget and credit plans are highly mobile. Our finding of a large, growing and integrated commercial sector in China's financial system undercuts the widespread view of China's economy as lacking in domestic integration (Young 2000 and 2003).

To appraise the efficiency of capital allocation in China, we trace capital flows across provincial borders and compare net capital inflows with provincial economic performance to identify inefficient capital allocation arising from government intervention, which channels resources out of productive areas to less effective recipients. Our initial conclusions on capital allocation inefficiency parallel those of Boyreau-Debray and Wei (2002) and others. But results from other metrics suggest that the general consensus of inefficient capital allocation may have overlooked ambiguities and complexities as turned out to be the case in capital mobility.

Section 1.2 will present the approaches and detailed results of our study on capital mobility and capital market integration. Section 1.3 will focus on the capital allocation efficiency issue. Section 1.4 summarizes findings and conclusions.

1.2. Capital Mobility and Financial Market Integration

In this section, we will introduce the general model and the one we will apply to examine the degree of capital mobility in China's domestic capital market, followed by the detailed studies and results with our own data set and the modified data set of Boyreau-Debray and Wei (2002).

1.2.1. General Approach and Data Set

The main function of a financial system is to collect funds and channel them to investments. Mobility measures the degree to which savings are channeled to finance projects across geographic boundaries in search of the highest return. If capital is perfectly mobile, one region's investment should not be constrained by its savings; similarly, one region's savings should respond to all available investment opportunities nationwide or worldwide.

The best-known study of capital mobility and financial integration was carried out by Feldstein and Horioka (1980). Under the hypothesis of perfect capital mobility, the correlation

between one country's savings and investment rates should be very low. But their test of data on OECD countries suggests a robust and positive relationship between national savings and investment rates. Although their paper generated a debate on the validity of their test on international capital mobility,[7] it has been widely agreed that their method serves as a reasonable indicator of capital mobility across different regions within a country.[8]

In fact, studies on Japan, Germany, Canada, USA and UK, whose capital markets are generally considered to be highly integrated with almost perfect capital mobility, confirm that the intra-national investment and savings data show negative or insignificant correlation. Boyreau-Debray and Wei (2002) summarize the results of these intra-national studies as shown in Table 4.

The general approach to studying intra-national or provincial capital mobility is to collect aggregate data on provincial (or state) savings and investment rates and estimate the coefficient on savings rates in panel data regressions with investments as the dependent variable. Boyreau-Debray and Wei (2002) follow this general approach and collect provincial aggregate data for China. They take the capital formation item under the expenditure approach of GDP data to represent the investment data, and subtract final consumption from the same GDP data to obtain the savings data. Investment and savings rates are calculated from dividing aggregate investment and savings data by each province's GDP. Using these data, they find that the correlation between Chinese provincial savings and investment rates is much higher than in advanced

[7] For example, Robert Murphy (1984) points out that in citing the positive correlation between savings and investment as the evidence to demonstrate the immobility of the capital, Feldstein and Horioka "appear to have confused two assumptions frequently employed together in international macroeconomic modeling: namely, the assumption of perfect capital mobility and the assumption of a small country." Further, Murphy states that "even when potential econometric problems are left aside, their test is not a test of capital mobility alone, but a joint test of capital mobility and country size." Linda Tesar (1991) provides a comprehensive survey of the theory and evidence on the relationship between savings and investment.

[8] See the logic and reasoning provided by Genevieve Boyreau-Debray and ShangJin Wei (2002). John F. Helliwell and Ross McKitrick (1998) also show that the "savings retention disappears if the region of study is a province within Canada rather than the nation as a whole."

nations. The high correlation (near .5 for the period 1978-2000) suggests that capital is immobile in China and leads the authors to conclude that cross border provincial capital flows in China resemble cross-country capital flows among OECD countries. Inter temporal comparisons show no significant changes in the behavior of capital flows before and after reforms.

To fully assess the impact of reforms on the behavior of capital flows, we need to penetrate aggregates to uncover the components. The conventional approach and data collected by Boyreau-Debray and Wei cannot illuminate domestic market integration when the data include large amounts of foreign funds. Deep in the process of transition toward a market economy, China still carries many features from the past. The coexistence of thriving private sectors and distorted investment and economic decisions led by government is a distinctive characteristic of China's transition economy. Government transfers and officially influenced capital allocations are still important (though on a decreasing scale). Therefore, to study capital market and economic integration, we need to decompose the aggregate data and focus on developments outside the government-led sector, which will allow us to uncover the active platforms of sectors which may operate under close approximations to market principles.

1.2.2. Our Approach and Data Set

To discover behavior at aggregate level as well as component level, we will disaggregate overall data to different components. First we distinguish purely domestic capital flows from total aggregates by subtracting foreign capital from the aggregate investment. We then separate domestic capital flows into what we will call "official" and "commercial" components. The official sector includes the investment and savings heavily influenced by government. The commercial sector captures the investment and savings outside government control.

Definition 1 domestic savings: $S_{dom} = S$

(S denotes total savings. In our analysis, domestic savings S_{dom} is the same as the total savings.)

Definition 2 domestic investment: $I_{dom} = I - I_f$

(where I denotes total investment and I_f denotes investment financed by foreign capital)

Definition 3 official sector savings: $S_{of} = S_{gov} + S_{ind}$

(where S_{gov} represents government savings and S_{ind} represents individual/household savings. Individual savings are included in the official sector's savings because government plays a significant role in directing most of these savings to investment. Table 13 shows that the absolute majority of individual savings is absorbed by state banks in China.)

Definition 4 official sector investment: $I_{of} = I_{si}+I_{loan}$

(where I_{si} denotes investment financed by state appropriations and I_{loan} denotes investment financed by bank loans)

Definition 5 commercial sector savings: $S_{com} = S-S_{of}$

(Commercial sector savings can also be referred to as " Operating Surplus," which is calculated as the excess of value added over the sum of compensation of employees, consumption of fixed capital, and net indirect taxes.)

Definition 6 commercial sector investment: $I_{com} = I_{dom}-I_{of}$

To Sum Up: $I = I_f + I_{dom} = I_f + (I_{of}) + (I_{com}) = I_f + (I_{si} + I_{loan}) + (I_{com})$ and $S = S_{of} + S_{com} = (S_{gov} + S_{ind}) + S_{com}$

The commercial sector investment has been an extremely important source for fixed asset investment in China. Table 5 shows that 50 percent to 70 percent of funds are financed by what we define as commercial savings. "Commercial" investment funds are what the Chinese sources refer to as "self-raised" funds, which includes funds obtained from retained earnings, funds

raised from sales of corporate stock, domestic bank laons that are outside state credit plans and funds obtained from other domestic sources.

These components allow us to dissect the economy into three layers: aggregate layer, domestic layer and commercial layer. The concept of aggregate layer overlaps the study of Boyreau-Debray and Wei's, corresponding to the total savings and investment rates. The domestic layer excludes foreign capital in calculating investment and savings rates. We then subtract the official layer from the domestic layer to focus on the behavior of the commercial layer. We assemble data sets for each layer and implement regression analysis to study the relationship between savings and investment rates for each layer.

The specific models are illustrated in the following equations:

(E.1 Layer.1: Aggregate): $\left(\frac{S}{Y}\right)_{it} = \alpha + \beta\left(\frac{I}{Y}\right)_{it} + \varepsilon_{it}$

(E.2 Layer.2: Domestic): $\left(\frac{S_{dom}}{Y}\right)_{it} = \alpha + \beta_{dom}\left(\frac{I_{dom}}{Y}\right)_{it} + \varepsilon_{it}$

(E.3 Layer.3: Commercial): $\left(\frac{S_{com}}{Y}\right)_{it} = \alpha + \beta_{com}\left(\frac{I_{com}}{Y}\right)_{it} + \varepsilon_{it}$

Let Y stand for provincial GDP, S for aggregate savings, I for aggregate investment, i for observation unit (i.e. province), and t for time. We will estimate β_s for each layer. The subscripts *dom* and *com* denote domestic and commercial layers respectively (β without subscript indicates aggregate layer coefficient). (E.2) removes foreign capital from total investment to test domestic capital mobility. (E.3) continues to remove the official sector's savings and investment rates, leaving us to study the relationship between the commercial sector's savings and investment rates.

The ideal data set for the above equations will require not only consistent and complete information on total provincial investment and savings data, which were obtained by Boyreau-Debray and Wei (2002), but also detailed data on the sources of provincial investment and savings. Savings data need to be disaggregated to government savings, household savings and business (commercial) savings while investment data needs to be decomposed to state appropriations, bank loans, domestic private funds and foreign capital.

However such data are not available with current statistical reports issued by China. We construct a unique data set on the above components with reasonable proxies using published statistical data. The original plan involved components as well as aggregates of provincial GDP, savings and investment data from 1978 to 2000.[9] Due to data limitations, we have collected 15 years (1985 - 2000) of data for 18 provinces[10] and 10 years (1990 - 2000) of data for 22 provinces.[11] The savings data are categorized to government savings (which we obtained from subtracting government expenditures from government revenues), business savings (which are the operating surplus items in GDP by structural items reported by National Bureau of Statistics)[12] and household savings (which are the increased flow of rural and urban residents' bank deposits from provincial statistical yearbooks). The investment data are proxied by the fixed asset investment data and are also categorized to four items: state appropriations, domestic loans, foreign investment and private investment. Most of the provincial yearbooks report breakdowns of the total fixed asset investment into the above four categories.

[9] Many scholars have questioned the reliability of Chinese statistics (Holz 2001, 2003 and Rawski 2001, 2002), especially statistical reports at provincial level. But because we are looking at data covering a long period of time, we believe that the published data from various provincial statistical yearbooks and other publications from National Bureau of Statistics are reasonable starting point for our analysis.

[10] The 18 provinces are: Anhui, Zhejiang, Henan, Hubei, Jilin, Jiangsu, Guangdong, Liaoning, Tianjin, Yunan, Shaanxi, Hunan, Jiangxi, Shanxi, Hainan, Heilongjiang, Hebei and Inner Mongolia.

[11] The 4 provinces in addition to the ones mentioned in footnote 6 are: Ningxia, Qinghai, Guizhou, and Gansu.

[12] Murphy (1984) also uses operating surplus as the business savings data.

These components of savings and investment data, though crucial in our analysis, are not perfect or 100 percent accurate. For example, capital formation includes inventory and fixed asset investment. But only the sources of funds for fixed asset investment are reported in China. Also, using individual bank deposits as the proxy for household savings might pose a more serious problem over time as individuals have more choices and freedom to purchase bonds, stocks or decide to build houses or start businesses as another form of savings. For example, using bank deposits as a proxy for individual savings underestimate the "true" amount of savings for rural residents. According to survey studies, the value of newly built rooms per capita roughly equals the increased bank deposits per capita in Jiangsu in 1999. We provide detailed information regarding the collection of the data set in the appendix. The data on each component is mapped into the equations above and we implement our analysis layer by layer until we reach the core of the question and unveil the commercial sector's behavior after 1978.

Given the imperfections in our data set, we adopt an alternative procedure to make sure that our results are more than an artifact of the unique but imperfect data set we constructed. We look at the data collected by Boyreau-Debray and Wei (2002), which is much more complete and consistent, though do not distinguish components from aggregates. We subtract our components from their total aggregate level data to uncover each layer. The operation is specified in table 6.

1.2.3. Our Results

Table 7 presents the results of our analysis based on our own data set and Boyreau-Debray and Wei's data set respectively.

Table 7 shows that results based on our data set suggest a clearly different trend than the general conclusion of capital market fragmentation in China. We do not find any significant correlation between savings and investment rates at any layer of the economy. More

importantly, removing foreign capital and officially influenced capital allocation yields a coefficient (-.2963) not only significantly lower than the positive aggregate estimate obtained by Boyreau-Debray and Wei (2002) (which is near .5), but also reaches the degree of capital mobility close to the U.S. and other advanced countries (in table 4).[13] This suggests that the substantial commercial sector we define shares similar market features with many market economies and also started to move towards strong integration.

In fact, our data set does not include places such as Beijing and Shanghai due to data limitations. But it seems reasonable to presume that these advanced areas are more likely to attract investment from outside sources. Savings accumulated in these areas probably have more facilities and channels to be directed to other destinations as well. For example, recent reports from China Daily illustrate that "strong local economic growth and municipal government work have combined to make Beijing an investment magnet for private domestic funds, which made up more than half of the 131.4 billion yuan (US $15.9 billion) invested in the capital during the first ninth months of the year."[14] Also, Zhejiang saw the number of enterprises based in Shanghai increase to over 50,000 by 2001, with investment in Shanghai reaching 50 billion yuan (Chun and Yao 2003) - 18% of the total fixed asset investment in Zhejiang province for the same year.[15] We believe that adding these areas in our data set could drive the coefficients even lower.

The imperfections in our data set also lead us to appraise our results with Boyreau-Debray and Wei's data. Table 7 shows that removing foreign capital from total investment of B-

[13] Some may argue that since coastal areas in China receive most of the foreign direct investment, this may drive domestic capital flow to other regions to seek higher rates of returns. However, rates of return on capital in coastal areas are not lower than those of inland regions. Receiving foreign capital may have increased the overall capital stock in the coastal areas, but it also brings in advanced management capabilities, new technologies etc., which tremendously improve the performance of industries in those provinces. The rapid growth of the coastal region is a proof of this impact. As we show later in this paper, enterprises' performance in coastal regions is actually much better that that of inland provinces.

[14] Tang Ming, "Private Funds Funnel Into Beijing," China Daily, p. 2, Oct 11, 2003.

[15] *Zhejiang Statistical Yearbook 2002, p. 108.*

W's data reduces the coefficient from .4851 to .4065. Further, eliminating the government appropriations and bank loans which we classify as official flows significantly reduces the coefficient to just .1571, a figure far below Boyreau-Debray and Wei's result. Even though this number does not reach the level of the mobility in more advanced nations (shown in table 4), it is definitely much lower than the coefficients obtained from the cross-national data in OECD countries. Figures 3 and 4 compare the results on China's capital mobility with other countries. We can see that removing foreign and official sector's funds significantly reduces the coefficient (with both B-W's data and our own data). Further, although we do not observe a close resemblance of China's figures and other countries with B-W's data, we see such similarity when we use our own data set.

Therefore, it is clear that results based on both our own data and Boyreau-Debray and Wei's data point to the same conclusion: two decades of reforms did create a substantial commercial sector with market characteristics within China's financial system that displays important elements of market integration.[16]

1.2.4. Channels for Domestic Capital Flows

In retrospect, maybe it is not so surprising that we find China did create a commercial sector sharing market characteristics. Chinese government has been taking steps to promote capital market and product market integration for many years. In 1993, China passed "Anti Unfair Competition Law," which clearly mentions that government cannot abuse its power to dictate business orders in favor of local manufactures, nor can it prohibit local commodities from reaching out to other regions. In the meetings of 16th Central Committee of the Communist

[16] We realize that government interventions and fiscal policies may also have an impact in affecting the provincial savings and investment rates. Such impact sometimes has a lagged effect. So we added one-year lagged investment rates as additional independent variables in our regression analysis. But this modification did not change our results significantly.

Party of China held in 2002, Beijing made it clear that it is their goal to break regional and industrial blockages to promote the mobility of commodities and factors of production in the national market. In the survey on local protectionism conducted by Development Research Center of the State Council (Li, Hou, Liu and Chen 2003), most surveyed enterprises believe that local protectionism has reduced tremendously in the past two decades. The survey also points out that in the means adopted by local government to exercise protectionism, direct control on quantity of sales and prices of commodities are not often exerted. Local governments' interference on funds transfer is not serious either.

The survey finds that as the scale of enterprises becomes larger, the percentage of local sales are getting smaller and smaller. For example, "21% of the small-size enterprises' local sales figures are less than 10% of their total sales, 27% of the large-size enterprises' local sales figures are less than 10% of their total sales."

The establishment of two stock markets in Shenzhen and Shanghai (in early 90s) and nationwide stock brokerage, the launch of inter-bank market for short-term funds transfers, and the development of commercial paper market help to facilitate funds transfers tremendously. For example, China launched its nation-wide interbank market in 1996 to unify the segmented interbank market. Although its trading volume is sensitive to government's policies to limit market irregularities, this market operated more than 10,000 million Yuan during its peak time (1995). In this market, 35 financing centers associated with provincial People's Bank branches are the major borrowers. "While other commercial banks, such as GuangFa and ShenFa, were net borrowers in the interbank market, the state-owned commercial banks tended to be net lenders. This suggests that the state-owned commercial banks might have incentives to channel

excess funds to the interbank market instead of lending to state-owned enterprises, as they were often required to." (Chen, Dietrich and Fang 2000, pp. 177-181)

Another important channel for domestic capital flows is the trust and investment companies (TICs) in China. "(TICs) have chosen borrowers and projects outside the state's Credit Plan, they have enjoyed greater discretion on the rates and terms they offer for lending and have provided a range of services not offered by banks…At the end of 1994, there were 393 authorized TICs, of which 185 were affiliated with specialized banks, 16 others operated on the national level, and 190 were local enterprises. Of the 190 local level TICs 47 operated on the provincial level, 32 on a municipal level or within special economic zones, and the remaining 111 on the prefectural level. By end-1995, the total number of TICs had fallen somewhat, to 332. But total assets continued to grow, and at the end of 1995 amounted to RMB 458 billion…TIC loans grew noticeably faster than those of banks in 1993, and again from mid 1994 to mid 1995." (Kumar, Lardy, Albrecht, Chuppe, Selwyn, Perttunen and Zhang, 1996).

There is also numerous evidence to show the growing integration of China's product market. For example, "Hengshan, one of the towns of Wujiang, has been a hub for the production of woolen garments since the early 1970s, with about 120 million sweaters produced annually…these sweaters are sold to Beijing, Tianjin, Harbin of Northeast China's Heilongjiang Province and Chendgu in Southwest China's Sichuan Province.[17] "The (shoe) industry has witnessed dramatic progress in the last 20 years in China. Various kinds of shoes produced in Zhejiang and Guangdong provinces are big sellers in China."[18] "Wenzhou, a city in East China's Zhejiang province with more than 90 percent non-State economy, has become a catchword for the entrepreneurial spirit that has swept the country over the past decade. It produces 20 percent

[17] Xinyan Bao, "Sewing Up the Sweater Business," China Business Weekly, p. 14, November 11-17, 2003.
[18] Ji Zhe, "Shoe Industry Takes Step into China's Western Regions," China Daily, p.10, June 7, 2004.

of China' shoes, 80 percent of its spectacles, 60 percent of its razors, 65 percent of its locks and keys, and 65 percent of its electric transformers."[19]

The flows of commodities are accompanied by increased flows of private investment. "The trend for these private entrepreneurs to 'go out' has already seen 7.62 billion yuan (US $910 million) invested in the Northeast, creating employment and at the same time injecting an enterprising spirit. More than 500 private enterprises from Zhejiang are due to take part in the annual Harbin Business and Trade Symposium, to be held on June 15-19, and co-sponsored by the governments of Heilongjiang and Zhejiang provinces."[20] "Economic co-operation between South China's Guangdong Province and Central China's Hunan Province was stepped up yesterday as some 98 contracts were signed involving a total investment of 35.83 billion yuan (US$4.3 billion). Guangdong's investment in Hunan is 24.1 billion yuan (US $2.9 billion), and the remaining 11.73 billion yuan (US $1.4 billion) consists of Guangdong's capital inflow by its business partners in Hunan."[21]

Other infrastructure development such as national expressway and airline networks also promote economic integration. The surge in demand for transport is an indirect evidence of the huge flows of commodities transferred across various regions. For example, Wu Qiang, the director of the Freight Bureau of Ministry of Railways, said that "The railway freight system is under increasing pressure and a great number of trunk lines have been operating at full or above capacity."[22]

As a result, the behavior of the commercial sector in the economy starts to share features with many other developed countries despite the general presumption of the primitive systems.

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[19] Li Jing, "Wenzhou Offers a Lesson in Economics," China Daily, p. 6, April 26, 2004.
[20] Ziaoyi Shao, "Zhejiang Enterprises Strive to Go Outside," China Business Weekly, p. 17, May 17-23, 2004.
[21] Weifeng Liu, "Guangdong, Hunan Strengthen Co-operation," China Daily, p.10, April 20, 2004.
[22] Desheng Cao, "Rail Speed-up Barely Helps Cargo Transport, China Daily, p. 2, May 12, 2004.

1.2.5. Results on "Rich" and "Poor" Regions

Because of the strong disparities between the level of economic development in different provinces and the long tradition of government intervention in directing capital from "rich" regions to "poor" ones (for example, the recent policy of "develop the west" calls for coordination in directing resources to the west), we separate provinces[23] above national GDP per capita level from those below and apply the above models (E.1, E.2 and E.3 in section 1.2.2) to these two groups respectively (See figure 3 for a map of geographic distribution of "rich regions," which are concentrated in coastal areas and "poor regions," which are mainly the inland areas).

The results with Boyreau-Debray and Wei's data are shown in table 8. Table 9 presents the results with our own data set. Figures in these two tables demonstrate that removing foreign capital has a more significant effect on the "rich provinces" than the "poor" ones. The coefficient for the "rich" group drops from .9289 to .7293 in table 5. This seems natural because most of the coastal provinces are doing much better than inland counterparts. They also receive the majority of foreign capital.

Both our data set and B-W's figures show that "rich provinces" present a much higher correlation between total provincial savings and investment rates. B-W's data even generates a coefficient close to 1. But once we remove the influence of the official sector (meaning subtracting the state appropriations and bank loans from total investment and subtracting government plus household savings from total savings as defined earlier) and foreign capital, both data sets deliver much lower coefficients showing the difference of the behavior between

[23]The 7 provinces, whose average GDP Per Capita over 1985-2000 are above the national level, are: Zhejiang, Jilin, Jiangsu, Guangdong, Liaoning, Tianjin, and Hainan. The 16 provinces, whose average GDP Per Capita over 1985-2000 are below the national level, are: Anhui, Henan, Hubei, Ningxia, Yunnan, Shaanxi, Hunan, Jiangxi, Shanxi, Hebei, Inner Mongolia,Qinghai, Xinjiang, Guizhou, and Gansu.

the commercial sector and the aggregate sector. Estimated coefficients on commercial sectors in both "poor regions" and "rich regions" present no great difference from the ones we obtained in the combined panel data regressions (as reported in table 7). B-W's data show significantly reduced coefficients on commercial sectors in both regions while figures based on our data set suggest that commercial sectors' behavior present no great difference than those from advanced nations in table 4.

In addition to the equations we followed in section 1.2.2, we add two more equations in our analysis to study the behavior of official sector's capital flows in both "poor" and "rich" regions. They are:

E.4: $$\left(\frac{I_{os}}{Y}\right)_{it} = \alpha + \beta\left(\frac{S_{gov}}{Y}\right)_{it} + \varepsilon_{it}$$

E.5: $$\left(\frac{I_{loan}}{Y}\right)_{it} = \alpha + \beta\left(\frac{S_{ind}}{Y}\right)_{it} + \varepsilon_{it}$$

As indicated in definition 1-6, Y is provincial GDP, I_{si} denotes the investment financed by state appropriations, S_{gov} is government savings, I_{loan} stands for investment financed by bank loans and S_{ind} represents individual/household savings. We will estimate the coefficient for the relationship between government savings and investment rates (i.e., β_{gov}) as well as the coefficient for bank loans and deposits rates (i.e., β_{bank}). Table 10 shows the results based on E.4 and E.5. When we focus on the relationship between government savings and appropriations, we find that "poor" regions display a negative relationship ($\beta_{gov} = -0.2917$ in table 10). This means that provinces with lower rates of government savings get more injections from outside to finance projects at a much higher rate than their government savings accumulations.

Similarly, there is no direct relationship between the loans issued to the poor regions and the bank deposits collected in those areas (β_{bank} is not statistically significant for the poor regions

in table 10). Private sector development in these regions lags behind the coastal areas. State owned enterprises (SOEs) also dominate in these regions. This supports the discovery made by Boyreau-Debray and Wei (2002) that "the share of SOEs in local industrial production has a clear positive and statistically significant effect on the size of investment allocated by government budget and that financed by bank loans."

These results suggest that to uncover the hidden characteristics in transitional economies like China, it is not sufficient to map aggregate level data to standard models. Penetrating beneath the aggregate level data yields important discoveries. Although aggregate data do not show any change in the behavior of low capital mobility and capital market fragmentation in China, we discover that two decades of reforms did create a commercial sector with high capital mobility. China's capital flows in what we define as the commercial sector start to behave like those in more developed countries. This sector is highly capable of channeling funds across provincial borders. Whether those flows reach projects with highest returns is the question we will address in the following section.

1.3. Efficiency of Capital Market

Mobility is required for capital to pursue the highest returns. As Paul Krugman mentioned, the ability of mobilizing resources and capital does not necessarily support sustainable growth, which relies both on mobility and efficiency.

Studies from world organizations, academic scholars and various sources agree that China's capital market is quite inefficient. This consensus is also supported by substantial evidence from both microeconomic and macroeconomic perspectives. For example, widely used measures such as net interest margin, overhead cost and bank profitability are cited as evidence to show the inefficiency problems in China's banking industry. Table 11 shows that return on

capital and return on assets for major banks are much lower in China than in Hong Kong. Out of the twelve banks listed in table 8 for China and Hong Kong respectively, only 1 out of 12 banks in China scored an asset return rate above 1% while 8 Hong Kong banks enjoyed asset returns well above 1%. 4 Chinese banks managed to score above .5% but that was again outnumbered by 10 Hong Kong banks.

The unsatisfactory performance in China's banking industry echoes with weakness discovered from macro perspectives. Wu (2003) argued that "China's economy has achieved an average growth rate of 9 percent over past 25 years, but all the pouring-in money is not being used efficiently. ... In developed countries, investors can gain US$1 of outputs with US$1 of investment but in China, we need up to US$7 in inputs to achieve an output of US$1. The investment (in China) is huge but inefficient. ... The ratio between investment and output is at a very low level."[24] These points are also supported by numerous studies on economy-wide TFP (total factor productivity)[25] and ICOR (incremental capital output ratio).

Although standard approaches are not foolproof and the validity of some measures is challenged,[26] general consensus still remains strong. Perhaps the wide agreement on the

[24] See China Daily, Dec. 31, 2003 http://www1.chinadaily.com.cn/en/doc/2003-10/31/content_277127.htm

[25] Zhang and Shi (2002) find that TFP decreased consistently after 1992; However, Li (1992) concluded that TFP was negative before reform and rose to an average of 3.8 percent per year in the post-reform period from 1979 - 1994; But Borensztein and Ostry (1996) point out that "although TFP has made remarkable contribution in the post-reform period, there are reasons to believe that true underlying productivity growth, in the sense of technical progress, is substantially lower." But we should also point out that other scholars (Wang and Yao 2001, Hu and Khan 1997 and Kraay 1996) find conflicting results.

[26] Microeconomic measures on interest earnings of financial institutions may very well indicate the gap between banks' performance in China and other countries but do not help to clarify, given no existence of full interest rate liberalization, whether China has made progress in improving capital allocation efficiency after the reforms.

Anderson (2003a,b) points out that using measures of TFP and ICORs can be problematic. Anderson (2003b) has shown that although none of the tiger economies showed evidence of an unusually strong trend improvement in overall productivity, when we compare their TFP figures with other countries, "the 1.1% average TFP growth in East Asia is perfectly acceptable, and no worse than its developed country counterparts." Table 12 is cited to support his view. ICOR measures the marginal productivity of capital, i.e., how much new investment does it take to raise the level of GDP by one dollar? It seems to be a direct measure of capital efficiency but the reality isn't this simple. Anderson (2003a) shows that ICOR figures does not help to evaluate overall economic efficiency in cross-country comparison because economies at different levels of development naturally have different capital-output ratios. This

inefficiency of China's capital market is so strong that many see no reason to penetrate beyond aggregate level to make close examination of provincial level data. But if we take a close look, is this consensus fully supported by investigations with both aggregates and components at provincial level? Are we going to make unexpected discoveries as with the capital mobility and capital market integration issues we examined in section 1.2? We plan not only to answer those key questions but also to address issues such as whether China has made progress in improving capital allocation efficiency after decades of reforms.

The lack of understanding surrounding key questions and the confusion with some standard approaches lead us to seek alternative methods to appraise the efficiency of capital allocation in China. We apply straightforward measures to address issues such as whether capital is directed to more effective and productive recipients and whether there is any change in the pattern of capital allocation.

We trace capital flows across provincial borders and compare capital inflows with provincial economic performance before and after reforms. To do this, we divide provinces in our data set to two categories: "rich regions" and "poor regions" according to their economic performance (as we did in section 1.2.3). Provinces with GDP per capita greater or equal to the level of national average are classified into the "rich regions" group, vice versa for the "poor regions" group. Our general hypothesis is that if capital is channeled to pursue the highest returns, we would expect to see two phenomena: 1) high growth regions should attract capital from outside. Therefore, the so-called "rich provinces" with dynamic economic performance should experience investment rates higher than their own savings rates and the "poor regions" should see local savings rates higher than local investment rates. In other words, capital from

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argument also applies to the provincial comparison of ICORs since the regional development disparity is huge in China. Thus ICOR cannot serve as the best indicator of capital allocation efficiency.

"poor regions" should flow to the higher return areas. One can argue that capital can generate higher returns in capital-scare regions. But a quick examination rules out this possibility in China (details of this examination will be explained in the following section). 2) high investment regions should also demonstrate improvement in GDP per capita growth. We develop two metrics to implement analysis for both hypotheses with consistent data as collected by Boyreau-Debray and Wei (2002). While we detected inefficiency patterns of capital allocation with metric one, our finding with metric two indicates that the general consensus of capital inefficiency in China may not be as clear as people have presumed. We will introduce the two metrics, data sets and results in the following sections.

1.3.1. Metric One and Results

We calculate the difference between total aggregate savings and investment rates with data used by Boyreau-Debray and Wei (2002) for provinces both in 15 "poor regions" and "rich regions." We also calculate the difference between total aggregate savings rates and domestic investment rates ($\frac{I - I_f}{Y}$ instead of $\frac{I}{Y}$) to remove the effect of foreign investment. Figures 6 and 7 illustrate our results for "poor regions" and "rich regions" respectively.

The striped gray bars represent the five-year average of difference between total aggregate savings and investment rates while the solid (black color) bars represent the five-year average of difference between total aggregate savings and domestic investment rates. We calculate these measures for 8 provinces in the "poor regions" and "rich regions" respectively.

Figure 6 shows that, for poor regions, the bars consistently fall below zero, indicating that local investment rates exceed local savings rates. Further, figure 7 indicates that rich provinces show the opposite trend. This implies a tendency for investment funds to move away from high growth regions into poor provinces.

One can also argue that following the law of diminishing returns, capital could generate much higher returns in capital scarce regions. But a close examination shows that there is no sign of higher capital return or profits earned by enterprises in those regions. Figure 8 examines the state owned enterprises in the same provinces above and below national GDP per capita level mentioned in Figures 6 and 7. We focus on state sector because most of the bank credits and loans are directed to state enterprises. The private sector receives extremely limited percentage of loans (less than 1%) from domestic banks (Ruby Zhu 2002). We report three enterprise performance indicators:

Return on Total Assets = 100%*(Profit + Interest Payment) / (Average Total Assets)

Net Profit Rate = 100%*(Profit/ (Net Assets))

Percentage of Bad Loans to Total Equity

In figure 8, striped bars represent the performance of state owned enterprises in the "rich regions" where the solid ones represent that of the "poor regions." All three indicators confirm that state sector performance in the poor provinces is consistently worse than in the rich provinces. This suggests that capital in the "poor regions" failed to bring more profits or higher returns. Therefore, the argument of channeling capital to poor regions for the purpose of pursuing higher returns based on capital scarcity is not supported.

We should point out that most of the loans are issued by state banks and most of the residents' bank deposits are absorbed by the big four state banks as well. For example, 71.7% of domestic bank loans are issued by the big four state banks. They also absorb 83% of deposits in China. The domestic bank loans have been the second biggest source of fixed asset investment in our data set. Despite the stimulus provided by foreign capital and investment in China during the post-reform period, it is important to remember that the size of foreign investment has been

quite moderate (normally less than 10% of the total fixed asset investment, see table 5) compared to the amount of funds raised from domestic loans and funds privately raised. That said, one can imagine the waste in the system to allocate savings from areas with great potential to the ones which have continuously lagged behind. Provinces which make significant contributions to national economy utilize the same amount or more often much less loans to stand well above the national level while banks continue to lend out generously to provinces whose performance has been below national average.

For example, figure 9 shows the GDP and absolute amount of loans received by Anhui and Zhejiang respectively. Anhui's GDP figure has always been below the national level while Zhejiang's well above. But there is almost no difference in the amount of loans they each received (especially when considering that the amount of Zhejiang residents' bank deposits are much larger than that of Anhui).

The second unexpected discovery is that there seems to be no change in the nation-wide picture of the mismatch between savings and investment rates throughout the whole time period we examined. Our data cover the period of 1970 to 2000. But the behavior portrayed in figures 6 and 7 does not present different patterns before or after the reform: rich regions consistently show savings rates higher than investment rates from 1970 to 2000 while poor regions display investment rates higher than savings rates for the entire period as well. Two decades of reforms did not correct the perverse tendency presented in figures 6 and 7.

This result from provincial level analysis parallels the general consensus in that capital allocation in China is largely inefficient. Boyreau-Debray and Wei (2002) point out that investment financed by government budget and bank loans is heavily influenced by share of state

owned enterprises in local industrial production, not by economic performance or other market-oriented measures.

With the discovery of capital mobility issues in our minds, we would like to remind our readers that these conclusions are from aggregate level data. Whether this mismatch only exists at the aggregate level and whether savings and investment rates also exhibit such inefficiency in the commercial sector we defined remain interesting questions to explore in the future.

1.3.2. Metric Two and Results

Another way to examine capital allocation efficiency is to follow the second hypothesis to examine whether faster capital growth is associated with faster economic growth in a region.[27] If one region receives investment at a rate much higher than national average, then we would expect to see differential growth if capital is allocated efficiently. Capital accumulation may not have an immediate impact on GDP growth, but examine the capital accumulation on GDP figures in subsequent years may resolve this issue. What we are looking for in metric two is this:

Let k_{it} denote capital formation for province i at time t, δk_{it} represent the changes in capital formation (i.e., $k_{it} - k_{i(t-1)}$), K_t stand for national capital formation for time t, and similarly σK_t represent the change in national capital formation (i.e., $K_t - K_{t\_1}$); also, let $\phi_{it} = \frac{\mathrm{Pr}\,ovincialGDPPerCapita}{NationalGDPPerCapita}$, and $\delta\phi_{it} = \phi_{it} - \phi_{i(t-1)}$, then if capital allocation is efficient, we

[27] This is not to assert that fast capital accumulation induces faster GDP growth because both capital accumulation and GDP growth can be endogenous. In other words, some exogenous forces can cause both capital accumulation and GDP to increase.

expect above average growth of capital stock, which occurs when $\frac{\delta k_{it}}{k_{it}} - \frac{\delta K_t}{K_t} > 0$ to be associated with above average growth, i.e., $\delta\phi_{i(t+1)} > 0$.[28]

Figures 10 and 11 show the results of our examination of hypothesis 2. The solid bars represent the difference between provincial capital growth rate and national capital growth rate ($\frac{\delta k_{it}}{k_{it}} - \frac{\delta K_t}{K_t}$) while the line shows whether this province has experienced growth in the rate of its own GDP per capita relative to the national average level ($\delta\phi_{i(t+1)} > 0$) in the next year. The percentage figure next to each province name indicates the average ratio of its GDP per capita to national GDP per capita over the period of 1985-2000. Our hypothesis predicts that when the bars are above zero (or below zero), points in the line representing GDP growth relative to national GDP per capita should also be above zero (or below zero).

For the "poor regions," we actually find that the data confirm this trend indicating that provinces with high investment growth did experience positive growth in their relative ranking to the national GDP per capita level for most years in Figure 10. Contrary to the popular belief that these provinces, which lag behind coastal areas, are the main arena for capital inefficiency due to government's support and dominance of state sectors, metric 2 suggests that description and conclusions reached by recent studies on capital allocation efficiency in these areas are at least partially incomplete and inaccurate.

For the "rich regions," we see slightly more incidence of the mismatch between the "capital formation growth" (bars in Figure 11) and the "GDP per capita growth" (points connected by the lines in Figure 11). We notice that many times there is higher than national

[28] As mentioned in the previous paragraph, since capital formation may not have an immediate impact on GDP figures, we check the subsequent years' GDP growth compared to national GDP per capita. The subscript denoting time is, therefore, *t+1* instead of *t*.

average capital formation, but the province's rank in GDP per capita to national GDP per capita drops.

The surprising result from metric two, not consistent with evidence emphasizing gross inefficiency of capital allocation in inland areas, suggests that the performance of China's capital market is probably more complicated than the blank picture described by recent research. Drawing the lessons from our practice on capital mobility and capital market integration issue, we should be cautious to reach conclusions when following general presumptions without attempting to undercover hidden characteristics in China's dynamic economy. We will implement further investigation with analytical methods before we advocate the general agreement.

1.4. Conclusions

The conventional view of China's product and capital markets suggest that despite tremendous growth, China's economy has achieved little progress in the direction of market integration. This paper focuses on one important aspect of economic integration by examining the mobility of domestic capital in China.

Recent studies support the general consensus by finding limited capital flows across provincial borders in China. Boyreau-Debray and Wei (2002) find that inter-provincial capital flows resemble capital flows across national borders in the developed world. In this paper, we show that capital flows outside the government budget and official credit plans in what we define as the commercial sector are both large and highly mobile. Stripping out foreign capital, government appropriations and bank loans, both our unique data set and Boyreau-Debray and Wei's data indicate that capital flows in the commercial sector do not resemble cross-country capital flows among OECD countries. Further, in some dimensions, these commercial capital

flows appear to behave like those in the U.S. and other advanced nations. We conclude that two decades of reforms did create a large commercial sector with market characteristics within China's financial system that displays important elements of market integration.

If capital market now displays such substantial element of integration, we must double the validity of studies reporting lack of integration in domestic product market. The results of this study show the need for searching re-examination of the widespread view that China's market system lacks internal integration.

If funds are highly mobile across domestic geographic boundaries, are these flows allocated efficiently? The general consensus suggests that investment is highly inefficient. Our examination of inter-provincial capital flows across provincial borders confirms that capital is continuously directed to poor regions while more promising areas receive only moderate portions of the newly generated savings to finance their projects.

However, analysis conducted with different metrics suggests that the general consensus may have overlooked ambiguities and complexities in this area. As with capital mobility and economic integration, we should approach standard views with caution. Full understanding of the efficiency of capital allocation in China will require further examination beneath the aggregate level. My future research plans will include the examination of key questions such as whether the mismatch between provincial savings and investment rates only exists at the aggregate level or this perverse tendency is also observed in the commercial sector.

Table 4 Intra-National Capital Mobility

Country	Time Period	Authors	Coefficient[a]
Japan	1975-1988	Deckle (1996)	[-0.21 to -0.30]
Japan	1970-1985	Amory (1995)	[-0.26 to -0.36]
Japan	1971-1985	Bayoumi and Rose (1993)	[-0.48,0.24, 0.01]
U.S.A.	1971-1985	Sinn (1992)	[-0.11][b]
U.K.	1971-1985	Thomas (1993)	[-0.56]
Canada	1961-1989		[-0.11]
Germany	1970-1987		[-0.06][c]

a: coefficient of the regional savings rates in a regression with the regional investment rates as the dependent variable
b: correlation between regional savings and investment rates
c: private savings and investment
Source: Boyreau-Debray and Wei (2002).

Table 5 Shares of Commercial and Official Funds in the Financing of Fixed Asset Investment in China, 1985-2000

Province	Official Sector						Foreign Investment			Commercial Sector		
	Government Appropriations			Bank Loans								
"Poor Regions"	**1985**	**1995**	**2000**	**1985**	**1995**	**2000**	**1985**	**1995**	**2000**	**1985**	**1995**	**2000**
Hubei (92.71%)	.11	.07	.10	.24	.23	.17	.00	.11	.02	.65	.59	.71
Shanxi (78.77%)	.28	.04	.07	.36	.26	.21	.00	.04	.07	.36	.66	.65
Qinghai (76.06%)*	.15	.06	.17	.46	.40	.23	.00.	.01	.01	.37	.55	.59
Ningxia (75.94%)	.30	.04	.12	.21	.30	.31	.03	.04	.01	.47	.63	.57
Hunan (73.15%)	.13	.04	.07	.15	.19	.20	.01	.06	.02	.62	.71	.65
Anhui (70.33%)	.14	.04	.08	.18	.31	.23	.18	.07	.03	.69	.58	.71
Henan (68.56%)	.13	.04	.07	.09	.23	.17	.04	.11	.03	.74	.62	.74
Yunnan (65.47%)	.16	.05	.08	.23	.21	.22	.02	.06	.01	.60	.68	.68
Shaanxi (61.16%)	.24	.08	.11	.17	.30	.26	.00	.09	.02	.59	.52	.61
Gansu (55.58%)**	.16	.05	.14	.30	.37	.31	.03	.06	.02	.51	.52	.52
Average	**.18**	**.05**	**.10**	**.24**	**.28**	**.23**	**.03**	**.07**	**.03**	**.56**	**.61**	**.64**
"Rich Regions"												
Tianjin (224.91%)	.20	.03	.03	.25	.24	.20	.05	.23	.16	.50	.51	.61
Guangdong (160%)	.12	.01	.02	.31	.15	.17	.14	.19	.11	.43	.65	.71
Liaoning (159.31%)	.15	.03	.06	.20	.20	.20	.01	.13	.06	.65	.65	.69
Zhejiang (151.81%)	.08	.01	.04	.19	.21	.26	.003	.08	.06	.73	.69	.63
Xinjiang (151.81%)*	.25	.03	.08	.17	.25	.22	.03	.09	.02	.54	.63	.68
Jiangsu (142.63%)	.09	.02	.02	.20	.16	.16	.02	.14	.09	.70	.69	.72
Hainan (105.23%)	.17	.02	.06	.22	.18	.13	.05	.28	.16	.56	.52	.65
Jilin (100.05%)	.16	.02	.06	.15	.18	.20	.00	.15	.03	.69	.65	.71
Average	**.15**	**.02**	**.05**	**.21**	**.20**	**.19**	**.04**	**.16**	**.09**	**.60**	**.62**	**.68**

Note. We categorize provinces above national GDP per capita level to "Rich Regions" and group provinces below national GDP per capita level to "Poor Regions." The percentage number next to each province's name is the average ratio of provincial GDP per capita to national GDP per capita for 1985-2000.

*1985 data for Qinghai and Xinjiang are missing so we replace them with 1987 data.
**1985 data for Gansu is also missing. We replace 1985 data with 1990 data for Gansu.

Source: The provincial level investment data (including sources of funds from state appropriations, bank loans, foreign investment, self-raised funds and others) are from each province's statistical yearbooks (1986-2001). If any of these data are not reported in provincial statistical yearbooks, we also collect data from the following publications from National Bureau of Statistics: Xinzhongguo 50 Nian Tongji Ziliao Huibian (Comprehensive Statistical Data and Materials on 50 years of New China), Gaige Kaifang 17 Nian de Zhongguo Diqu Jingji (China Regional Economy: A Profile of 17 Years of Reform and Opening-up), Zhongguo Caizheng Tongji 1950-1988, and Zhongguo Caizheng Nianjian (various years).

Table 6 Our Modification on the Data Set By Boyreau-Debray and Wei (2002)

Layer	Sector	Investment Data	Savings Data
1	Aggregate	Aggregate B-W Data	Aggregate B-W Data
2	Domestic	Aggregate B-W Data minus Foreign Investment[a]	Aggregate B-W Data
3	Commercial	Aggregate B-W Data minus State Appropriations & Bank Loans[b]	Aggregate B-W Data minus Government Savings & Household Savings[c]

a. The foreign investment data are taken from the figures reported in the fixed asset investment. We also collected foreign capital utilized for each province for the period of 1985-2000. The data are reported in "Comprehensive Statistical Data and Materials on 50 years of new China" (Xin Zhongguo 50 Nian Tongji Ziliao Huibian). Foreign capital is reported in U.S. dollars. We convert those figures to Chinese currency with official exchange rates.

b. Bank loans are the investment financed by domestic bank loans reported in the table of sources of funds for fixed asset investment in provincial statistical yearbooks.

c. Household savings are the increased flows of bank deposits by rural and urban residents reported in the sources cited in "note" under table 5.

Note. The investment components we subtracted from aggregate B-W data are items reported as sources for fixed asset investment in provincial statistical yearbooks (1986-2001). The savings components are obtained from government revenues, government expenditures and rural and urban residents' bank deposits in provincial statistical yearbooks (1986-2001). If any of these data are not reported in provincial statistical yearbooks, we also collect data from the following publications from National Bureau of Statistics: Xinzhongguo 50 Nian Tongji Ziliao Huibian (Comprehensive Statistical Data and Materials on 50 Years of New China), Gaige Kaifang 17 Nian de Zhongguo Diqu Jingji (China Regional Economy: A Profile of 17 Years of Reform and Opening-up), Zhongguo Caizheng Tongji 1950-1988, and Zhongguo Caizheng Nianjian (various years).

Table 7 Regression Results with Our Own Data Set and B-W's Data Set

Layer	β	Results Based on B-W's Data	Results Based on Our Data Set
1. Aggregate Layer	β	0.4851*	-0.0719*
2. Domestic Layer	β_{dom}	0.4065*[a]	-0.0932*[a]
3. Commercial Layer	β_{com}	0.1571*[a]	-0.2963*

*denotes significance at 5% level.
Note. If we substitute the foreign capital data (reported as foreign capital utilized for each province in footnote "a" under Table 6) for the (smaller) foreign capital reported in the fixed asset investment data, these coefficients will decrease further.

Table 8 Regression Results for "Rich" and "Poor" Regions with B-W Data

	B – W Data		
Group	β	β_{dom}	β_{com}
Rich	0.9289*	0.7293*	0.2019*
Poor	0.3670*	0.3199*	0.1541*

*denotes significance at 5% level.

Table 9 Regression Results for "Rich" and "Poor" Regions with Our Own Data

	B – W Data		
Group	β	β_{dom}	β_{com}
Rich	0.2559*	0.2183*	0.0257
Poor	-0.2165*	-0.2303	-0.5252

*denotes significance at 5% level.

Table 10 Estimated Coefficients on the Behavior of the Official Sector

Group	β_{gov}	β_{bank}
Rich	0.2076*	0.1755*
Poor	-0.2917*	0.0242

*denotes significance at 5% level.

Table 11 Banks' Profitability in China and Hong Kong, China, 1999

	Assets	Capital Asset Ratio	Pre-tax Profit	Return on Capital	Return on Assets[1]
	US$ million	%	US$ million	%	%
China					
Industrial and Commercial Bank of China	427546	5.13	498	2.3	0.12
Bank of China	350736	4.35	798	5.3	0.23
Agricultural Bank of China	274876	5.91	-43	-0.3	-0.02
China Construction Bank	265845	4.96	890	7.0	0.33
Bank of Communications	72233	4.19	324	11.1	0.45
Everbright Bank of China	20278	5.1	82	9.8	0.4
China Merchants Bank	19866	7.57	184	14.8	0.92
CITIC Industrial Bank	19003	4.62	138	16.5	0.72
Shanghai Pudong Development Bank	12466	7.53	142	21.2	1.14
Hua-Xia Bank	7383	5.2	62	16.4	0.84
Fujian Industrial Bank	5940	6.59	53	13.7	0.89
Xiamen International Bank	1097	13.79	2	1	0.15
Avg. of the above Chinese banks:				**9.9**	**0.51**
Hong Kong, China					
Hong Kong and Shanghai Banking Corp.	210770	4.45	3178	32.6	1.51
Bank of East Asia	18703	9.39	208	12.2	1.11
Doa Heng Bank	17003	834.00	180	13.0	1.06
Nanyang Commercial Bank	11047	11.62	86	6.9	-1.78
Wing Lung Bank	7687	8.17	131	22.2	1.71
Shanghai Commercial Bank	7433	11.68	134	16.3	1.8
Wing Hang Bank	6491	8.85	103	18.9	1.59
Po Sang Bank	6350	17.58	133	12.5	2.09
CITIC Ka Wah Bank	6278	10.97	14	2.1	0.23
National Commercial Bank	6210	11.92	31	4.3	0.5
China State Bank	6176	10.82	31	4.7	0.5
Dah Sing Financial Holdings	5713	7.75	85	20.0	1.49
Avg. of the above Hong Kong banks				**13.81**	**0.98**

1. After-tax return
Source: The Banker, October 2000.

Source: OCED publication (2002) "China in the World Economy."

Note. It is also pointed out in this book that "Even allowing for some recovery since 1999, the profitability of these banks is quite low by international standards. … The low-level of profits, although not their secular decline, is partly attributable to inefficiencies that lead to excessively high costs in bank operations. The extent of such inefficiencies is difficult to gauge from aggregate data (see Box 7.2 on p. 237). Nevertheless, there is evidence at the individual bank level of substantial inefficiencies and accompanying excessive costs in operations."

Table 12 Total Factor Productivity Growth Estimates

Region	TFP Growth, 1960-94 (Average rate per annum)
Indonesia	0.8
Korea	1.5
Malaysia	0.9
Philippines	-0.4
Singapore	1.5
Thailand	1.8
Taiwan	2.0
East Asia	**1.1**
South Asia	0.8
Latin America	0.2
US	0.9
Europe	1.1

Source: Anderson (2003).

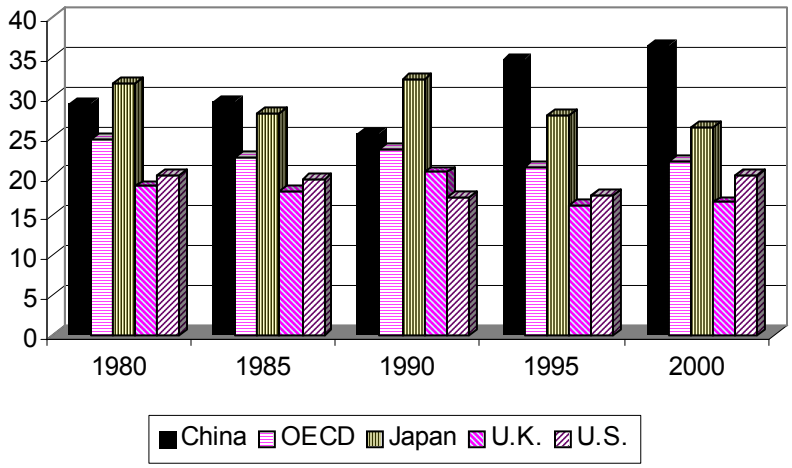
Table 13 The Distribution of Assets, Loans and Deposits in China's Banking System, 1999

	Assets		Loans		Deposits	
	Billion RMB	Share of banking system total (%)	Billion RMB	Share of banking system total (%)	Billion RMB	Share of banking system total (%)
Big 4 State Banks	10403	73.2	6249	71.7	7618	83
City Commercial Banks	554	3.9	271	3.1	441	4.8
Foreign Banks	263	1.9	180	2.1	43	.5
Joint Equity Commercial Banks	1456	10.2	704	8.1	1038	11.3
Policy Banks	1540	10.8	1312	15.1	37	.4
Total	14218	100	8718	100	9179	100

Assets, deposits and loans refer to consolidated figures including domestic and foreign currency. Source: The Banking Industry in China, 2000.

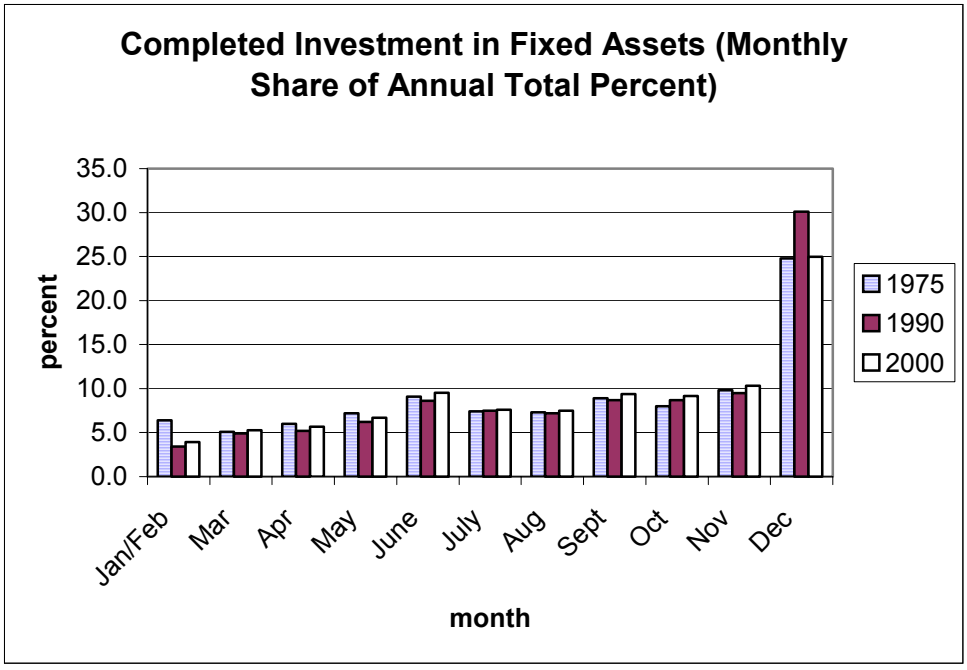
Source: OCED publication (2002), p241.

Figure 1 Ratio of Gross Fixed Capital Formation as a Percentage to GDP



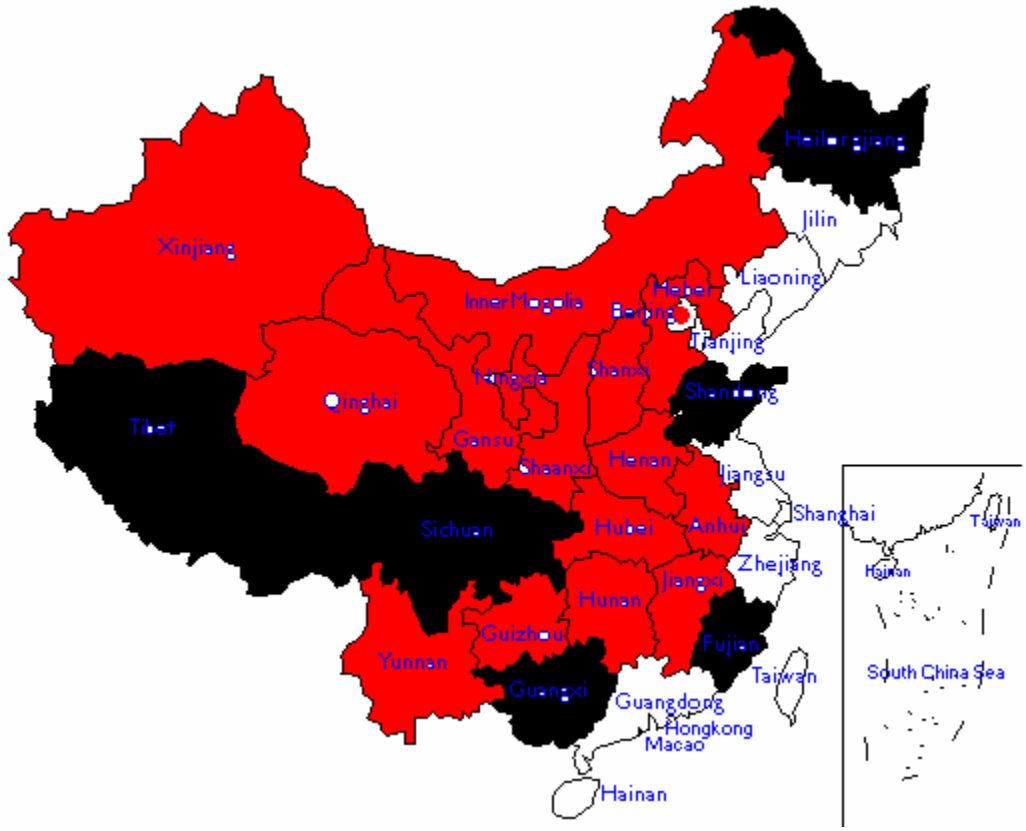
Source: World Development Indicators Database.

Figure 2 Completed Investment in Fixed Assets (Monthly Share of Annual Total Percent)



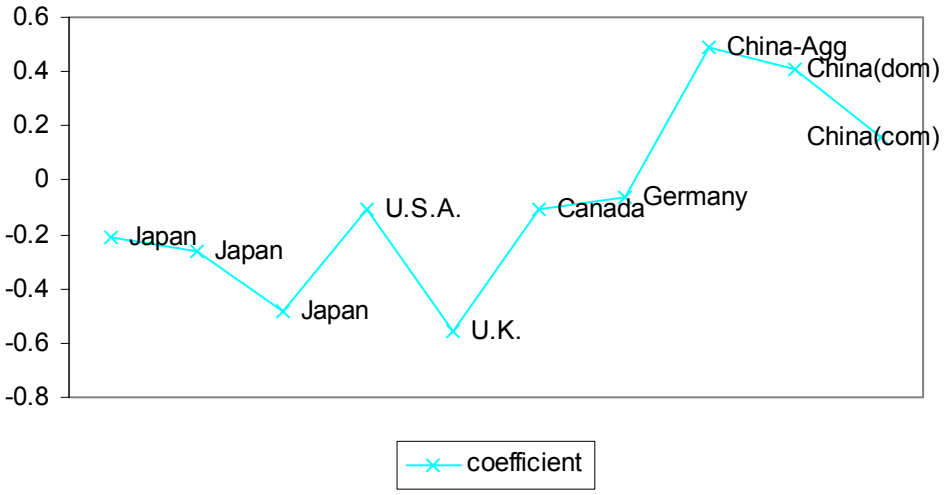
Sourc: China Statistical Yearbook on Investment in Fixed Assets 1950-1995, p. 77. China Monthly Economic Indicators, 1. 2001, p. 36.

Figure 3 Geographic Distribution of "Poor" and "Rich" Regions



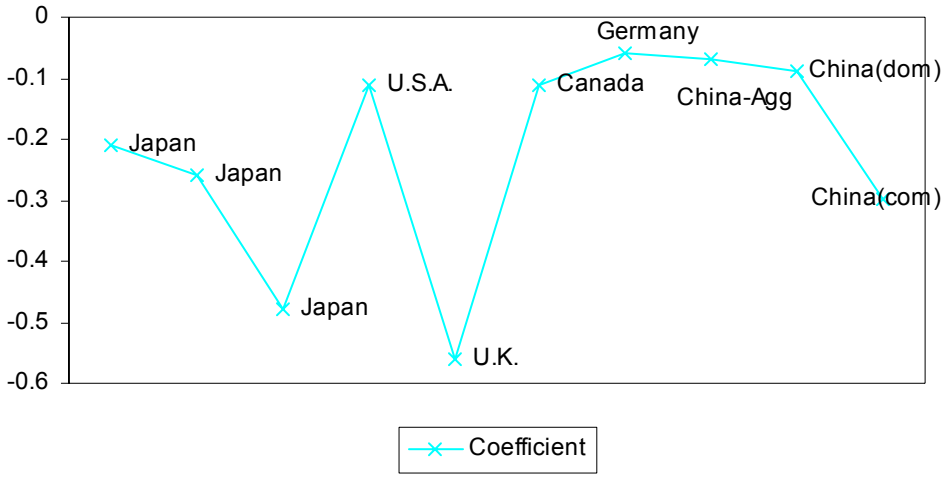
Note. The gray area represents provinces in the "poor region" group. The unshaded/white area represents provinces in the "rich region" group. The rest of the provinces shaded in black color are the ones not included in our analysis due to data limitations.

Figure 4 Comparison of Capital Mobility in China (With B-W's Data) and Other Countries



Source: Coefficients on China's capital mobility are obtained from our results in Table 7. Coefficients on other countries are obtained from figures reported in Table 4.

Figure 5 Comparison of Capital Mobility in China (With My Data) and Other Countries



Source: Coefficients on China's capital mobility are obtained from our results in Table 7. Coefficients on other countries are obtained from figures reported in Table 4.

Figure 6 Differences Between Savings and Investment Rates in "Poor Regions"

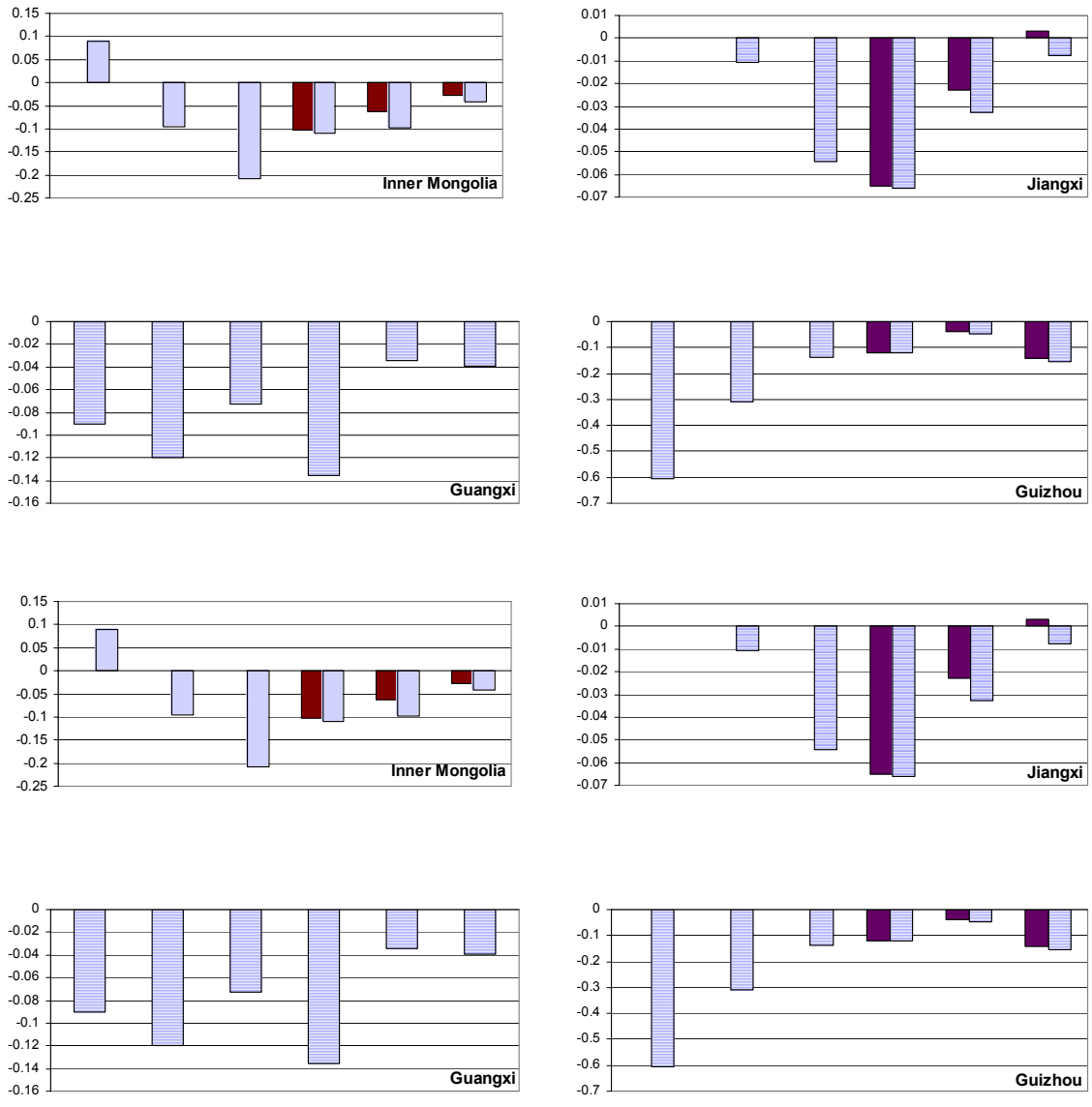


Figure 7 Differences Between Savings and Investment Rates in "Rich Regions"

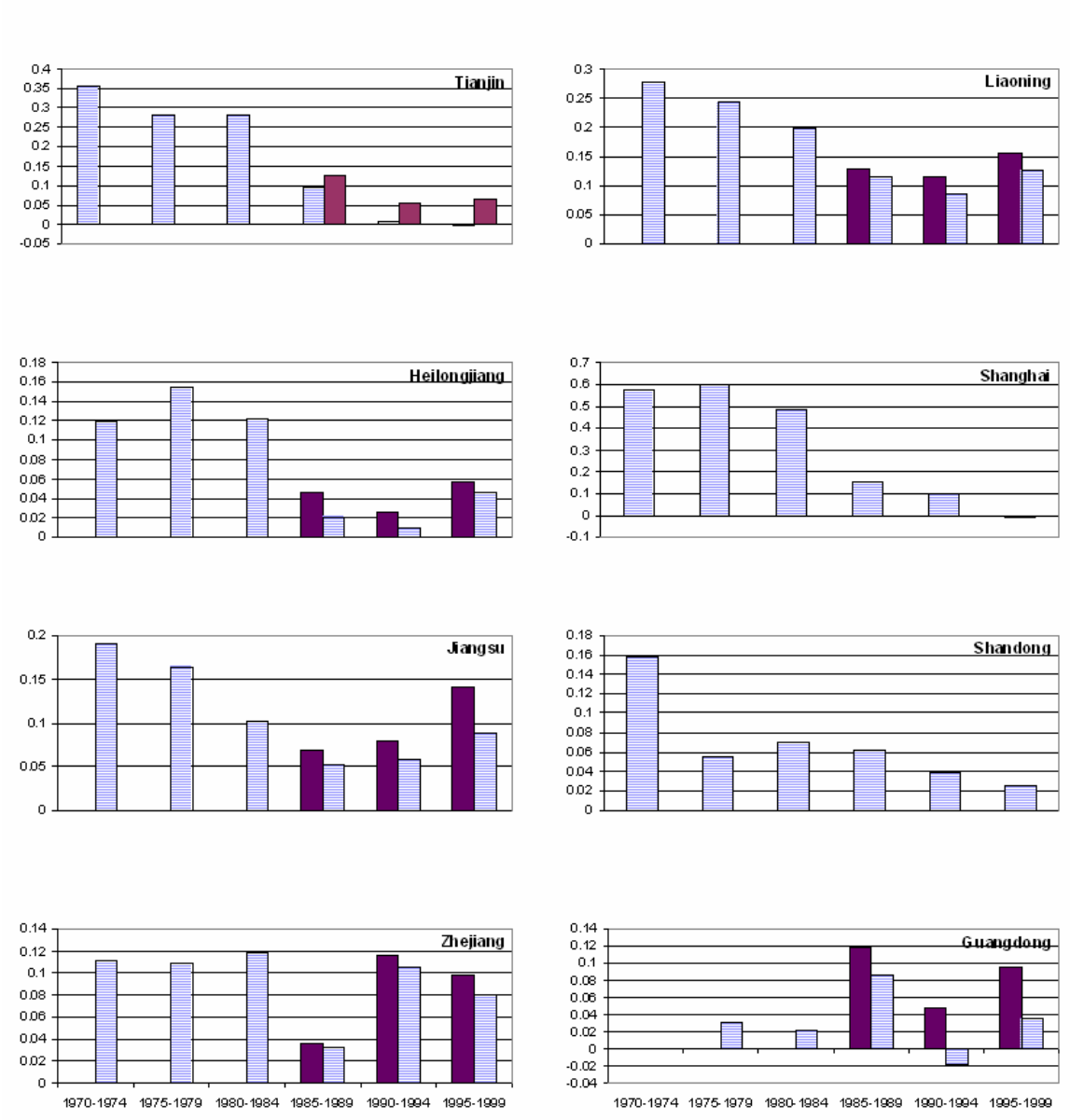
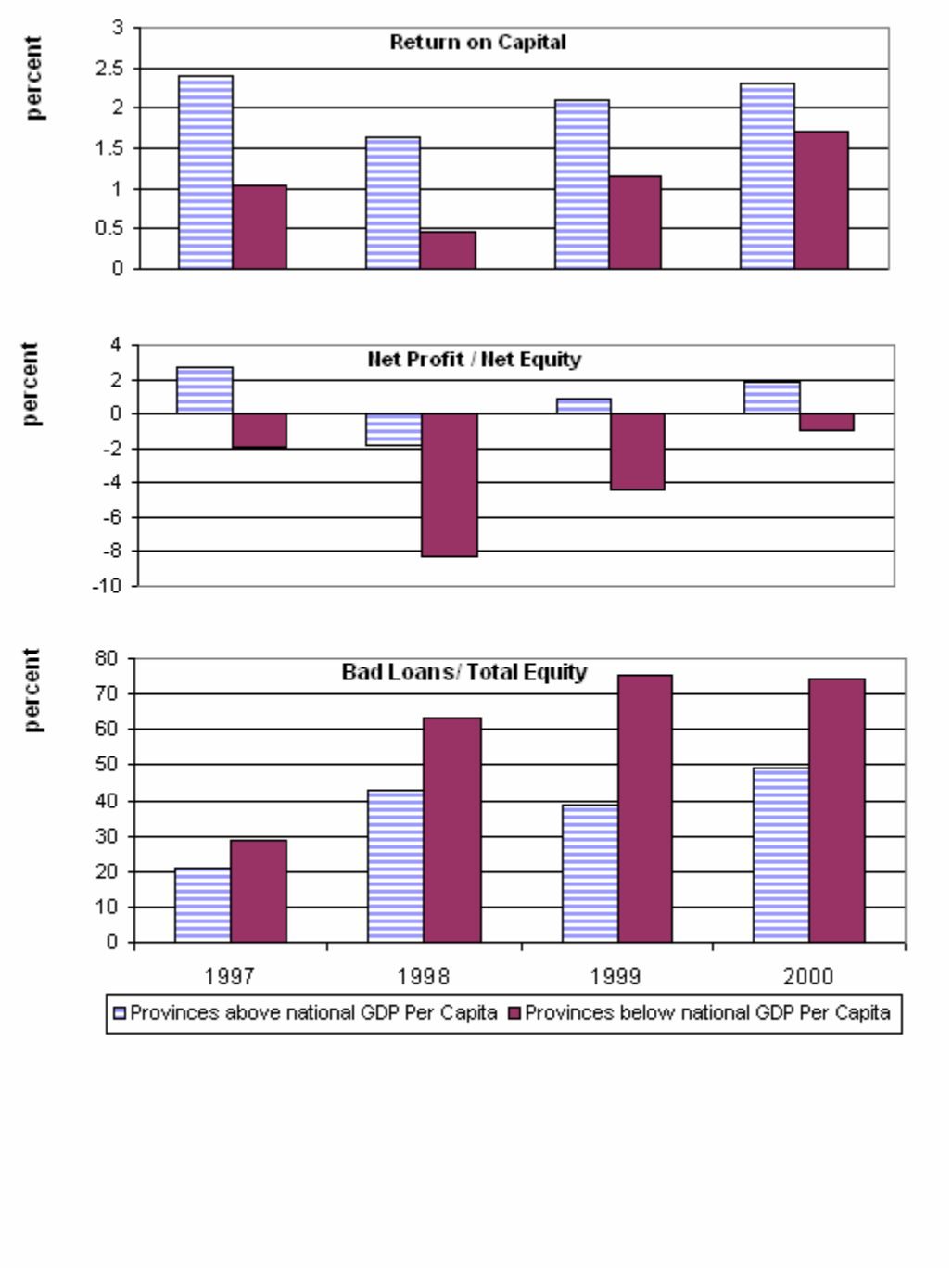
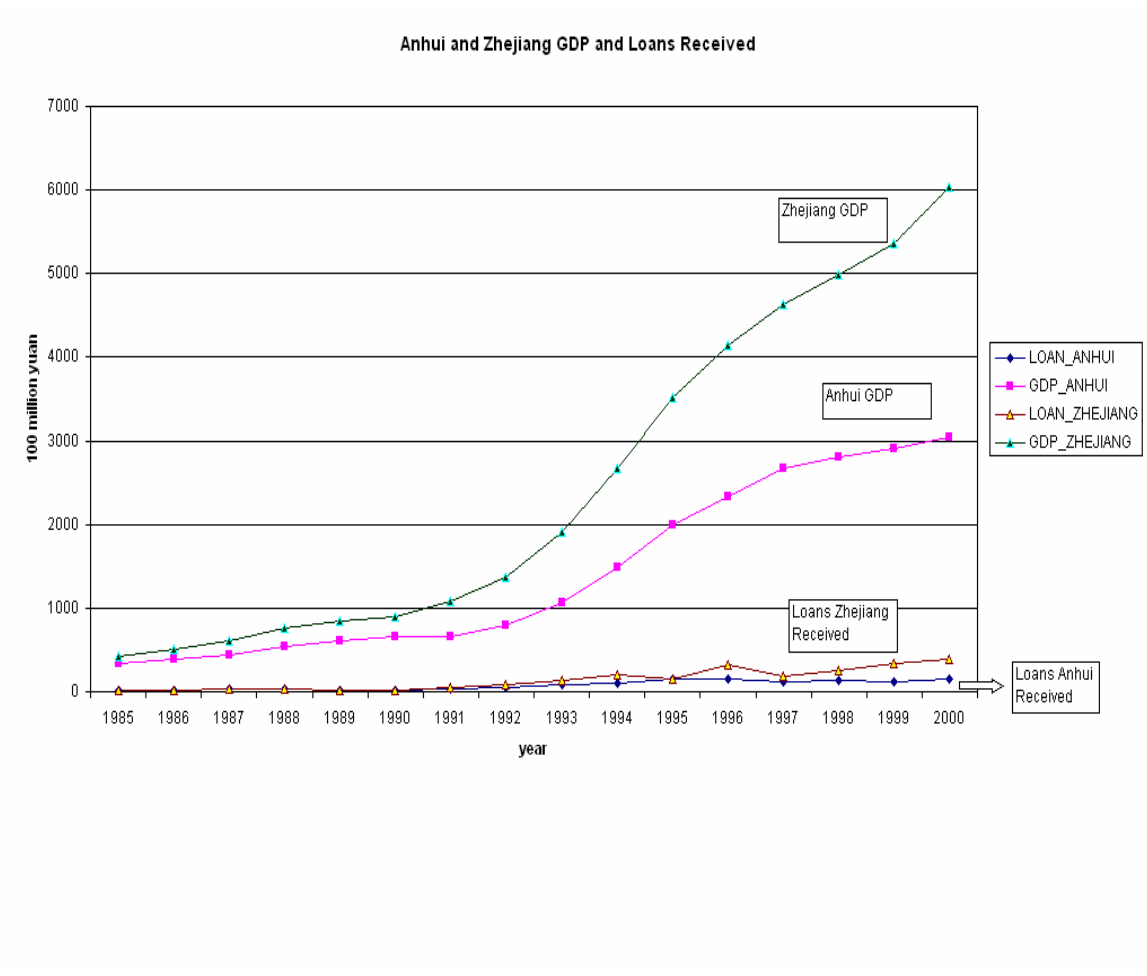


Figure 8 State Sector Performances in "Rich" and "Poor" Regions



Source: Caijing Tongji Ziliao, 2001.

Figure 9 Anhui and Zhejiang GDP and Absolute Amount of Loans Received



Source: Anhui and Zhejiang Provincial Statistical Yearbooks, 1989-2001.

Figure 10 Metric 2 for "Rich Regions"

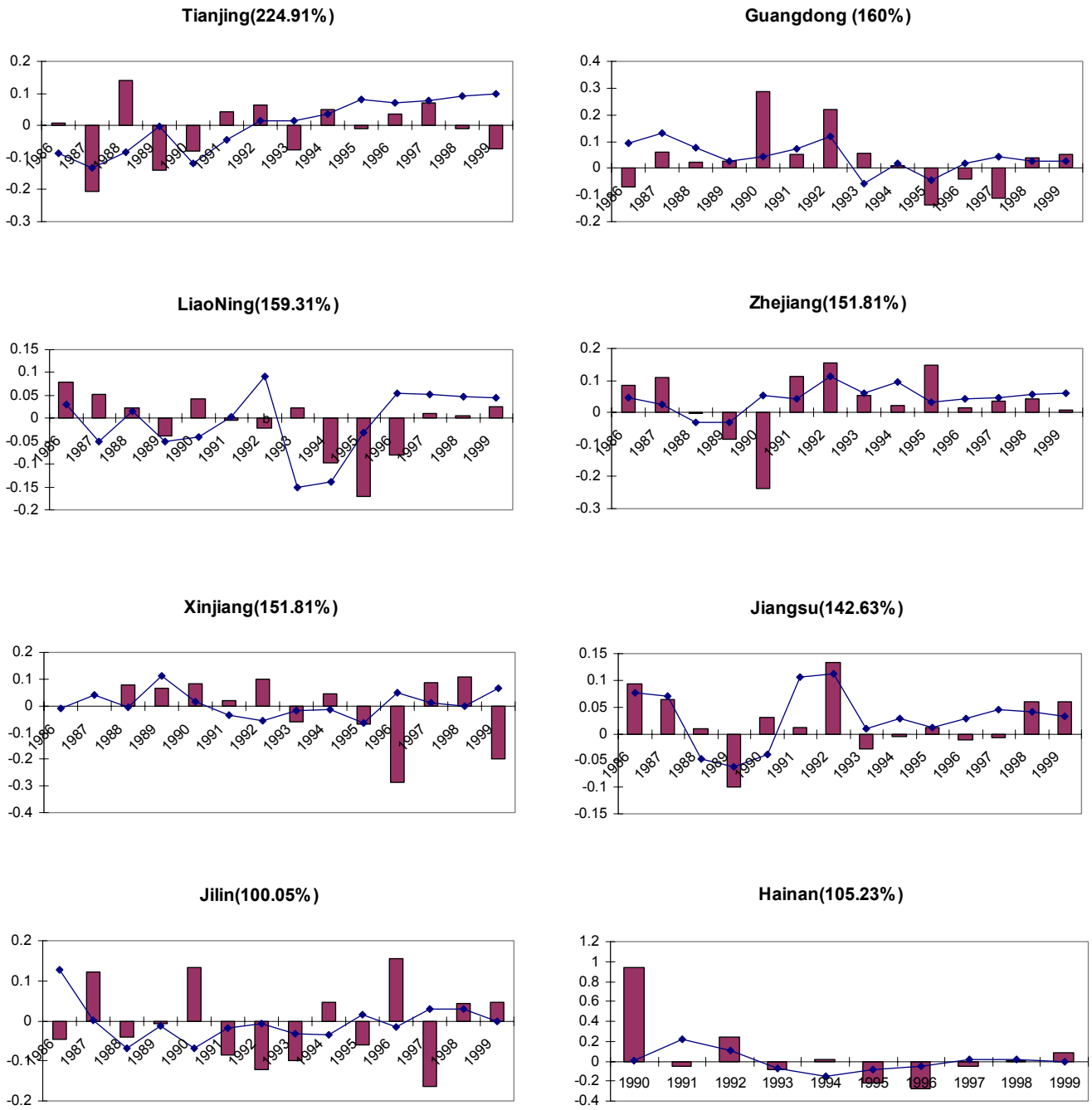
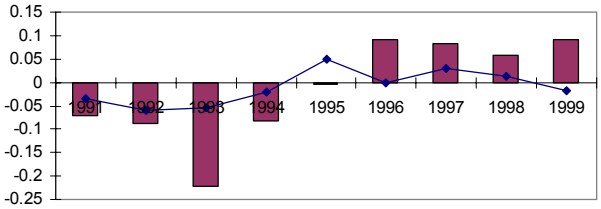
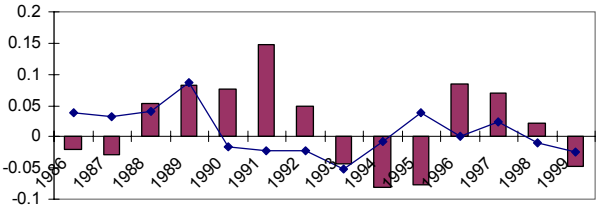


Figure 11 Metric 2 for "Poor Regions"

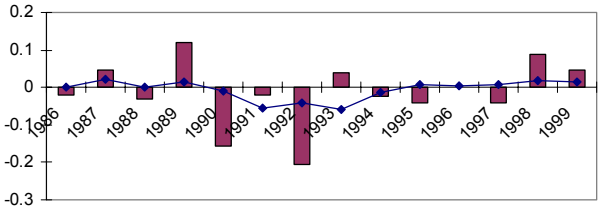
Gansu(55.58%)



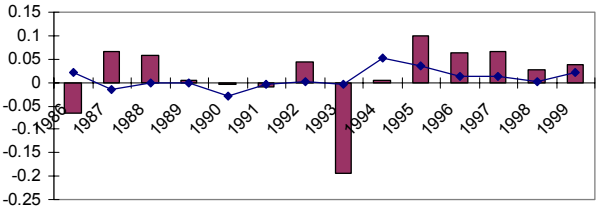
YunNan(65.47%)



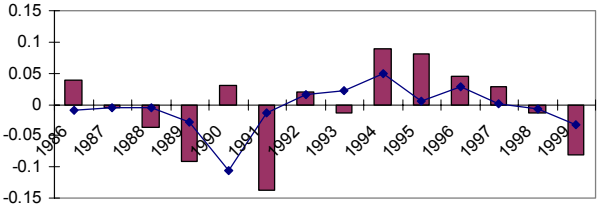
Shaanxi(67.16%)



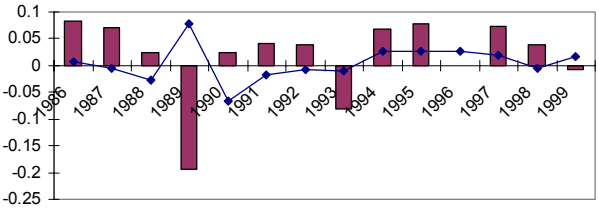
HeNan(68.56%)



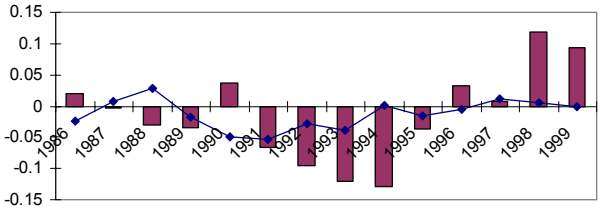
Anhui(70.33%)



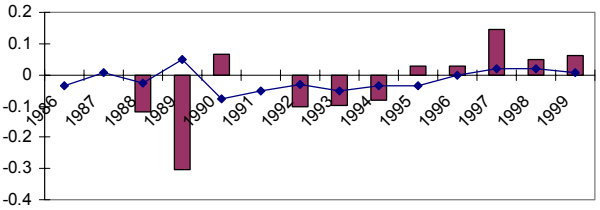
Hunan(73.15%)



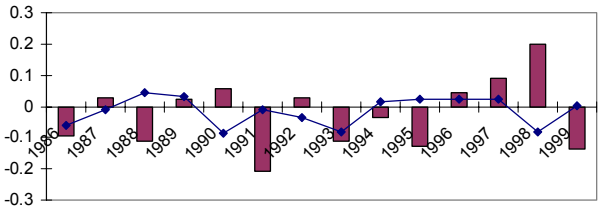
Ningxia(75.49%)



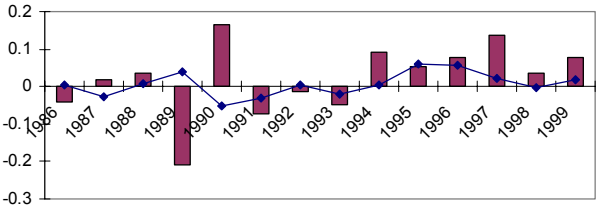
Qinghai(76.06%)



Shanxi(78.77%)



Hubei(92.71%)



2. Information Use and Transference Among Legally Separated Share Markets – An Experimental Approach

2.1. Introduction

Foreign share ownership restrictions have been a common practice at different times in almost all emerging capital markets.[29] They come in various forms to protect domestic industries while serving the purpose of attracting foreign capital. Several countries with emerging capital markets have adopted legally separate share markets (LSSM) in which local firms can market separate claims to the same underlying dividend flow to two distinct sets of investors, domestic shareholders who can buy "*A*" shares with domestic currency and foreign investors who can only buy "*B*" shares with foreign currency. For example, in China, local firms issue "*A*" shares to Chinese citizens who can only trade "*A*" shares with Chinese currency, Yuan;[30] firms can also issue "*B*" shares to foreign investors who can only trade "*B*" shares with U.S. currency.[31] "*A*" and "*B*" shares carry the same economic and voting rights.

As an empirical fact, prices of these assets diverge. This would provide arbitrage opportunities if there were no legal restrictions of the trading of these assets. However, restrictions on the percentage of capital that can be raised by the sale of "*B*" shares, together with prohibition of foreigners purchasing "*A*" shares and of domestic investors buying "*B*" shares prevent any opportunity for arbitrage across these two market claims to the same dividend

[29] For example, the Restrictions Act of 1939 significantly limited foreign shareholdings in Finnish companies. The law differentiated between restricted shares, which only Finns were permitted to own, and nonrestricted shares, which were available to foreigners. Philippine stock market and Mexican stock market also have different restrictions on foreign share ownership at different times.

[30] Since February 19, 2001, Chinese investors who already had a foreign currency savings account were also allowed to trade "B" shares. Most countries with LSSM design in their capital markets relax restrictions on foreign share ownership gradually. Our study is based on the initial forms and features of LSSM where there is still strict separation between domestic and foreign investors.

[31] "B" shares listed in Shanghai Stock Exchanges are traded with U.S. currency while "H" shares listed in the other stock exchange in China – Shenzhen Stock Exchanges are traded with Hong Kong dollars.

flow.[32] Nevertheless, previous studies have documented the covariance in *A* and *B* shares' price movements (Kim and Shin 2000, Chui and Kwok 1998, and Chakaravarty, Sarkar and Wu 1998). This has led a number of scholars to attempt to provide an explanation for the difference in pricing of these two classes of shares and the share price co-movements. Empirical work with field data using implications of CAPM models (Fernald and Rogers 2002) has attempted to account for the divergence in prices of "*A*" and "*B*" shares on the basis of difference in risk premiums. However, this approach implies that the difference in risk premiums should be the same across different companies. We find that this implication is not consistent with empirical data. Moreover, because these markets are legally separated, traders in these different markets have different portfolios. The CAPM model does not imply that two sets of traders who participate in market environments with different market portfolios will price the same assets identically.[33]

While we have good theoretical reasons to believe that shares traded in LSSM need not have the same price level in equilibrium, what remains to be explained is the covariance observed in the price movements of these shares. It is this phenomenon to which this research is directed.[34]

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[32] However, there have been reports indicating domestic capital flows trading "B" shares. Chinese citizens can ask overseas relatives to open an account to trade "B" shares. But there is no close estimate of the scale of such activities.

[33] Optimal portfolio theory implies that the price of any one share depends not only upon its own dividend flow but also upon the characteristics of the dividend flows of other assets that individuals may purchase. Since foreign investors and domestic investors have distinct sets of assets from which they can compose their portfolios, optimal portfolio theory provides a basis for accounting for differences in the prices for "A" shares and "B" shares. Although it is difficult to implement purely empirical tests on this hypothesis, there has been some experimental evidence to support the prediction of asset pricings of optimal portfolio theories. For example, Bossaerts, Plott and Zame (2003) show that asset prices are consistent with the predictions of portfolio theories (although portfolio choices diverge from choice predictions of the same theories).

[34] Originally our study is designed to test optimal portfolio theory as well as information transmission. There are many advantages of testing optimal portfolio theory with an experimental approach. The problems with pure empirical methods using only field data are: 1) we do not know what is exactly the market portfolio and what are the full options each individual faces? 2) optimal portfolio theory involves with each asset's stochastic process which generates dividends. But in reality, no one really knows this process. However in an experiment, we can control all

We focus on explaining the price co-movements of "*A*" and "*B*" shares with an experimental approach. A natural explanation for the price co-movements of "*A*" and "*B*" shares is the notion that people trading in LSSM tend to read price movements of one market as a relevant assessment of the fundamental factors regarding the same underlying dividend flow they are trading in the other market. Traders in LSSM may not value the same dividend flows in the same way, but they are both equally interested in the dividend flows. Generally those dividend flows are, at best, known probabilistically. However, some individuals may have better information than others as to the nature of this dividend flow. Therefore, all traders may be attempting to infer what the best information is from price movements in *both* markets. Indeed the market efficiency hypothesis implies that in equilibrium, the price of "*A*" and "*B*" shares will fully reflect the best available information. It is this hypothesis that we wish to test in this experiment.

Such a study on information use and transference among legally separated share markets will extend the literature of experimental studies on information revelation and market efficiencies. Our experimental design is inspired by the LSSM mechanism adopted in China. However, the results and findings of our study will provide a more strenuous test on fundamental market efficiency theories as well as the insights into general LSSM behavior in emerging capital markets.

2.2. Research Motivation

In the attempts to explain the different price levels paid by foreign and domestic investors as well as the correlation between "*A*" and "*B*" share price movements, most existing studies

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of these factors and obtain the full knowledge of these parameters. There have been several experiments that test optimal portfolio theory (as indicated in footnote 34). In general, the results show that individuals price assets as predicted by portfolio theory but they do not hold the portfolio suggested by the theory. Since these studies have already provided insight into optimal portfolio theory with experimental methods, we decided to focus on information transmission only with a simpler design.

adopt purely empirical approaches (Kim and Shin 2000, Chui and Kwok 1998). Studies which empirically identify the correlation between "*A*" and "*B*" share price co-movements have attempted to identify lead-lag relationship as a way of suggesting the direction of information flow. For example, Chui and Kwok (1998) use daily prices of "*A*" and "*B*" shares and demonstrate the lead-leg effect between these two types of shares is robust. They point out that an information transmission mechanism may be used to explain their results: "since *B*-share investors have better information than *A*-share investors, the latter tend to gain more information from the trading of *B* shares for the same stock. The direction of information flow is mainly from the price of *B* shares to the price of *A* shares. *A*s a result, the returns on *B* shares lead the returns on the *A* shares."

Although this suggestion mentioned in empirical studies provide excellent theoretical reasons to explain the price co-movements of "*A*" and "*B*" shares widely observed in LSSM, it is difficult to implement empirical tests of this idea. Field data approaches have difficulties in testing and interpreting asset pricing theories because these theories imply that the equilibrium price of an asset depends on parameters or "fundamentals" that cannot be observed in the field but are known to the experimenter who creates the environment within which asset trading takes place. These fundamentals include the utility functions of individual investors, the stochastic processes governing earnings flows as well as the distribution of knowledge among investors. Thus, due to the limitations inherent in the field data studies, the explanation for the lead-lag relationship mentioned above is inevitably conjectural.

However, in a laboratory experiment these fundamentals are chosen by the experimenter and can be used directly in testing hypotheses about asset pricing. Experimental approaches are especially attractive for studying information transference and usage in capital markets because

any private information that might be reflected in the market price of an asset is unobservable by an analyst of field data. Therefore, it is not possible to provide a direct test of the hypothesis that information transmission induces price co-movements using field data. For this reason, we propose to utilize laboratory experiments in which the experimenter knows the actual distribution of information among market participants to study the use and transference of information across legally separated share markets.

2.3. Literature Review

The test of our hypothesis on the impact of how information that might appear in one market gets transmitted to another market is a test of market efficiency. The price co-movement phenomenon is closely related to the hypothesis that the market price reflects the best available information, which is the central implication of the claim that asset markets are efficient. There has been some experimental support for this claim.

Previous experimental studies with regard to information transmission in a single market (that is, a single group of traders) have focused on two types of situations: one is that information "insiders" hold perfect knowledge of what the state will be; the other is that no individual knows exactly what the true state is but if private information were aggregated, the true state will be revealed.

In both of these two settings, there is a basic set up: one asset whose dividend flow is state dependent and the other is a trading currency. The difference in the private value of the state-dependent dividend to experimental subjects serves as the criterion to separate subjects to different types of investors.

Previous studies show that in general insider information does emerge and is reflected in market prices, although this is not always observed. For example, in the case of perfect insider

information, information revelation for one-period assets could be observed in the experiment of Plott and Sunder (1982) with dividend payments dependent on three states and three trader types which differed only with regard to the payoff associated with each of the possible states.

In the case of partial private insider information, information aggregation is observed but it does not happen all the time. Plott and Sunder (1988) studied markets where traders had different information and the information structure was collectively complete; that is, traders' collective information completely identified each trader's payoff. They demonstrated that a complete set of Arrow/Debreu securities help to aggregate information. Forsythe and Lundholm (1990) examine the extent to which markets actually aggregate and transmit information. They find that trading experience and common knowledge of dividends are jointly sufficient to achieve rational expectation equilibrium, but that neither is sufficient condition by itself.

But information aggregation does not work well in complicated environments. Studies extending the possible number of states governing dividend payoffs (O'Brien and Srivastava 1991 tested information aggregation with six possible states), and number of securities simultaneously traded fail to observe information aggregation. Moreover, recent studies also show the possibility of "information trap" – a sort of equilibrium in which information existing in the market does not become revealed in prices (Noeth, Camerer, Plott and Webber 1999). These efforts are designed to test the limits of the market information aggregation. Most of the extensions have been in the direction of reaching more complicated environments such as number of possible states and securities.

However, the process and impact of information revelation (or aggregation) *across* segmented markets, which applies to many markets in real economies, have not been studied. Will the power of simple environments, in which information transmission has been proved to

exist, also support information transmission across separated markets which represent the same dividend flow? If so, what does this mean to asset pricing in those markets?

Our study will answer these questions directly with a simple environment. We will extend the testing of market efficiency and information revelation to a new dimension by studying the flow of information and its impact across segmented markets. The design of previous experimental studies on information transference and market efficiency is confined to an environment where all the subjects have access to all the assets. To the best of our knowledge, there has not been any formal experimental study on information transference and its impact on asset pricing across segmented markets, which is a phenomenon widely observed around the world. We believe that this project will not only fill the gap in the literature but also address an important issue in emerging capital markets. Further, our design will provide a more strenuous test of the efficient market hypothesis than prior experiments with insider trading in that for full efficiency individuals will have to extract information from price movements in markets in which they cannot themselves trade. The results of our experiment should shed light on the interpretation of price movements observed in legally separated markets.

2.4. Experimental Design

2.4.1. The Environment

We will recruit subjects for a computerized double auction asset market game. The subjects will be divided into two groups: one is the domestic player group and the other is the foreign player group. Members of each group may trade amongst themselves, but cannot trade with members of the other group.

In this experiment, each group will have two assets: one of them pays a state-dependent dividend and the other is a trading currency that pays a dividend independent of state. Each

subject will start with 10 units of stocks (either A or B depending on which group they belong to) and 3500 units of trading currency. Each asset pays its dividend at the end of each trading period. Each asset has a one period life. At the end of a market period the assets have no redemption value. The stochastic process generating the state at the end of each trading period will be public knowledge, as will be the state-dependent dividends paid by each asset. In each market, there will be different types of traders who will be distinguished by the different payoffs received for the realized state. It will be common knowledge that the distribution of types of subjects is the same in both groups. Therefore, the fully revealing equilibrium will be the same in both groups.

Table 14 shows the stochastic process and the payoffs paid for assets *A*, *B* and the trading currency for different types of traders in both groups.

Table 14 Dividends and Payoff Information

	Dividends of *A* & *B* (in franc) for **TYPE X**	Dividends of *A* & *B* (in franc) for **TYPE Y**	Return on money (in franc) for both **TYPE X&Y**
θ_1 = Probability of ***state I*** observed: .5	300	150	1
θ_2 = Probability of ***state II*** observed: .5	25	50	1

Following the standard approach accepted for inducing preferences, our subjects will maximize the following dollar redemption form (as introduced in Plott and Sunder 1982):

$$R_i^t = \gamma_i[d_i(\theta)x_i^t + \sum_s P_s^{it} - \sum_p P_p^{it} + C_i^t],\ d_i(\theta) > 0,\ \gamma_i > 0,\ x_i^t > 0, \text{ where}$$

R_i^t = dollar earnings of individual *i* in period *t*,

x_i^t = asset units held by *i* at the end of period *t,* which is the sum of initial endowment of assets plus purchases less sales in period *t*,

$d_i(\theta)$ = dividend paid in francs for individual *i* and expressed as a function of the state of nature θ,

$\sum_s P_s^{it}$ = revenue from sales of assets during period *t*,

$\sum_p P_p^{it}$ = cost of assets purchased during period t,

$\theta \in \Omega$ = possible states of nature,

C_i^t = initial endowment of cash in francs,

γ_i = conversion rate of francs into dollars.

The above dividend and payoff table and dollar redemption formula is public knowledge before trading takes place. The advantage of this design is that to prevent potential "information trap," we create only two possible states and two types of traders. The dividend paid to the assets for the two states is quite different from each other to reduce confusion (dividend paid in *state I* is much higher than that in *state II* for both types of traders). The different preference for each individual is reflected in the different state-dependent dividend payoff.

The expected full-revealing rational equilibrium asset prices and asset holdings are also relatively easy to predict:

When *state I* occurs, price for asset *A* (*B*) is 300, Type X will hold asset *A* (*B*),

When *state II* occurs, price for asset *A* (*B*) is 50, Type Y will hold asset *A* (*B*).

However, in the rational equilibrium without insider information (that is, subjects do not have perfect knowledge about the true state of the current trading period), the equilibrium asset prices and asset holdings will be:

No matter which *state* occurs, price for asset *A* (*B*) is 162.5 and Type X will hold asset *A* (*B*).

The experimenter will go though basic exercises before the start of every experiment. We plan to run 15 to 17 trading periods with each period lasting 3 minutes.

2.4.2. Treatment Variables

The hypothesis studied in this experiment is the notion that people trading in LSSM tend to read information from the price movements in one market as a relevant assessment of the fundamental factors of the asset they are trading in the other market. Therefore, the treatment variables will involve the distribution and knowledge of private information.

We propose three treatment variables: One is the existence of subjects with insider information. When there is insider information some individuals will have private knowledge on the true state of the current trading period. This information will be released to selected subjects at the beginning of a trading period. Thus, in our experiment, the insiders have the full and complete private information regarding the true states of the world. Insiders' full knowledge, instead of partial information, does not require our insiders to depend on extracting information from other subjects who also possess partial information, as in other experiments. The second treatment variable is whether or not there is common knowledge regarding the existence and market location of insiders. We focus on three combinations of these treatments.

In the baseline treatment (*treatment 1*), it will be common knowledge that no one knows which state will prevail at the end of a trading period when dividends are declared. That is, there

are no traders with "insider information." Under this condition, the rational expectation equilibrium price for asset *A* (or *B*) is 162.5 (.5*300 + .5*25).

In a second condition (*treatment 2*), there will be a set of "insider traders" in one market who will be told at the beginning of each trading period what state will prevail at the end of the period. It will be common knowledge that there are insiders, but their identities and the market in which they can participate will be known only to the individuals who are provided with the inside information. Because both "foreign" and "domestic" traders have an interest in uncovering the information held by "insiders," our hypothesis is that subjects without insider information will watch the market price fluctuations across markets to infer the true state of the dividend payoff and therefore induce co-movements of the price of "*A*" and "*B*" shares.

In the third treatment (*treatment 3*), subjects are not only aware of the existence of the insiders, but also of the location of the group (or market) to which insiders belong. We believe that we will not only see covariance in the prices of "*A*" and "*B*" shares but also a stronger trend of lead-leg correlation between the prices as well as a more clear direction of information flows. The full-revealing equilibrium prices for *A* (or *B*) are:

When *state I* occurs, price for asset *A* (*B*) is 300,

When *state II* occurs, price for asset *A* (*B*) is 50.

2.5. Experimental Results

We have run 4 sessions for treatment 3 (in all 4 sessions, half of the subjects in the market trading asset *A* have insider information), 1 session for treatment 2, and 2 sessions for treatment 1.

We will analyze the data according to three different hypotheses.

2.5.1. Hypothesis 1: Convergence to Equilibrium Prices

The first hypothesis we wish to test is that when there are insiders, transaction prices converge to the full-revealing equilibrium prices in both *A* and *B* markets; on the other hand, transaction prices in both markets converge to the rational expectation equilibrium prices (162.5) when there are no insiders (thus subjects only have the knowledge of the probability of the occurrence of the two states).

Figure 12 reports the average transaction prices and the predicted full-revealing equilibrium prices for the sessions we ran for treatment 3 (where there are insiders and subjects have common knowledge of the location of the insiders) and treatment 2 (where there are still insiders but subjects do not have the knowledge of their location).

In each of the graphs in Figure 12, the horizontal axis shows the trading periods in each session, and the vertical axis presents the price levels. The smooth line represents the predicted full-revealing equilibrium prices and the other two lines with accentuated data points represent the average transaction prices for *A* and *B* in each trading period.

It is quite obvious that subjects were able to reach the full-revealing equilibrium prices for almost all trading periods in all four sessions we ran for treatment 3. The gap between the average transaction prices for *state I* and *state II* is getting larger and larger indicating that subjects were able to distinguish the two states and price assets accordingly as predicted by the full-revealing equilibrium. This trend is especially clear after period 10 for these 4 sessions.

It is important to note that average transaction prices for asset *B* not only track the average transaction prices for asset *A*, but also converge to the full-revealing equilibrium prices as well. Since that subjects in *B* market have no private insider information about the current state of the trading period, this is strong evidence that the insider information migrates into the *B* market. Informal interviews with subjects after each session confirmed that subjects in *B* market

were watching the prices in *A* market closely and were able to successfully infer the true state of most trading periods.

The last graph in figure 12 shows the average transaction prices for each trading period for treatment 2. It seems that participants in *B* market were able to discover that the insiders were located in *A* market, and learned to infer the true state eventually. We can observe that *B* market's prices were distinctively different before and after period 7. Before period 7, *B* market prices stayed around a steady level without distinguishing the two states, where equilibrium prices would be dramatically different. But after some trading experience and learning, *B* market started to move closer to equilibrium prices with the right trend.

Figure 13 reports the average transaction prices for assets *A* and *B* in each trading period in the two sessions we ran for treatment 1. In this base treatment, no one has insider information. Therefore, the rational expectation equilibrium prices stay at 162.5 for each trading period.

Although the average transaction prices for assets *A* and *B* never reached the exact level of 162.5, they seemed to be steady – staying between 100 – 150 for all the trading periods. The most distinctive feature for the average transaction prices for treatment 1 (compared to treatment 3) is that there is no huge swing for each period no matter which state is realized - an observation consistent with the rational expectation equilibrium prices. For treatment 3, the prices drop to 50 when *state II* is realized and increase to 300 when *state I* is realized. Average transaction prices in Figure 13 for both markets reflect the absence of insider information and therefore stay at a consistent and steady level.

Careful readers may have noticed that average *B* market prices in some periods in these 4 sessions shown in Figure 12 reached the "wrong" state or simply did not follow the prices in *A* market. Such periods include:

periods 2 and 5 in the session of March 18, 04

period 5 in the session of March 25, 04 (night session)

periods 1 and 5 in the session of May 26, 04 (afternoon session) and

periods 2, 4, 5, and 16 in the session of May 26, 04 (night session).

Figure 16 shows the gap between average transaction prices of asset *A* and asset *B* in these 9 periods. We can see that in these periods *B* market prices simply did not respond to the prices observed in *A* market.

We examined these periods further to analyze why average *B* market prices in these periods failed to match average *A* market prices, and sometimes reached the equilibrium price of the "wrong state," a phenomenon opposite to what we observed for most periods we have run.

2.5.1.1. Reason 1

We discovered that there are two main reasons. The first is associated with the price dynamics of the *A* market itself. In this case, either there is no clear trend of *A* market prices towards the equilibrium prices, or transactions in the *A* market in the beginning of a period are scarce. Such behavior in *A* market directly affects *B* market participants' ability to infer the correct state from observing the price dynamics of *A* market.

For example, period 2 in the March 18, 04 session and period 2 in the May 26, 04, night session fits into the scenario of the first reason where there are not clear trends in *A* market reaching to the correct equilibrium prices. Figure 17 plots the graphs to show the price dynamics of both *A* and *B* markets. The horizontal axis represents the sequence of transactions in both markets, and the vertical axis indicates the prices. In both periods, the true state is ***I*** and the equilibrium price should be 300. In period 2 of March 18's session, prices in market *A* keep at the low level close to 50, which is state *II*'s equilibrium price level. It can be seen that *B* market

participants were tracking the prices in *A* market (without knowing that the true equilibrium price should be 300, instead of 50). *A* market prices start to increase only towards the end of the period. Therefore, *A* market participants successfully "fooled" the *B* market subjects.

Period 2 in the session of May 26 tells a similar story. Although *A* market prices did reach 300 early in the period, but they fluctuate dramatically between 300 and 100. They even dropped to below 50 a couple of times. It's early in the session (given that it is only period 2) and the variance in the transaction prices in market *A* obscured *B* market subjects' ability to forecast the correct state.

Other than the vagueness in the trend of *A* market prices, scarcity of transactions also impacts *B* market's inference of the true state. Periods 5 in both sessions of March 18 and May 26 reflect this case. Figure 18 plots the sequence of transaction prices for both assets *A* and *B*. In both periods, the true state is *II* and the equilibrium price is 50. Even though market *A* prices stay close to the equilibrium price (therefore indicating a clear trend), there are very few transactions in the beginning of these periods in market *A*. However, there are a lot more trades in market *B* in the beginning of each period. *B* market was not following prices in *A* market but has "a mind of its own."

Figure 17 and 18 tell us that the "quality" and "clarity" of signals sent by *A* market prices have a strong impact on the mechanism of information transference between *A* and *B* markets. *B* market's failure in inferring the right state when signals sent out by *A* market are ambiguous is another piece of evidence to show that *B* market participants are watching the *A* market and if *A* market sends out clear signals, there is indeed information transmission as we observed most of the time.

2.5.1.2. Reason 2

The second reason that *B* market prices fail to track *A* market prices is due to some individuals' behavior. Some subjects engaged in transactions where prices seemed to be "highly irrational" even though there did seem to be a clear trend of market *A* prices reaching the correct equilibrium. The transactions they are involved with count for almost all of the deviation in *B* market from the true equilibrium prices or the average transaction prices in *A* market.

Periods that fit into this scenario are period 5 of the March 25's session and periods 1 and 5 of the May 26, afternoon session.

For example, in period 5 of March 25's session, the true state is *II* and therefore the equilibrium price should be 50. However, there are 16 trades in market *B* with prices over 85. It turned out that 9 of these trades of asset *B* were bought by subject 10 and all of these 9 transactions occurred in the last 30 seconds before that period was finished. Whether subject 10 mistakenly predicted the state or he/she simply speculates towards the end of that period was not known to us. But this one individual's behavior has caused the average transaction price of *B* to drift away from the correct equilibrium price.

Similarly, in period 1 of May 26 afternoon session, the true state is *II* and therefore the equilibrium price should be 50. There are 26 trades with prices over 100 in market *B*. Out of these 26 trades, 7 were bought by subject 9 and 18 were bought by subject 10. These two individuals' transactions count for 25 out of 26 trades with price over 100. If we exclude their behavior, the average transaction prices of *B* will fall close to the prices in *A* market.

These two subjects' behavior induced the same pattern in period 5 of the same experimental session. The equilibrium price should be 50, but there are 31 trades with prices

over 100. Out of these 31 transactions, 23 were bought by subject 9 (12 trades) and subject 10 (11 trades).

2.5.1.3. Two Cases We Cannot Explain

Out of the 9 periods with a big gap between average transaction prices in *A* and *B* markets, we could not explain what happened in periods 4 and 16 in the May 26, Night Session. Neither can we claim vague trends in *A* market prices nor can we blame on a single subject for these periods.

2.5.2. Hypothesis 2: Real Time Transaction Data

Hypothesis 1 confirmed that transaction prices for assets *A* and *B* do converge to (or move consistently with) the predicted equilibrium prices. Our next task is to test whether there is any information transmission between *A* market and *B* market. In treatment 3, half of the subjects in market *A* have the insider information. Everyone else in the experiment knows that subjects in *A* market have the insider information. Figure 12 shows that indeed the transaction prices for asset *B* track the transaction prices for asset *A*. Therefore it will be natural to presume that transaction prices for asset *A* will reach the equilibrium price earlier than transaction prices for asset *B*. This conjecture forms the basis of our second hypothesis.

Suppose we construct a price interval for the equilibrium price level (x) for each trading period (i.e., pick an ε to form $(x - \varepsilon, x + \varepsilon)$), then we can locate the real time (T: T_A for market *A* and T_B for market *B)* in each trading period when any transaction price for asset *A* (or *B*) falls into that interval. In our analysis, we locate T as the number of seconds left before the end of a trading period when that particular transaction occurred. Hypothesis 2 states that for treatment 3, for most periods we observe, T_A should be greater than T_B – indicating that *A* market price

reaches the interval earlier than *B* market price. However, for treatment 1, whether T_A is greater or T_B is greater should be random.

Figure 14 shows the graphs supporting hypothesis 2 for treatment 3. In each graph in Figure 16, we plot the figures for T_A and T_B for each period and the value of T_A *minus* T_B. ε was chosen to be 5 for state *II* and 150 for state *I*.[35] According to Hypothesis 2, most T_As should be greater than T_Bs. Therefore, the lines called "time difference", which is simply (T_A - T_B), in Figure 16's graphs lie above the horizontal axis for most periods.

In fact, the probabilities for T_A to be greater than T_B in the four sessions for treatment 3 are .73, .94, .82 and .59 respectively.

The probabilities for T_A to be greater than T_B in the two sessions for treatment 1 are only .29 and .27. (ε was chosen to be 52.5.) Figure 15 demonstrates this feature.

2.5.3. Hypothesis 3: Portfolio Composition

Other than the prices of assets, portfolio composition is another aspect of portfolio theory and test of market efficiencies. Optimal portfolio theory gives precise predictions not only of equilibrium prices but also of the equilibrium portfolio composition for the design of our experiment.

Based on the state dependent payoffs described in Table 14, type *X* has the higher expected payoff and should therefore hold all the stocks (*A* or *B*) at the end of a trading period while type *Y* should hold no stocks at all at the end of a trading period in treatment 1. However, for treatment 3 with full-revealing equilibrium, type *X* should hold all the stocks (*A* or *B*) when state *I* occurs while type *Y* should hold all the stocks (*A* or *B*) when state *II* occurs.

[35] We have to increase the value of ε for state *I* because transaction prices for most periods never reach the equilibrium price level 300 for state *I*. If we narrow the interval, there won't be any transaction price that falls into the interval. We extended the intervals so that they are closer to the real average transaction prices.

Recall that in our experiment, each subject starts with 10 units of stocks at the beginning of each trading period. In each group (group trading *A* or *B*), there are 3 type *X* subjects and 3 type *Y* subjects. Therefore, the total number of stocks in each group is 60. *A*ccording to the prediction we just described, the distribution of stocks in equilibrium by type for each period should be:

Table 15 Equilibrium Stock Holdings for Treatment 1

	State *I*	State *II*
3 Type *X* Subjects	60	60
3 Type *Y* Subjects	0	0

Table 16 Equilibrium Stock Holdings for Treatment 3

	State *I*	State *II*
3 Type *X* Subjects	60	0
3 Type *Y* Subjects	0	60

Figures 19 and 20 plot the stock holdings for *A* & *B* separately for each trading period of the sessions we have run. Figure 19 includes the two sessions of treatment 1 and figure 20 includes the four sessions we ran for treatment 3 and the one session we ran for treatment 2 with full-revealing equilibrium. In each graph, the horizontal axis plots the number of trading periods and the vertical axis represents the number of stocks held by type *X* subjects for that period (We did not show the stocks held by type *Y* because any stocks not held by type *X* subjects are held by type *Y* subjects. Therefore, the number of stocks held by type *Y* subjects is simply 60 minus the number of stocks held by type *X* subjects.) Each black square point represents the equilibrium holdings for stock *A* or *B* by type *X* subjects while each triangle point represents actual holdings

of stock *A* or *B* by type *X* subjects. If subjects did hold stocks according to the prediction of the optimal portfolio theory and reached full efficiency, the triangle points should reach all the black square points.

However, figure 19 shows that for many trading periods when there are no insiders (treatment 1), subjects did not hold the equilibrium portfolio. The second session (May 26, 04 night session) seems to be moving with the right trend towards the equilibrium but it never gets there for most periods. The gap between subjects' actual holdings and the equilibrium holdings is even bigger for the first session (March 19, 04 session).

Figure 20 reveals that in the market with insider information (that is, market *A*, and the corresponding graphs are the 4 graphs on the left side), the portfolio holdings are very close to the equilibrium. For most periods we observe, the gap between actual holdings and equilibrium holdings is very small. This indicates that insider information helps to improve the efficiency achieved in the market. However, *B* market did not reach the same degree of efficiency. Even though there are periods where *B* market subjects did hold portfolios very close to the equilibrium (for example, see periods from the first two sessions – March 18 and March 25 sessions), they often failed to distribute stocks among themselves efficiently. It seems that although *B* market participants were able to infer the right state most of the time, they were a step behind in holding efficient portfolios. The graphs for treatment 2 (where there are insiders but other subjects do not have the common knowledge of their location) confirm the same trend we observe for treatment 3. Subjects in *A* market (where insiders are located) hold a much more efficient portfolio than their counterparts in *B* market. There did seem to be some improvements in the efficiency of *B* market after a few periods (for example, periods 8 – 11). But such an improvement is limited.

To further examine the efficiency issue with a more accurate quantitative measure, we calculated the sum of dividend payoff of the efficient stock holdings predicted by optimal portfolio theory for all three treatments. We then compare that figure with the dividend earned by the actual holdings of subjects for each treatment. In table 17, the figure in each cell is the outcome of the actual dividend payoff divided by the dividend payoff of efficient stock holdings. In the base treatment without insiders, there is no difference in the efficiency of *A* and *B* markets as expected. But for treatment 2 and 3, the efficiency in market *A* (with insiders) is consistently greater than B market, a confirmation of what we have seen from the graphs earlier.

Table 17 Efficiency Measure for All Three Treatments

Session	**Efficiency of A Market**	**Efficiency of B Market**
Treatment 1 (No Insiders)		
May 27, 04 Session	.90	.91
Mar 19, 04 Session	.85	.86
Avg.	**.875**	**.885**
Treatment 2 (Insiders but no common knowledge)		
Mar 25, 04 Morning Session	**.91**	**.83**
Treatment 3 (Insiders & Common knowledge)		
Mar 18, 04 Session	.96	.92
Mar 25, 04 Night Session	.90	.92
May 26, 04 Afternoon Session	.96	.76
May 26, 04 Night Session	.95	.83
Avg.	**.94**	**.86**

Having the common knowledge of the insiders' location did improve the efficiency measure for *B* market in treatment 3 compared with treatment 2 (the average *B* market efficiency

is higher in treatment 3 than treatment 2), but we cannot say so when comparing with treatment 1. However, it is clear that *A* market's efficiency is increased with insiders (the efficiency measure of Treatment 2 and 3 is much higher than treatment 1).

It seems that the presence of insiders significantly increases the efficiency of the market with the insiders, but such positive impact fades away when the insider information gets transmitted to the other market. But the easier it is for subjects without insider information to infer the true state of the world (therefore, insider information is transferred), the more efficient the market without insider information is.

2.6. Conclusions and Future Research Plan

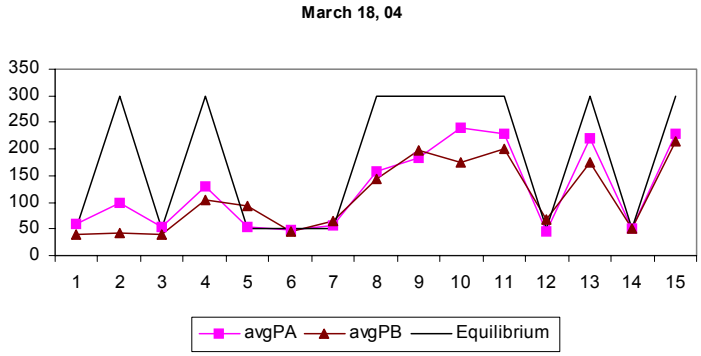
We implemented an experiment to study the effect of information use and transference on asset pricing and portfolio composition between legally separated stock markets. Our results show that insider information, which is available only to some participants in one market, does influence prices in both markets. Experimental participants in the market without insider information are able to infer the right state and therefore reach the full-revealing equilibrium. This provides a theoretical support for the conjectures made by empirical studies on emerging capital markets which adopt the same type of segmentation between local shares issued to local investors and foreign shares issued to foreign investors. The conjecture is based on the observation that prices of local and foreign shares seem to move together. It claims that the co-movements are induced by the fact that one group of traders has more information and the other would watch that group shares price to infer the information. Therefore, the transmission of information from one market to the other causes the co-movements.

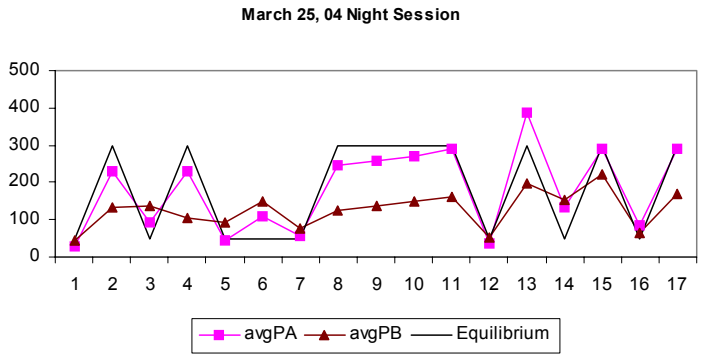
We also discover that the quality and clarity of signals sent out by the market with insider information directly affects the ability of the other market to infer the true state.

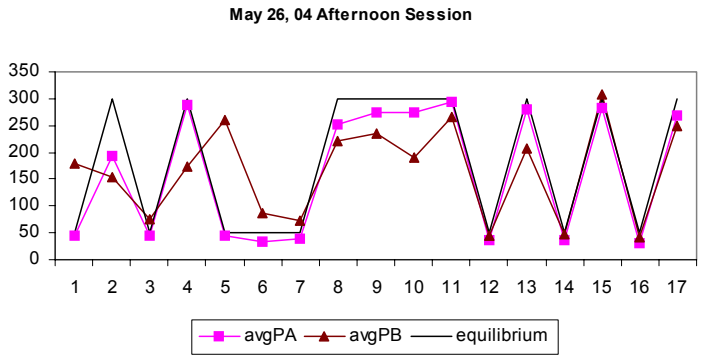
Finally, in terms of market efficiency reflected by stock holdings in subjects' portfolio, we find that participants in the market with insider information hold a more efficient portfolio than those in the other market.

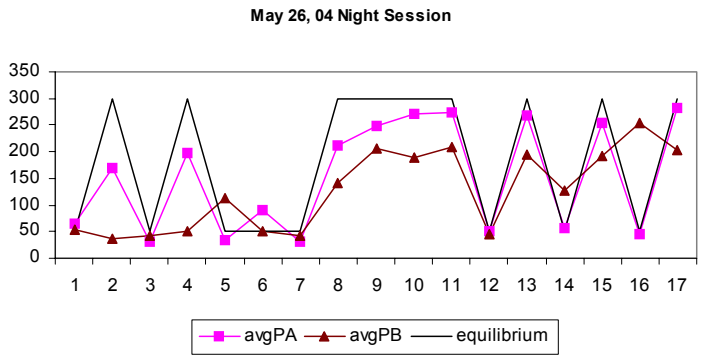
In the future, we can also investigate the capacity of legally separated markets to reveal market information by controlling the degree of difficulties for participants to infer the best available information. For example, we can construct different state-dependent payment tables for the two groups instead of using the same table for both groups (as implemented in this study). Knowing only the dividend and payoff information for the market one can participate, but not the other market, should make it more difficult for subjects to infer true state of the world by observing price movements in both markets.

Figure 12 Average Transaction Prices for Treatment 3









Average Transaction Prices for Treatment 2

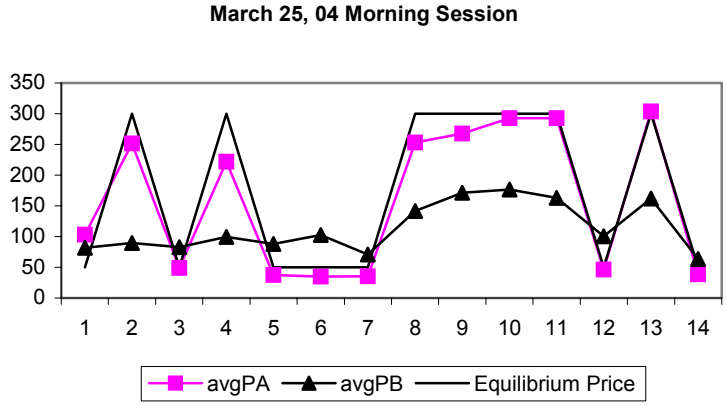
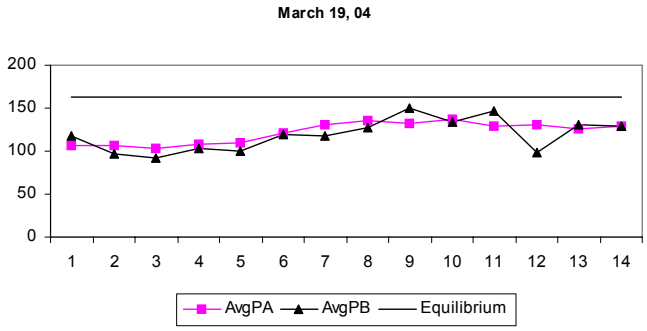


Figure 13 Average Transaction Prices for Treatment 1



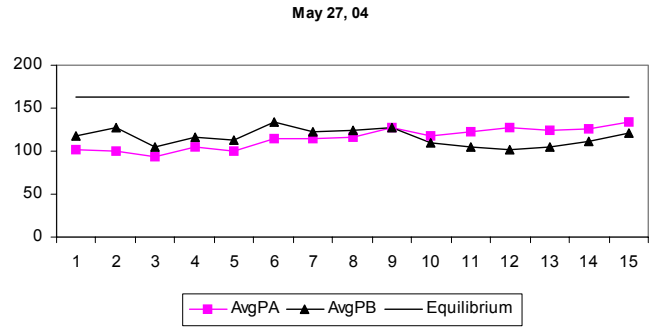
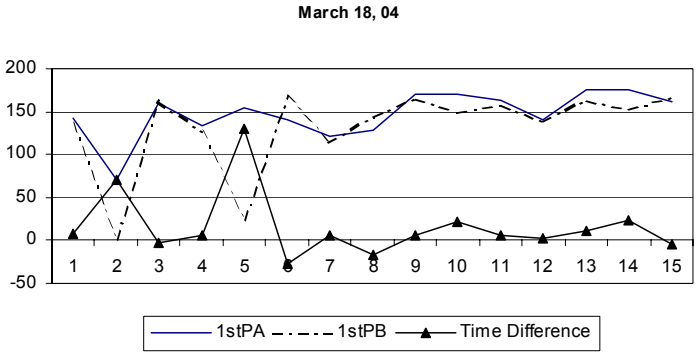
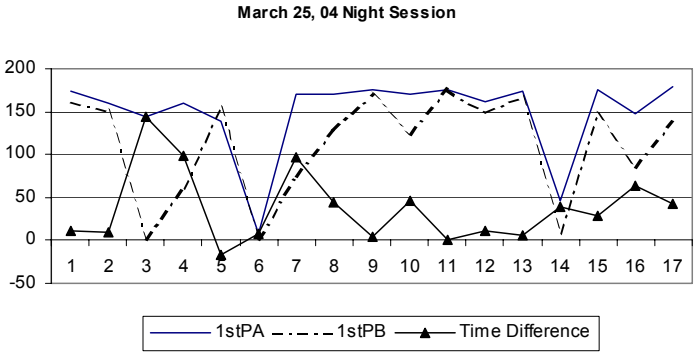
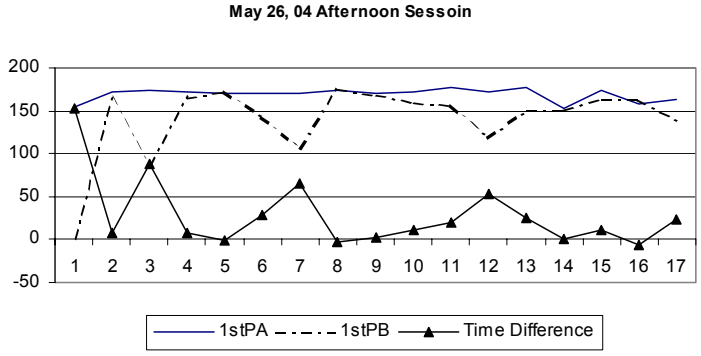


Figure 14 T_A and T_B for Treatment 3







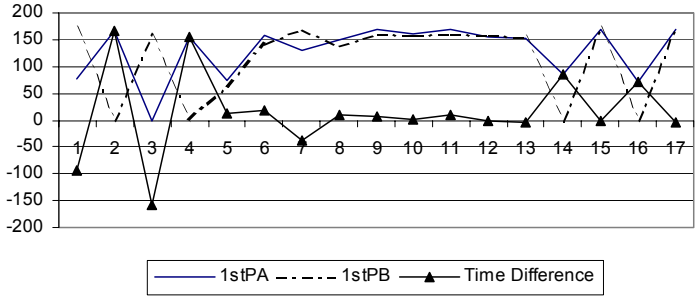


Figure 15 T_A and T_B for Treatment 1

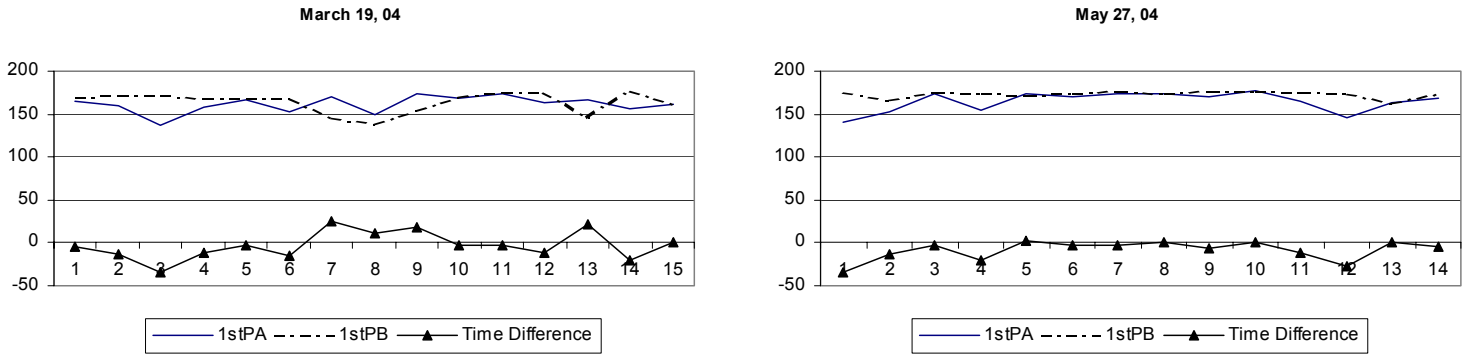


Figure 16 The Gap Between Avg. Pa & Avg. Pb for 9 Periods in Treatment 3

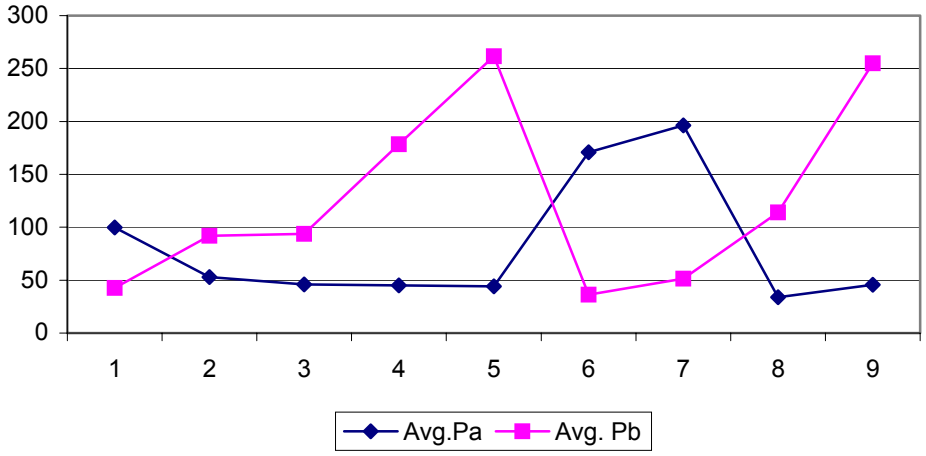
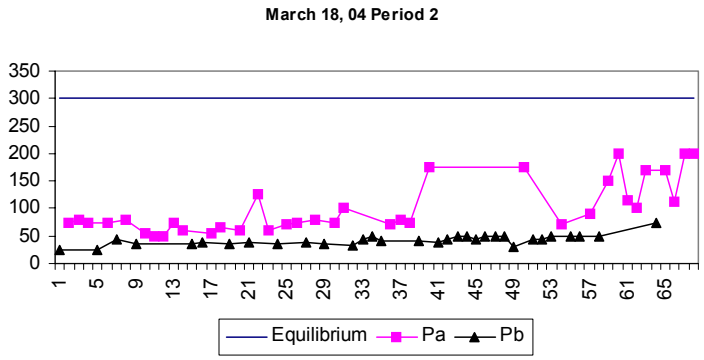


Figure 17 Non-clear Trends in Market A Causing Market B to Fail to Infer the Correct State



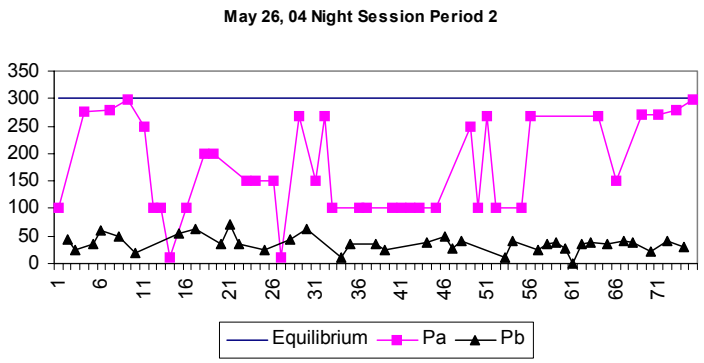
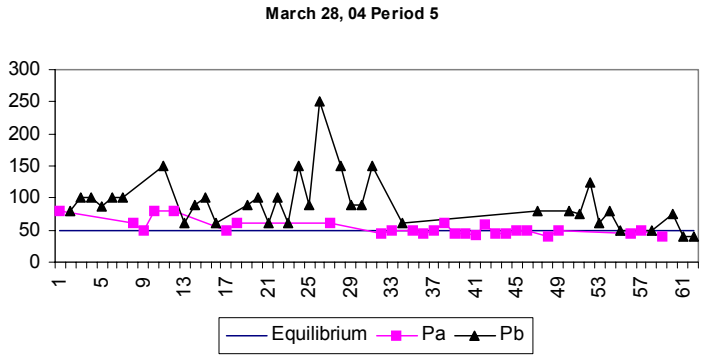


Figure 18 Scarce Transactions in Market A Causing Market B to Fail to Infer the Correct State



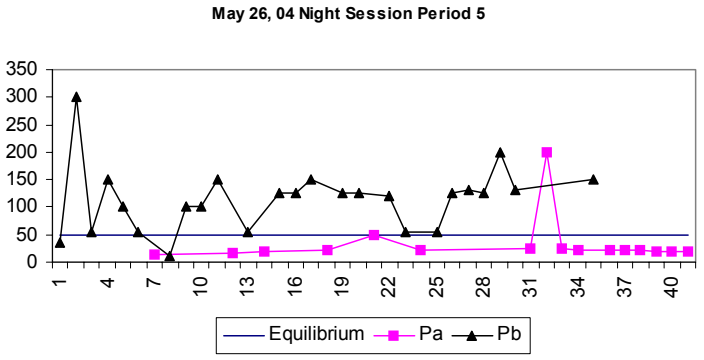
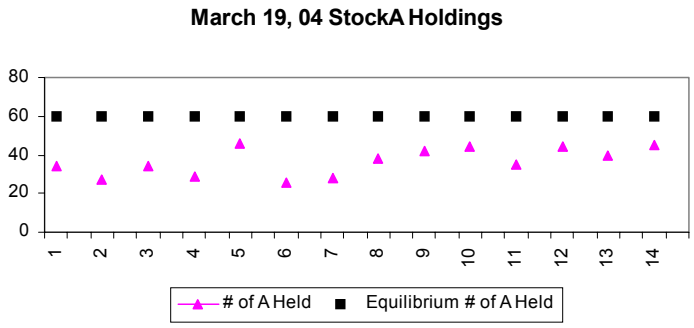
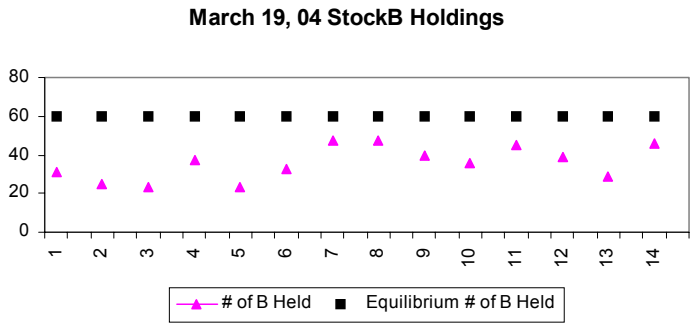
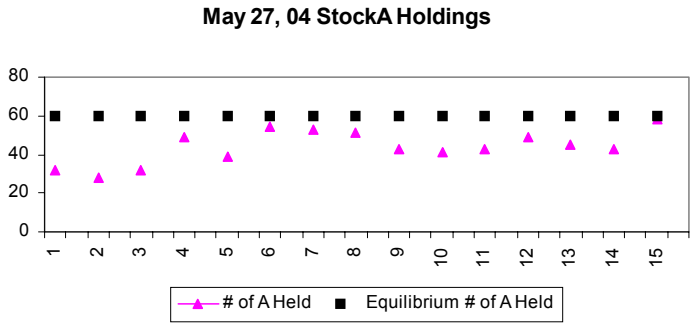


Figure 19 Stock Holdings for Treatment 1







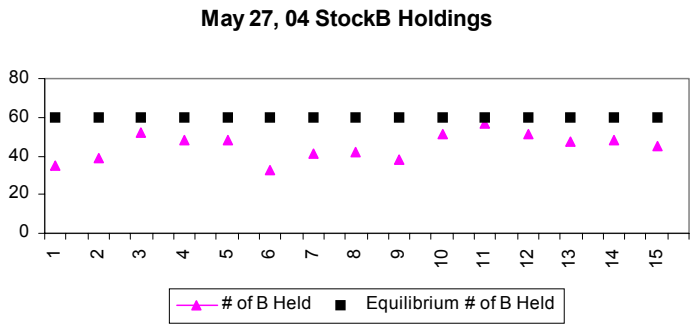
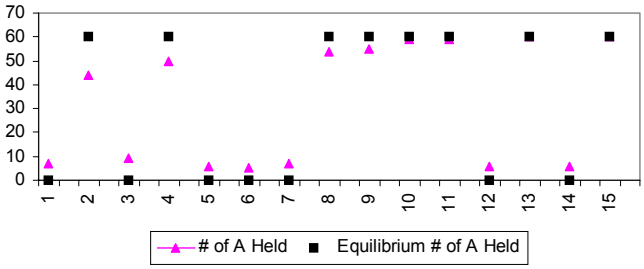


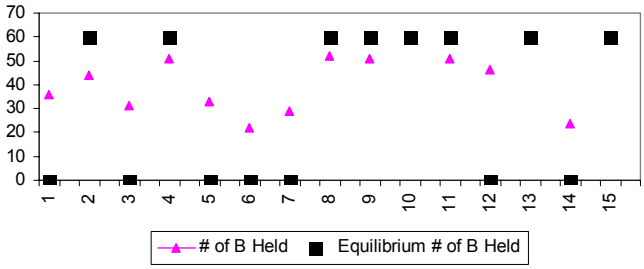
Figure 20 Stock Holdings for Treatment 3 and Treatment 2

Treatment 3:

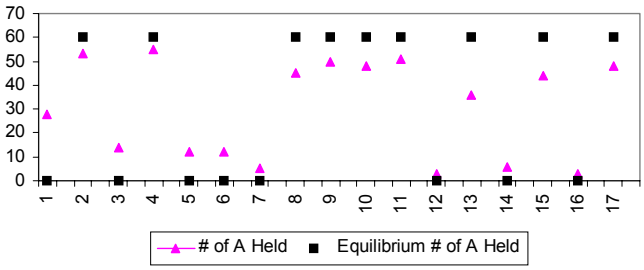
March 18, 04 StockA Holdings



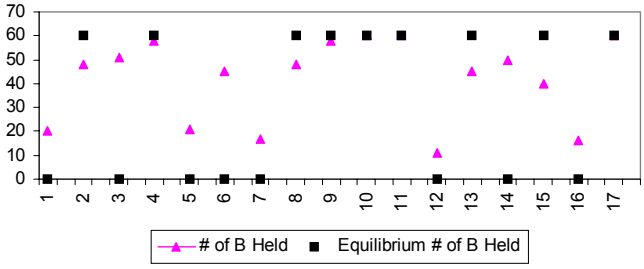
March 18, 04 StockB Holdings



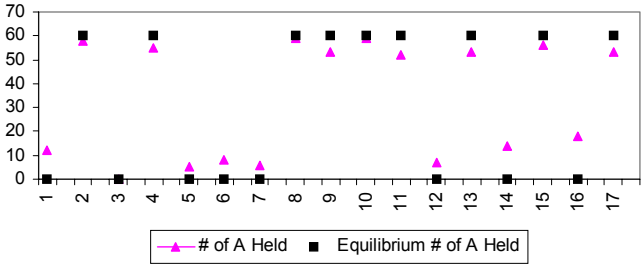
March 25, 04 Night Session, StockA Holdings



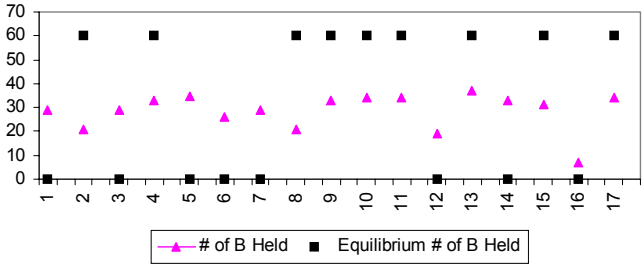
March 25, 04 Night Session, StockB Holdings



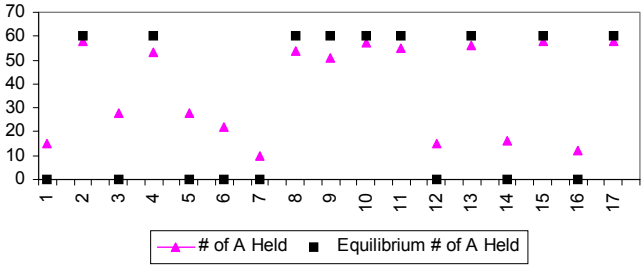
May 26, 04 Afternoon Session, StockA Holdings



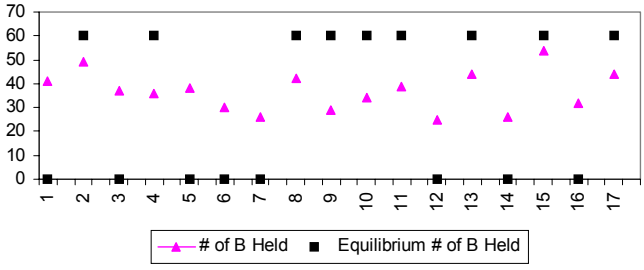
May 26, 04 Afternoon Session, StockB Holdings



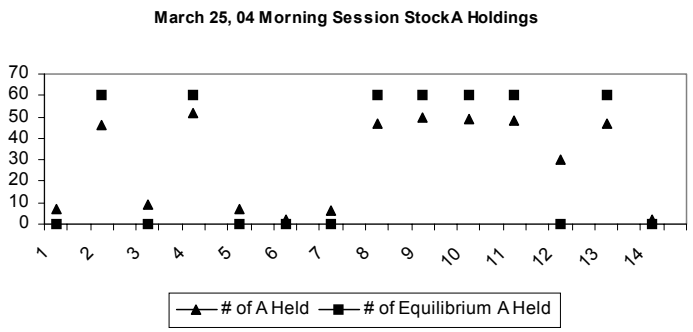
May 26, 04 Night Session, StockA Holdings

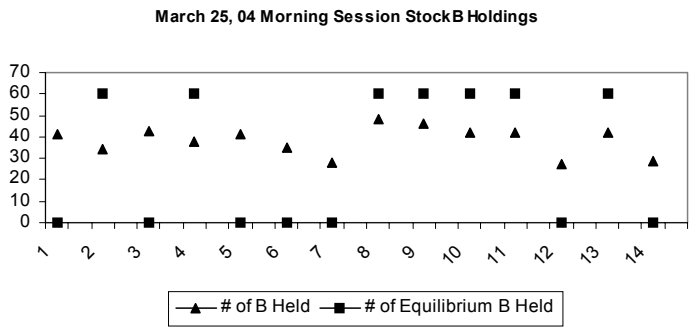


May 26, 04 Night Sssion, StockB Holdings



Treatment 2:


March 25, 04 Morning Session StockA Holdings
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
# of A Held
# of Equilibrium A Held


March 25, 04 Morning Session StockB Holdings
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
# of B Held
# of Equilibrium B Held

3. Asset Pricing of Legally Separated Share Markets: An Empirical Approach

3.1. Introduction

The establishment of the Shanghai (1990) and Shenzhen (1990) stock exchanges marked an important step towards building a functional capital market in the history of economic reforms started in 1978 in China. Like other newly established emerging capital markets, China's security markets exhibit many unique and constraining institutional features that have no counterparts in advanced nations. Attracting foreign capital is one of the priorities for many emerging economies which open their security markets to foreign investors (with different forms of restrictions on foreign share ownership). But do foreign and domestic investors price assets in these markets the same way? In such an environment with more instability and unique institutional constraints, can we still expect the same risk and return relationships predicted by standard CAPM models?

These are the questions addressed in this paper. Focusing on the shares listed on the Shanghai Stock Exchange, our research shows that foreign and domestic investors price assets quite differently in this market. Moreover, while domestic investors price asset risk as predicted by standard CAPM models, foreign investors do so only for large and prominent companies with better performance.

In the next section (section 3.2), we will provide a brief history of the development of Chinese stock markets and introduce two distinct institutional features essential to this market's operation and therefore, the research analysis. Then we will provide theoretical reasoning and empirical facts of domestic and foreign investors' distinct asset pricing behaviors in section 3.3. The paper proceeds to analyze risk and return relationships observed in the Shanghai Stock Exchange with standard CAPM models. Readers will find conclusions in the last section (section 3.5).

3.2. The Development of China's Stock Market and Two Distinct Institutional Features

3.2.1. A Brief History of Development

Although the Chinese capital market is still at a primitive stage, it has a long history. The Shanghai Stock Exchange (SSE) was the biggest stock exchange in Asia prior to World War II. The SSE was terminated after the establishment of People's Republic of China in 1949. Until the reforms in 1978, China had no capital market because the state exercised virtually full control over the collection and disbursement of funds. But since the start of reforms in the late 1970s, elements of a capital market have begun to appear: banks emerged from government departments (In fact, China has built four state-owned commercial banks: China Construction Bank, Industrial and Commercial Bank of China, Agricultural Bank of China and Bank of China); a central bank, the People's Bank of China, was established; insurance companies emerged; firms gained growing degree of independence and turned attention to profit seeking; In the early 1990s, two stock exchanges – Shanghai Stock Exchange and Shenzhen Stock Exchange - were opened. Table 18 shows the rapid development of the stock market in China since its establishment in the early 1990s.

3.2.2. Two Distinct Institutional Features

There are two classes of shares listed in Shanghai Stock Exchange: *A* shares and *B* shares.

The majority of class *A* shares are issued by state-owned enterprises. These shares can be further classified into three categories: "(1) State shares, which are shares held by the government through a designated government agency; (2) Legal shares, which are shares held by Chinese 'legal persons' (i.e. the enterprises and/or other economic entities but not individuals); (3) Public shares, which are shares held by Chinese citizens. According to the Chinese securities rules, only public shares can be traded on exchanges. Therefore, these public shares are called "tradable" shares. The State and Legal shares are issued at the time the company

are formed, but cannot be traded. These special regulations ensure that the government maintains control over the listed companies." (Chakravarty, Sarkar, Wu 1998) The state, legal persons and domestic investors each held about 30% of the total outstanding shares at the end of 1995 (Xu and Wang 1999).

Like many other emerging capital markets, China is also cautious about opening its security markets to foreign investors. Foreign share ownership restrictions have been a common practice at different times in almost all emerging capital markets.[36] They come in various forms to protect domestic industries while serving the purpose of attracting foreign capital. China has adopted legally separate share markets (LSSM) in which local firms can market separate market claims to the same underlying dividend flow to two distinct sets of investors, domestic shareholders who can buy "*A*" shares with domestic currency and foreign investors who can only buy "*B*" shares with foreign currency. For example, in China, local firms issue "*A*" shares to Chinese citizens who can only trade "*A*" shares with Chinese currency, Yuan;[37] firms can also issue "*B*" shares to foreign investors who can only trade "*B*" shares with U.S. currency.[38] "*A*" and "*B*" shares carry the same economic and voting rights.

3.3. Asset Pricing of *A* and *B* shares

A simple examination of historical *A* and *B* share prices reveals that these two groups of investors actually value the *A* and *B* shares quite differently. Another well-known fact of the

[36] For example, the Restrictions Act of 1939 limited foreign shareholdings in Finnish companies significantly. The law differentiated between restricted shares, which only Finns were permitted to own, and nonrestricted shares, which were available to foreigners. Philippine stock market and Mexican stock market also have different restrictions on foreign share ownership at different times.

[37] Since February 19, 2001, Chinese investors who already had a foreign currency savings account were also allowed to trade "B" shares. Most countries with LSSM design in their capital markets relax restrictions on foreign share ownership gradually. Our study is based on the initial forms and features of LSSM when there was still strict separation between domestic and foreign investors.

[38] "B" shares listed in Shanghai Stock Exchanges are traded with U.S. currency while "H" shares listed in the other stock exchange in China - Shenzhen Stock Exchange - are traded with Hong Kong dollars.

Chinese stock market is the severe discount price of *B* shares (the class of shares available only to foreign investors).[39] The difference in the price levels of *A* and *B* shares would induce arbitrage incentives but legal restrictions on cross trading between A and B shares prevent such activities.

Figure 21 shows the prices of *A* shares and *B* shares of 41 companies listed on the Shanghai Stock Exchange. At the end of April 2004, there are 43 companies that issue both *A* and *B* shares in Shanghai Stock Exchange.[40] *B* share prices are converted into Chinese Yuan by official exchange rates. It is clear that although there appears to be some co-movements in *A* and *B* shares prices, domestic and foreign investors price these two types of shares differently. We have daily *A* and *B* share price data from 1994[41] to February 19, 2004 for 41 companies that issue both *A* and *B* shares on the Shanghai Stock Exchange. After converting *B* shares into Chinese Yuan, our calculation shows that, on average, *A* shares are priced 3.79 times higher than their corresponding *B* shares.

Such an empirical finding is not surprising. Fundamental optimal portfolio theories predict that although *A* and *B* shares represent the same dividend flow (especially if we ignore the exchange rate risk[42]), in equilibrium, *A* and *B* shares need not have the same price levels. Optimal portfolio theory implies that the price of any one share depends not only upon its own dividend flow but also upon the characteristics of the dividend flows of other assets that individuals may purchase. Since foreign investors and domestic investors have distinct sets of assets from which they can compose their portfolios, optimal portfolio theory provides a basis

[39] As mentioned earlier, Chinese citizens were also allowed to trade B shares with U.S. dollars since Feb 19, 2001. B shares prices experienced a dramatic increase after that day.
[40] Information is obtained from Shanghai Stock Exchange website: www.sse.com.cn.
[41] 10 out of 41 companies were listed after 1994. Therefore the data for those companies started after 1994.
[42] Although lately there have been many discussions about the pressure for Chinese RMB to be revalued (mainly to appreciate), the exchange rates between Chinese Yuan and U.S. dollars have been relatively stable in the period of our study. Chinese government adopts a pegged exchange rate policy, which means that the exchange rate is not determined by international capital markets.

for accounting for differences in the prices for "*A*" shares and "*B*" shares. This explains that just because *A* shares and *B* shares are issued by the same company, and therefore represent the same dividend flow (if there is no significant exchange rate risk), such a condition is not sufficient to guarantee the same equilibrium price levels for these two types of shares. The investment opportunities and market portfolios are different for Chinese and foreign investors. Hence, *A* and *B* shares will be valued differently by these two segmented groups of investors.

3.4. Risk and Return Relationships for *A* and *B* Shares

If optimal portfolio theories successfully predict the divergence of *A* and *B* shares price levels, can we expect to utilize standard asset pricing theories based on the notion of market portfolios to predict the same risk and return relationships for these two types of shares? This section focuses on examining whether *A* and *B* shares' returns can be explained by systematic risks in China and the U.S. as well as idiosyncratic risks of the listed companies.

We will use standard CAPM one factor model to show that domestic investors price asset risks as predicted by this model, but foreign investors do so only for large and prominent Chinese firms with significantly better performance.

We will proceed by introducing previous literature on this topic and reasons we select CAPM models, model derivation, data description, and empirical results.

3.4.1. Literature Review

There have been quite a few papers studying the relationship between *A* and *B* share prices. These studies focused on the lead-lag or cross-autocorrelation between prices and returns of *A* and *B* shares (Kim and Shin 2000, Chui and Kwok 1998). While these studies provide a lot of insights into the *A* and *B* share pricing relationship, they did not utilize standard asset pricing models.

Among the ones that did include asset pricing models, present value models (and modifications of present value models) are often selected as the candidate to study *A* and *B* shares pricing issues.

For example, Fernald and Rodgers (1999) utilized the standard present value model to conjecture that the difference in *A* and *B* share prices of the same company can be attributed to differences in the discount rates applied by foreign and Chinese investors.

In their argument, the expected rate of return r for Chinese and foreign investors in the model:

$$P_A = \frac{D_t}{r_A - g} = k\frac{E_t}{r_A - g} \tag{1a}$$

$$P_B = \frac{D_t}{r_B - g} = k\frac{E_t}{r_B - g} \tag{1b}$$

is the key that determines the difference between *A* and *B* share prices (P_A is the price of an *A* share, P_B is the price of the corresponding *B* share, D_t is the dividend paid at time *t*, r_A is the constant expected rate of return of Chinese investors for *A* shares, similarly, r_B is the expected rate of return of foreign investors for *B* shares, *k* is the ratio of dividends to earnings E_t, and *g* is the constant growth rate of dividend). Since *A* and *B* shares are issued by the same company in China, the earnings are same for *A* and *B* shareholders. The above equation shows that:

$$\frac{P_B}{P_A} = \frac{r_A - g}{r_B - g} \tag{2}$$

Equation (1a,b) implies that $\frac{E}{P} = \frac{r - g}{k}$, therefore, it follows that:

$$r_A - r_B = k\left[\frac{E}{P_B} - \frac{E}{P_A}\right] \tag{3}$$

However, this argument is not fully convincing. Since we had wide variations in the gap between prices of *A* and *B* shares, the fixed effect of the difference in r for Chinese and foreign investors is not sufficient to explain cross company differences in the relative prices paid by foreign and Chinese investors for the same asset claims.[43] For example, on average, the *A* share prices of Hainan Airlines is about two and a half times more than its *B* share prices. But this difference between the price of *A* and *B* shares of the company "Rubber Belt" is as large as seven times. It seems that the price difference of *A* and *B* shares cannot be explained theoretically by a simple present value model.[44]

Starting with a present value model, Fernald and Rodgers finished the analysis by using a modified version of the P/E ratio analysis based on equation (3).[45] They formed a panel of Chinese companies to "identify variables associated with cross-company differences in the relative price paid by foreigners and earnings-price ratio." These variables include "a dummy variable for whether the firm exports a high share of its output; the percentage of total shares owned by the state; sales (lagged one period) as a proxy for size; turnover, defined as the average ratio of daily trading volume to shares outstanding; and observed sales growth from 1993-1997." (Fernald and Rodgers, 1999) In their analysis, *betas*[46] were indeed included as one variable to explain the relative prices of *A* and *B* shares. But this study is not a direct test of CAPM model.

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[43] If r_A and r_B is the only factor that leads to the difference of A and B share prices as predicted by the present value model. Then the price difference should be same for all the companies that issue both A and B shares according to equation (3).

[44] Adopting the basic present value model which says the price of an asset is simply the discounted expected future dividend stream is not plausible either. The companies listed in Shanghai Stock Exchange that issue both A and B shares only issued dividends 3 or 4 times altogether in the period we're looking at (1994-2002).

[45] In their regression, the dependent variable is $\frac{E}{P}$.

[46] See Section 3.4.2 for the explanation of *betas*.

In the results shown in their paper, the domestic and foreign *betas* failed to explain the difference in the relative prices of *A* and *B* shares. In addition, the domestic *A*-share *beta* and *B*-share *beta* yield opposite signs when they are included as independent variables to explain the earnings to price ratio of *A* and *B* shares respectively in their model.

I utilize CAPM one-factor model to explain the asset pricing of *A* and *B* shares. My study differs from Fernald and Rodgers' present value model analysis. Instead of inducing the conjecture from the present value model that the expected rate of return *r* is the key to explain *A* and *B* share prices, I will use the CAPM one factor model to directly estimate the *betas* of *A* and *B* shares. The estimated betas should provide insight into risk and expected return relationship of *A* and *B* shares.

3.4.2. The Model

In my analysis, the CAPM one factor model is adopted to study the asset pricing issues of *A* and *B* shares. Although this specification is not used as widely now as when it was first introduced, given the nature of the issues addressed here and the data limitation, I believe this is the most appropriate model for this analysis.

As Cochrane indicated in his book *Asset Pricing* (2001), all CAPM factor models are special cases of consumption-based asset pricing model. Suppose we have a basic asset pricing equation:

$$P_t = E_t \frac{\left[\alpha U'(C_{t+1}) X_{t+1}\right]}{U'(C_t)} \tag{4.1}$$

Where U represents individual's utility function, C_t and C_{t+1} represent consumption, P_t is the current asset price and X_{t+1} is the payoff of the asset.

Define the discount factor m as:

$$m_{t+1} = \alpha \frac{\mu'(C_{t+1})}{\mu'(C_t)} \tag{4.2}$$

then we can rewrite the basic asset pricing equation (4.1) as

$$P_t = E_t[m_{t+1} X_{t+1}] \tag{4.3}$$

Unfortunately, most empirical work testing this equation has shown that the discount factor using consumption data as specified in (4.2) doesn't fit the data very well. Obtaining asset price P_t and asset payoff X_{t+1} is a fairly easy job. All the empirical tests of asset pricing models fall into the difficulties associated with the task of getting good measures of the discount factor m_{t+1} and linking them to the data. This has inspired scholars to search for alternative models like CAPM as a proxy to the discount factor. The essence of CAPM models lies in this equation:

$$m_{t+1} = a + bR^W_{t+1} \tag{4.4}$$

R^W_{t+1} is the wealth portfolio return, which is normally replaced by the return on a broad-based stock portfolio in practice. Equation (4.4) linearizes the discount factor specification (4.2) and expresses m_{t+1} in terms of "factors."

The key connection between the CAPM single *beta* model and the traditional consumption based asset pricing model is the assumption that the agents' utility function takes a quadratic form. This utility form will ensure that the discount factor can be transformed into a linear representation as specified in (4.4).

I will follow Cochrane's notations to derive the CAPM model (Cochrane 2001, pp. 155-160). Assume an investor has a two-period quadratic utility function with no labor income:[47]

$$U(c_t, c_{t+1}) = -\frac{1}{2}(c_t - c^*)^2 - \frac{1}{2}\beta E\left[(c_{t+1} - c^*)^2\right] \tag{4.5}$$

[47] It was shown that other assumptions could be used to obtain CAPM model too. For example, Cochrane showed that infinite horizon quadratic utility with i.i.d. returns can also lead to equation (4.4).

with the budget constraint:

$$c_{t+1} = W_{t+1}$$
$$W_{t+1} = R^W_{t+1}\left(W_t - c_t\right)$$
$$R^W_{t+1} = \sum_{i=1}^{N} w_i R^i_{t+1},$$
$$\sum_{i=1}^{N} w_i = 1$$

The problem facing each investor is to choose consumption in two periods c_t, c_{t+1} and portfolio weights w_i to maximize the utility as specified in (4.5). Each agent starts with the endowment wealth W_t and lives for two periods. R^i_{t+1} is asset *i*'s return in the second period and R^W_{t+1} is the portfolio return to the investor in the second period. c^* is the peak of the parabolic curve.

A standard first order condition solution will give:

$$m_{t+1} = \beta \frac{u'\left(c_{t+1}\right)}{u'\left(c_t\right)} = \beta \frac{\left(c_{t+1} - c^*\right)}{\left(c_t - c^*\right)} \tag{4.6}$$

Substitute the budget constraint to (4.6) yields the following form:

$$m_{t+1} = \beta \frac{R^W_{t+1}\left(W_t - c_t\right) - c^*}{c_t - c^*} = \frac{-\beta c^*}{c_t - c^*} + \frac{\beta\left(W_t - c_t\right)}{c_t - c_*} R^W_{t+1} \tag{4.7}$$

which can be written as:

$$m_{t+1} = a_t + b_t R^W_{t+1}$$

where $a_t = \dfrac{-\beta c^*}{c_t - c^*}$ and $b_t = \dfrac{\beta\left(W_t - c_t\right)}{c_t - c^*}$.

The CAPM model is often stated in equivalent *beta* term:[48]

$$E(R^i) = \gamma + \beta_{i,R^W}\left[E(R^W) - \gamma\right] \quad (5)$$

In the above equation, R^i is an individual asset *i*'s return; R^W is the wealth portfolio return; β_{i,R^W} is the so called *Beta* which is closely related to the covariance of the individual asset's return and the wealth portfolio's return. The one-year treasury bill rate for the U.S. market and one-year deposit rate for Chinese market is a proxy for γ, the risk free interest rate in my analysis. My results described in section 3.4.4. below show that most *A* shares conform to the linear relationship between expected returns and risk. However only the *B* shares of large well-known corporations' data fit the relationship well.

Moving γ to the left, equation (5) states that an individual asset's excess return is simply this particular asset's *beta* multiplied by the market excess return[49] and that the intercept of this regression should be zero. The *beta* of each asset captures the systematic risk facing the whole market which cannot be avoided through portfolio diversification. The error term in a regression based on equation (5) catches the firm's idiosyncratic risk, which can be avoided by holding a well-diversified portfolio. Since the available assets to form portfolios for Chinese and foreign investors are different, the wealth portfolios to Chinese and foreign investors are different too. Therefore, according to equation (5), *A* shares' excess returns should be regressed on the Chinese

[48] For detailed proof of the equivalence of equation (5) and (4.4), see Cochrane (2001), Chapter 6, "*Asset Pricing*," 2001. William Sharpe also showed the derivation of equation (5) in his paper "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of risk," *The Journal of Finance*, Volume 19, Issue 3, P425-442.

[49] An asset's excess return is defined as the difference of an asset's return and the risk free interest rate. The market excess return is defined as the difference of the composite stock index return and the risk free interest rate.

market excess returns. The corresponding *B* shares' excess returns should be regressed on the U.S. market excess return.[50]

Historically there have been two different approaches to test equation (5). One is time series analysis, which uses an OLS regression to regress the excess return of an asset onto the excess return of wealth portfolio R^W and obtain the estimate of the *beta* for that particular asset. This equation states the precise relationship we should observe between the risk of an asset which is measured by the betas and its expected return. The more recent and popular approach is to perform a cross-section regression analysis based on (5). The general approach is to estimate *betas* from historical asset prices and stock indexes, and then use the estimated *betas* to forecast future asset returns.

Although most prominent works in testing the CAPM models follow the second approach, I still choose to use the time series regression analysis for the following reasons: 1) The purpose of my analysis is not to forecast the returns of *A* and *B* shares. What I am interested in is the relationship between the average risk premium and expected returns of *A* and *B* shares; 2) The estimated *beta* from the past history does not reveal possible changes of the *betas* in the future in the forecast. For one single asset, the *beta* may change dramatically from one period to another due to the firm's idiosyncratic characteristics and risk; On the contrary, the estimate of *beta* from the time series regression captures the sense of an average value of the *beta*. 3) To resolve the problem mentioned in 2), scholars have been forming different portfolios based on the initial estimate of individual asset's *beta* to test the CAPM model. The portfolio's beta might be more stable because the diversification of portfolios reduces the effect of firm-specific event.

[50] In reality, of course not all the foreign investors who hold B shares are American investors. But if the B shares are traded in U.S. dollars and the dividends are also paid in U.S. dollars, the average opportunity cost of investing in Chinese B shares is the average return forgone if they had invested in the U.S. capital market.

Fama and MacBeth (1973) constructed portfolios to diminish the statistical noise from the specific firm risk even though their work did not establish the validity of the CAPM model.

Recently other variables have been included as risk factors to explain the cross sectional difference in assets' returns and proved statistically more powerful than *betas* in prediction of future returns. The popular candidates are size of the firm ratio of market value to book value… etc. (See Fama and French 1992) However, this approach bears the danger of "fishing" for various factors to explain asset returns. One has to ask what is the compelling economic theory or story that guides us to pick all these factors. This approach has induced a huge debate. The fear of "data snooping" spread and challenged the results of these studies.

I do not plan to add "ad hoc" factors to pursue a good statistical fit in this study. All of my regressions will be based on equation (5) to see if there is any insight from the most familiar original form of CAPM model.

3.4.3. Data

I have obtained the monthly individual asset returns listed in Shanghai Stock Exchange (SSE) from 1992 to 2001. My data set also includes a monthly composite index of returns on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and NASDAQ, and the Shanghai *A* share index returns for the same period. The model specified by equation (5) also requires the risk free interest rate. As mentioned above, I have also included the one-year treasury bill rate and one-year Chinese deposit rate as a proxy for the risk free interest rate for U.S. and China respectively. Since *A* and *B* shares are traded with different currencies, I plan to look at the asset prices and returns in real terms. Therefore, the U.S. and China monthly inflation data are also collected.

The individual assets I will examine are the *A* shares and *B* shares of the companies who issue both classes of shares listed in SSE.[51] In my data set, 40 companies listed in SSE issue both *A* and *B* shares. The SSE *A* share index minus the one-year Chinese deposit rate is a proxy to the market excess return for Chinese investors and the NYSE, AMEX and NASDAQ composite index minus the U.S. one-year treasury bill rate is the proxy for the U.S. market excess return.

The regressions are based on equation (5).

3.4.4. Empirical Results

Table 19 shows the regression results for the forty companies that issue both *A* and *B* shares.

For the regressions with Chinese market *A* shares, only four out of forty companies in my dataset statistically reject the implication of the model specified as equation (5). The absolute majority of the samples we have confirmed the linear relationship between individual asset's excess returns and the market excess returns. The estimated "beta" ranges from 0-2.04.

Since the essence of equation (5) states that a stock's *beta* is closely related to the covariance of the individual asset's return and the wealth portfolio's return, we also calculate the covariance of the excess returns of individual assets and the excess returns of the wealth portfolio from our data. In the *A* shares of 36 stocks we examined, the covariance ranges from 19.33 to 709.27. We sort these stocks on the ascending order of covariance. Then we break the 36 companies into 3 categories (category 1's covariance figures are less than 200; category 2's covariance figures are less than 370; and category 3's covariance figures are less than 710.) We

[51] There are two Stock Exchanges in China, one is in Shanghai and the other is in Shenzhen. By the end of 1998, there were 106 companies that issue B shares. Some companies issue B shares only. 54 were listed in Shenzhen Stock Exchange, the other 52 were listed in Shanghai Stock Exchange (SSE). The size of the two stock exchanges is comparable, but the SSE has raised slightly more capital through B shares than Shenzhen. The B shares listed in Shenzhen are traded in Hong Kong dollars. My analysis is focused on the A and B shares in SSE.

also sort these stocks on the ascending order of *A*-share *beta* figures. If the *betas* we obtained from regressions are also closely related to the covariance figures as predicted by equation (5), we would expect to see the sort based on two different criteria results in a similar rank.

It turns out that although the ranks of these companies by their *betas* and covariance figures are divergent for the first two categories, as the covariance gets bigger, the rank from both ways of sorting does become close. Figure 22 shows these two types of ranking for 36 companies' *A* shares and for the companies that fall into category 3 respectively. The three segments of the 45-degree line represent the rank by covariance figures for the three categories. The other plotted line represents the rank by *betas*.

However, for the regressions with Chinese *B* shares on U.S. market excess returns, 37 of 40 companies reject the implication of the model. If we relax the confidence level to 10% instead of 5%, then 33 companies reject the model (the results of those companies that conform with the model are in bold font in Table 19). Even among the companies whose data did yield significant estimates of *betas*, the estimated intercepts were not zero except for one company - a contradiction to the prediction of zero intercept by the model. Moreover, the estimated betas are much higher than their counterparts in the *A* shares – estimated *betas* for *B* shares are in the range of 4.35 to 6.25. This shows that *B* shares issued by Chinese companies present a much higher systematic market risk to foreign investors. But on the other hand, the higher systematic risk offers a higher excess returns for *B* shares. The positive intercepts (in the range of 21.64 to 32.73) also indicate B shares' higher returns.

Despite all the unique institutional features, the CAPM single *beta* factor model seems to work well with the Chinese *A* shares I examined. The interesting result, however, is that only 7 of 40 enterprises' data partially conform to the CAPM model for *B* shares (the estimates of

intercepts are non-zero, therefore, we cannot claim a good fit to the model). Equation (5) shows that some assets must offer higher than average returns to persuade investors to hold them in their portfolios (i.e., assets with higher estimated *betas*). This result indicates that a foreign investor would probably like to insist on higher returns when investing in a foreign country, especially if foreign firms provide minority shareholders with limited information and little control over management. In addition, concerns over political instability and exchange risk may also induce the foreign investors to demand higher than average returns.[52]

The conformation of *A* shares' data to the CAPM model and the rejection of *B* shares' data to this model may be surprising since it is often believed that many Chinese individuals investors, new to the stock markets, are novice traders and often present excess mood swings (Shangjin Wei, 2000). The "stock market fever" (*gubiao re*) in the early stage of the establishment of China's stock markets described by some scholars (Hertz, 1998, pp. 71-93) also makes one wonder that perhaps the extreme enthusiasm among individual investors may have caused the *A* shares market to drift away from stock market fundamentals. On the contrary, foreign investors in *B* shares are more experienced with securities markets especially since many participants in China's *B* share markets are institutional investors.

One might wonder as Chinese investors became more experienced, did their "learning" in the securities market help to improve pricing the assets more accurately predicted by the CAPM model? As foreign investors know more about China's securities markets, did this shift more companies' data towards the standard risk and return relationships predicted by CAPM? To assess whether there is any "learning" going on and whether there is distinct behavioral

[52] Although B shares are traded with U.S. dollars, the dividends and other payments by the issuing company shall be calculated and declared in Renminbi but paid in foreign currency. This conversion depends on the official exchange rate. Since China's exchange rate is still largely fixed by the government, during the period I am looking at, there is not huge fluctuation in the exchange rate. Nevertheless, exchange rate can be a factor that concerns the foreign investors.

difference as domestic and foreign investors know more about China's securities' markets, we break our data to two sub periods (one is from 1994 to 1997 and the other is from 1998 to 2001) and run the CAPM model on these two sub periods respectively. We could not find any strong pattern of "learning" in the system, i.e., there is no great difference in the regression results on the period before 1998 and after 1998. For example, for the 7 companies whose *B* share data partially conform to the CAPM model, we find no trend of regression results improving from the first to the second sub period, nor do we find such shift in those corresponding *A* shares (see Table 20).

Our next question is why this standard asset pricing model works for certain companies for foreign investors but not all of them? What are the special features that these companies share? Any Chinese investor would be able to recognize immediately that those thirteen companies are all pillars in their own industry with widely recognized brand names. For example, the Dazhong Transportation (Group) Co., Ltd which is a joint stock company with Volkswagen.

We examined other financial indicators as well for those thirteen companies and the rest twenty-seven companies. Table 21 shows that the average net profit for 1999 is almost 4 times higher for those 7 companies than for the remaining companies in our data set. The average net profit per share in 1999 for those 7 companies is .17 Yuan while the rest averaged .004 Yuan per share. Also, the average net asset return rate (5.22%) for those 7 companies is much higher than the rest, which scored only –9.66%. Even if we remove the firms with the biggest loss from the second group of 33 companies, all of these indicators from the 13-company-group are distinctly different and better than those of the remaining companies.

We also examined trading volumes for the stocks in our data set. Although the size of a company does not clearly distinguish the 7-company-group from the remaining 33 companies, trading volumes can be an important issue in asset pricing. Stocks which suffer thin markets (without active trading and thus low trading volumes) may experience higher variance in their prices.

Table 22, which compares trading volumes for both *A* and *B* shares for the companies in these two groups, reveals no great difference between the trading volumes for *B* shares in group 1 and group 2. The trading volumes of the 7-company-group's *A* shares are much higher than group 2, but we attribute this to one company in group 1 which has extremely high trading volumes for *A* shares. If we take out this outlier, trading volumes in these two groups bear close resemblance.

Further, features such as percentage of non-negotiable shares and *B* shares did not play a significant role in distinguishing these two groups.

Overall, it seems that asset pricing for foreign shares of large corporations with better performance conforms to the implication of CAPM models. Financial performance matters more than the size and stock structures in determining whether the model works.

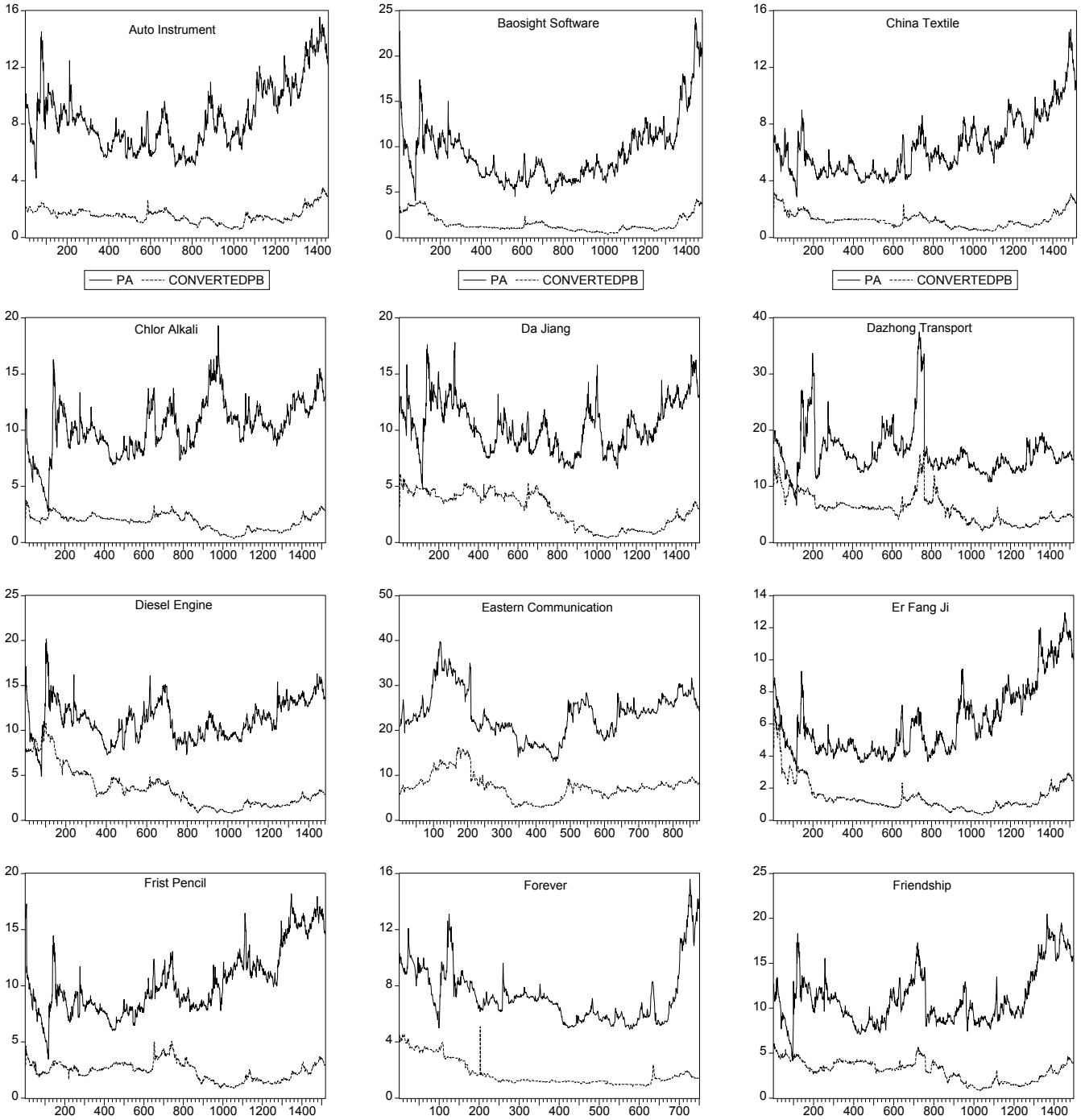
The CAPM one factor model simply doesn't fit the data for the other 33 companies. If the estimated betas turn out to be statistically insignificant, the *B* shares returns simply fluctuate randomly around the risk free rate of the U.S. market. In fact, a preliminary examination of the *B* shares returns does show a random fluctuation around the U.S. one-year treasury bill rate. According to Sharpe (1964), one interpretation of the model (5) is that the one asset's *beta* multiplied by the market excess return accounts for the systematic risk of that particular asset. The residual of the regression based on (5) shows the idiosyncratic risk associated with the

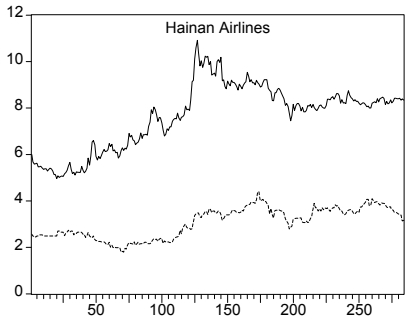
particular asset. The average returns of the majority of the *B* shares assets cannot be explained by systematic risk in the U.S. market. After all, most of these shares are stocks issued by State Owned Enterprises (SOEs) in a different country and their returns never even enter the calculation of those indexes used as a proxy for U.S. market. The zero value of the estimated coefficient might suggest that investors who play with *B* shares simply ask for the return of the risk free rate they could get by investing in the U.S. treasury bill. In other words, *B* share investors simply want to get the lowest opportunity cost covered when they invest in those Chinese state owned enterprises where they hardly have control over the management and operation as a stockholder. Since many people believe that Chinese government simply won't allow a large SOE to fail no matter what conditions such firms really face, the return of the investment is guaranteed. In that sense, the most risky enterprises for foreign investors became the safest ones due to the government's commitment to SOEs.

3.5. Conclusions

We examined issues of asset pricing as well as risk and return relationships in a special environment in China's stock market. This market bears distinctive features such as large percentage of non-tradeable shares and separation of domestic and foreign investors. We find that domestic and foreign investors price *A* shares (available for domestic investors) and *B* shares (available for foreign investors) differently. Moreover, we discover that the standard risk and return relationships implied by CAPM models comply with *A* shares. Therefore, domestic investors price asset risk as predicted by CAPM models. But we find that foreign investors do so only for large and prominent Chinese firms with better performance.

Figure 21 Prices of A and B Shares

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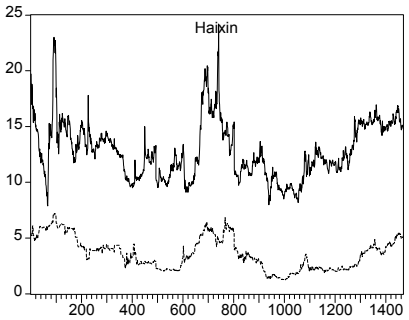
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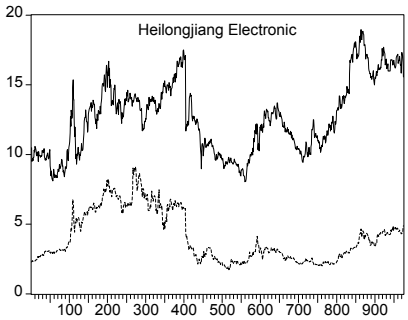
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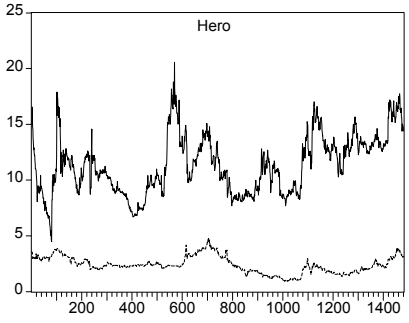
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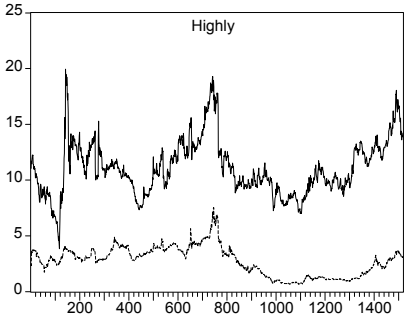
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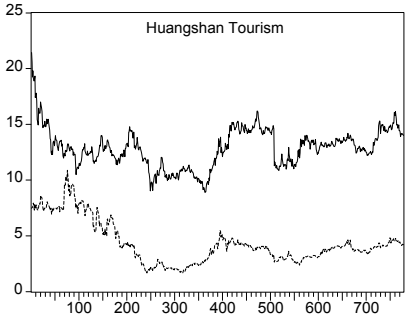
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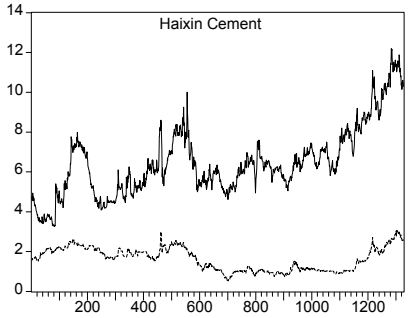
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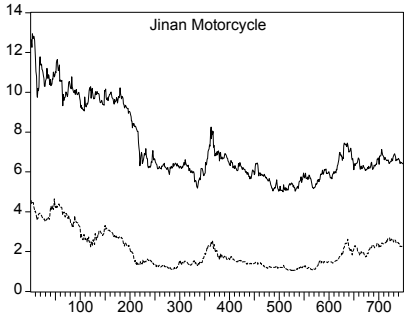
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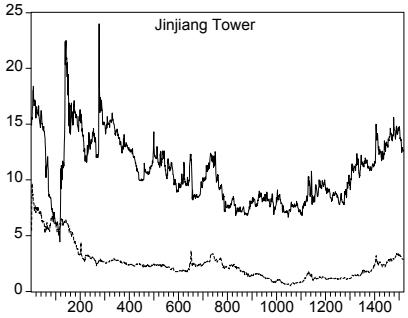
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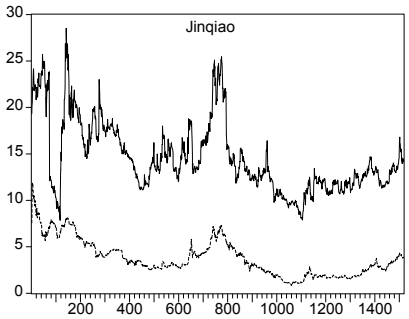
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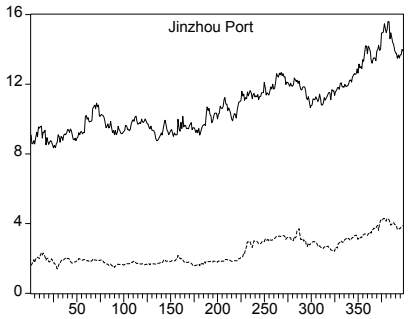
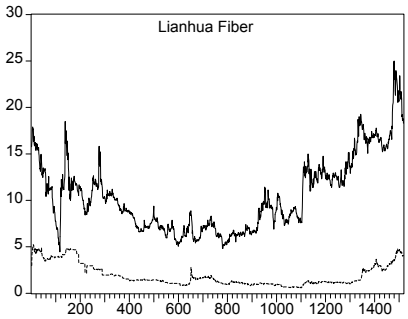
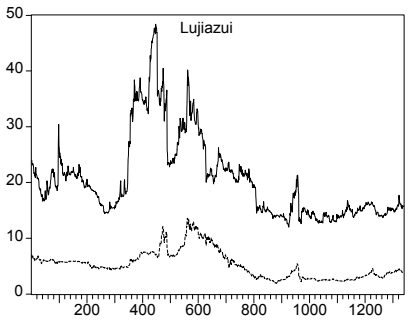

Jinzhou Port


Lianhua Fiber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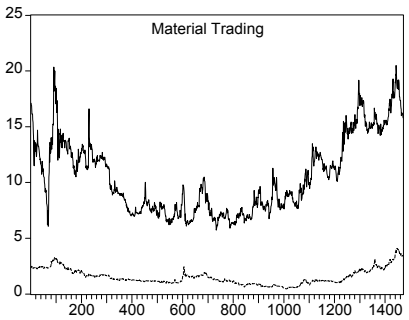
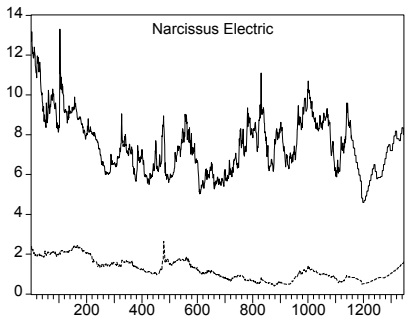

Material Trading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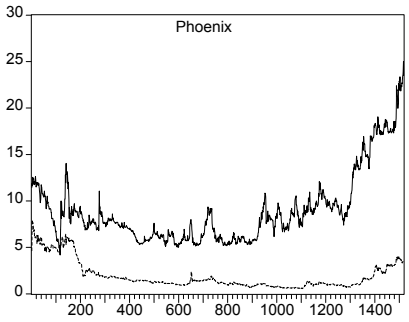
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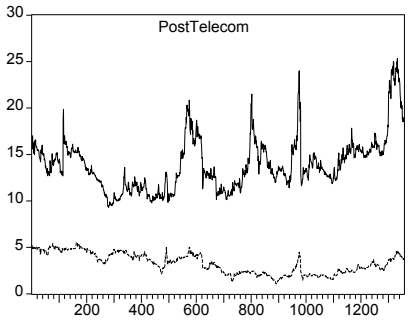
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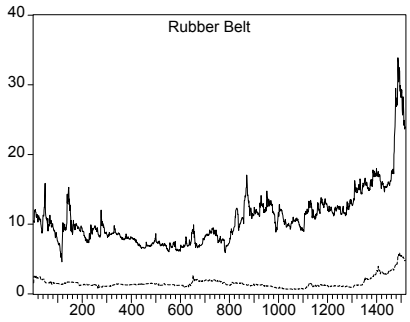
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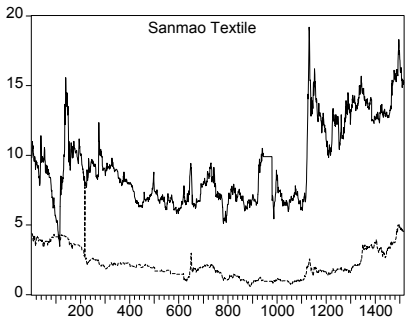
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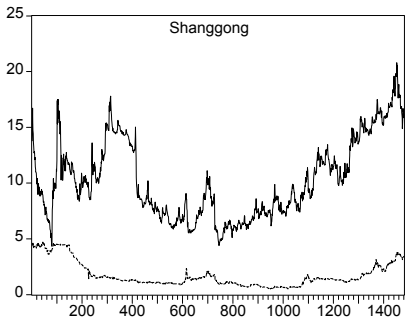
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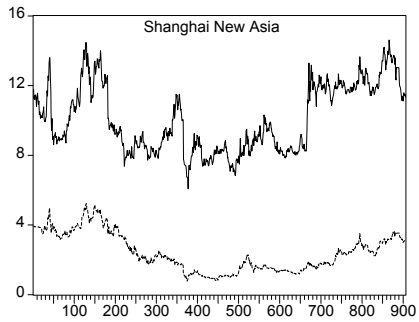
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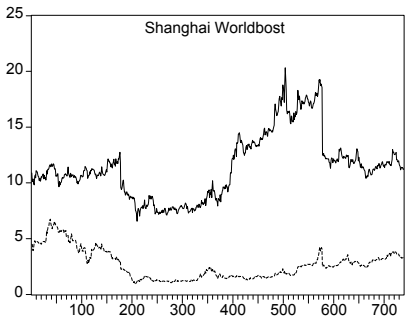
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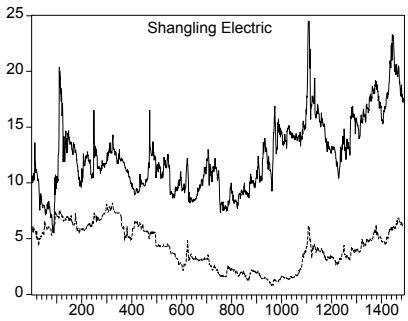
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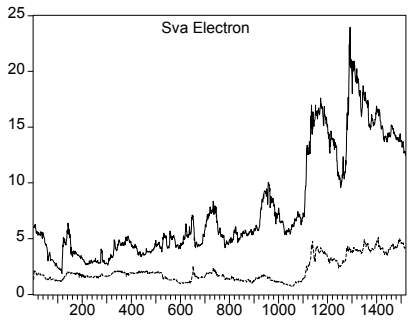
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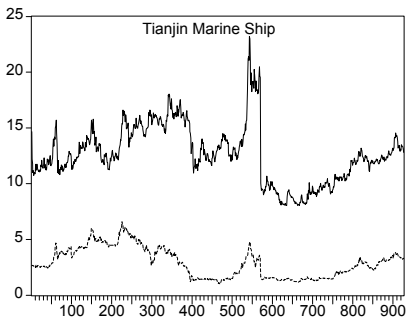
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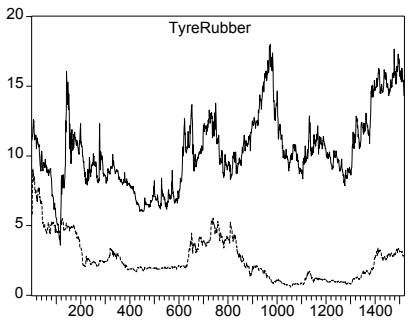
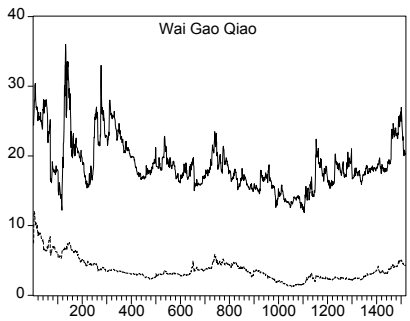

TyreRubber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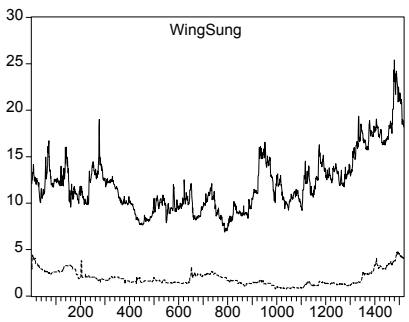
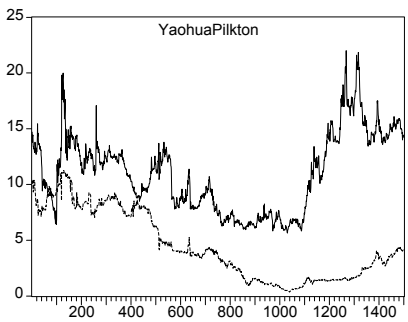

WingSung


YaohuaPilkton

Note. B share prices, which are denoted in U.S. dollars, are converted into Chinese currency, Yuan, with official exchange rates. The daily data of A and B shares are obtained from www.tei.com.tw. The data for most of the companies included in this figure cover the period of January, 1994 to January, 2001. 10 out of 41 companies were listed after 1994. Therefore the data for those companies started after 1994.

Table 18 Development of China's Security Market

(Unit in RMB, 100 millions)

	GDP	Total Market Capitalization	% To GDP	Negotiable Market Capitalization	% To GDP	Total Fixed Asset Investment	Capital Raised Domestically	% To Total Fixed Asset Investment
1992	26 638.1	1 048.13	3.93	N.A.	N.A.	8 317.0	50.00	0.6
1993	34 634.4	3 531.01	10.20	N.A.	N.A.	12 980.0	276.41	2.13
1994	46 759.4	3 690.62	7.89	964.82	2.06	16 856.3	99.78	0.59
1995	58 478.1	3 474.00	5.94	937.94	1.60	20 300.5	85.51	0.42
1996	67 884.6	9 842.37	14.50	2 867.03	4.22	23 336.1	294.34	1.26
1997	74 772.4	17 529.23	23.44	5 204.43	6.96	21 154.2	856.06	3.40
1998	79 552.8	19 505.64	24.52	5 745.59	7.22	27 630.8	778.02	2.82
1999	82 054.0	26 471.17	31.82	8 213.97	9.87	29 475.2	896.83	3.04
2000	89 404.0	48 090.94	53.79	89 404.0	17.99	N.A.	1 498.52	N.A.

Note. Total Market Capitalization is the market value of all the shares. Negotiable Market Capitalization is the market value of the tradable shares only. See section 2.2 for the description of the tradable and non-tradable shares.

Source: Almanac of China's Finance and Banking 2001, p. 382.

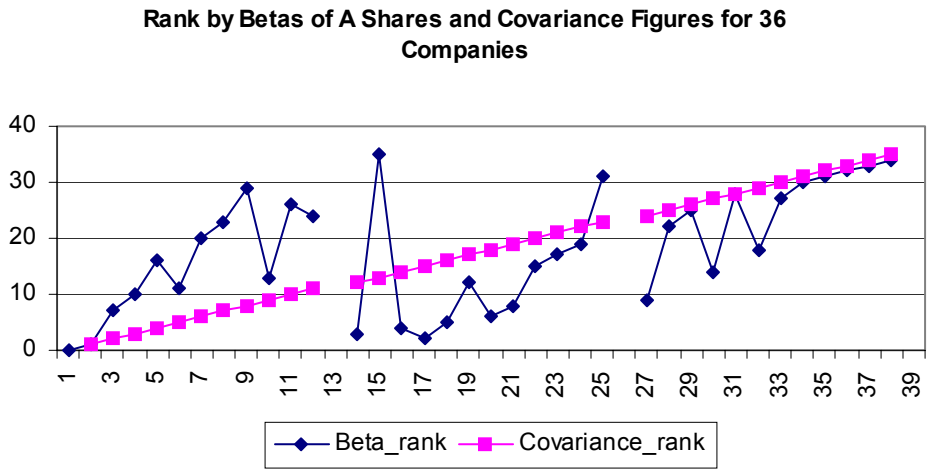
Table 19 Regression Results of A and B shares for CAPM Model

			A Shares		B shares	
Company	**Start Date**	**End Date**	**Intercept**	**A-beta**	**Intercept**	**B-beta**
Auto Instrument	4/29/1994	01/2001	-0.85 (1.01)	**0.91*** **(0.05)**	3.49 (11.68)	1.1 (1.86)
Baosight Software	3/16/1994	01/2001	1.58 (1.52)	**1.20*** **(0.08)**	N.A.	N.A.
China Textile Machinery	08/?/1992	01/2001	-0.92 (1.21)	**0.85*** **(0.06)**	-3.58 (10.21)	-0.03 (1.83)
Chlor Alkali	12/29/1993	01/2001	0.89 (1.17)	**1.11*** **(0.06)**	-10.82 (9.5)	-1.18 (1.68)
Dajiang (Group)	12/29/1993	01/2001	-0.03 (1.12)	**0.98*** **(0.06)**	N.A.	N.A.
Dazhong Transportation	12/29/1993	01/2001	1.8 (1.65)	**0.94*** **(0.05)**	**21.64*** **(10.63)**	**4.35*** **(1.9)**
Diesel Engine	3/11/1994	01/2001	-0.07 (0.89)	**1.06*** **(0.05)**	9.06 (13.11)	2.47 (2.23)
Eastern Communications	11/26/1996	01/2001	0.26 (1.56)	**1.08*** **(0.18)**	19.59 (21.02)	3.88 (3.69)
Erfangji	12/29/1993	01/2001	-1.34 (1.17)	**0.82*** **(0.06)**	8.33 (0.8)	2.13 (1.75)
First Pencil	12/29/1993	01/2001	0.98 (0.93)	**1.01*** **(0.04)**	-1.65 (9.3)	-0.08 (1.66)
Forever	1/28/1994	01/2001	-1.27 (2.08)	**0.70*** **(0.11)**	10.5 (16.4)	2.52 (2.8)
Friendship	12/29/1993	01/2001	**2.54*** **(1.05)**	**1.26*** **(0.05)**	9.4 (15.68)	2.04 (2.67)
Hainan Airlines	11/25/1999	01/2001	2.89 (2.98)	0.69 (0.57)	44.58 (27.14)	7.34 (4.29)
Haixin Group	4/5/1994	01/2001	-0.57 (1.36)	**0.77*** **().07)**	3.97 (14.75)	.99 (2.51)
Heilongjiang Electricity Power	7/1/1996	01/2001	-0.11 (1.20)	**0.89*** **(0.13)**	12.06 (17.3)	2.57 (3.02)
Hero	3/11/1994	01/2001	0.72 (1.45)	**0.99*** **(0.07)**	15.41 (14.04)	3.13 (2.4)
Huangshan Tourism	5/6/1997	01/2001	-0.69 (1.17)	**1.04*** **(0.13)**	15.5 (22.3)	3.36 (3.92)
Huaxin Cement	12/9/1994	01/2001	-0.35 (1.17)	**0.91*** **(0.1)**	1.8 (14.04)	.94 (2.4)
Jinjiang Tower	12/29/1993	01/2001	1.24 (0.91)	**1.24*** **(0.05)**	**24.79*** **(11.24)**	**5.1**** **(1.95)**
Jinan Motorcycle	6/17/1997	01/2001	**-2.71*** **(0.80)**	**0.98*** **(0.09)**	-4.13 (19.29)	0.28 (3.39)
Jinqiao	12/29/1993	01/2001	0.27 (0.87)	**1.04*** **(0.04)**	**23.55**** **(12.53)**	**4.78*** **(2.2)**
Jinzhou Port	6/9/1999	01/2001	5.6 (3.56)	**2.82*** **(0.40)**	29.05 (25.98)	4.83 (4.23)
Lianhua Fibre	12/29/1993	01/2001	1.56 (1.36)	**1.11*** **(0.07)**	11.94 (13.64)	2.64 (2.38)
Lujiazui	11/22/1994	01/2001	0.44 (1.14)	**1.08*** **(0.10)**	8.92 (13.79)	2.26 (2.35)

Material Trading Center	3/30/1994	01/2001	-0.67 (0.93)	**1.01* (0.05)**	13.81 (12.69)	2.77 (2.16)
Narcissus Electric	11/10/1994	01/2001	-1.60 (1.44)	**0.91* (0.13)**	6.48 (15.5)	1.95 (2.64)
Phoenix	12/29/1993	01/2001	-0.31 (1.19)	**0.89* (0.06)**	14.88 (12.44)	3.15 (2.15)
Posts&Telecoms	10/20/1994	01/2001	0.72 (1.38)	**1.10* (0.13)**	-1.53 (16.86)	0.26 (2.9)
Refrige Compressor	?	01/2001	1.15 (1.02)	**1.13* (0.05)**	-9.16 (10.24)	-0.91 (1.81)
Rubber Belt	12/29/1993	01/2001	-0.46 (1.37)	**0.88* (0.06)**	N.A.	N.A.
Sanmao Textile	1/4/1994	01/2001	**2.44** **(1.33)**	**1.30* (0.07)**	27.11 (16.3)	**5.26**** **(2.8)**
Shanggong	3/11/1994	01/2001	0.71 (1.12)	**1.08* (0.06)**	22.29 (13.46)	**4.43**** **(2.3)**
Shanghai New Asia	10/11/1996	01/2001	-0.68 (1.46)	**0.90* (0.16)**	0.97 (16.28)	0.78 (2.85)
Shanghai World Best	7/3/1997	01/2001	0.63 (1.29)	**0.84* (0.15)**	N.A.	N.A.
Shangling Electric	2/24/1994	01/2001	-0.01 (1.2)	**0.93* (0.06)**	**32.73**** **(19.42)**	**6.15**** **(3.32)**
Svaelectron	12/29/1993	01/2001	-0.46 (1.85)	**0.78* (0.07)**	-6.25 (10.56)	-0.79 (1.9)
Tiensin Marine Ship	9/9/1996	01/2001	0.22 (1.35)	**1.16* (0.15)**	15.44 (22.83)	3.08 (3.99)
Tyre & Rubber	12/29/1993	01/2001	-0.88 (1.08)	**0.92* (0.05)**	4.32 (11.54)	1.58 (2.05)
Wai Gaoqiao	12/29/1993	01/2001	8.88* (2.29)	**2.04* (0.12)**	**32.47* (11.31)**	**6.25* (1.97)**
Wing Sung	12/29/1993	01/2001	-3.52* (1.42)	**0.49* (0.07)**	-3.91 (9.66)	-0.51 (1.74)
Yaohua Pilkington	12/21/2000	01/2001	-1.96** (1.09)	0.76 (0.06)	-1.3 (13.54)	0.65 (2.33)

Note. Standard errors are recorded in the parentheses below the estimate coefficient. * represents significant at 5% level while ** represent significant at 10% level.

Figure 22 Ranks of 36 Companies



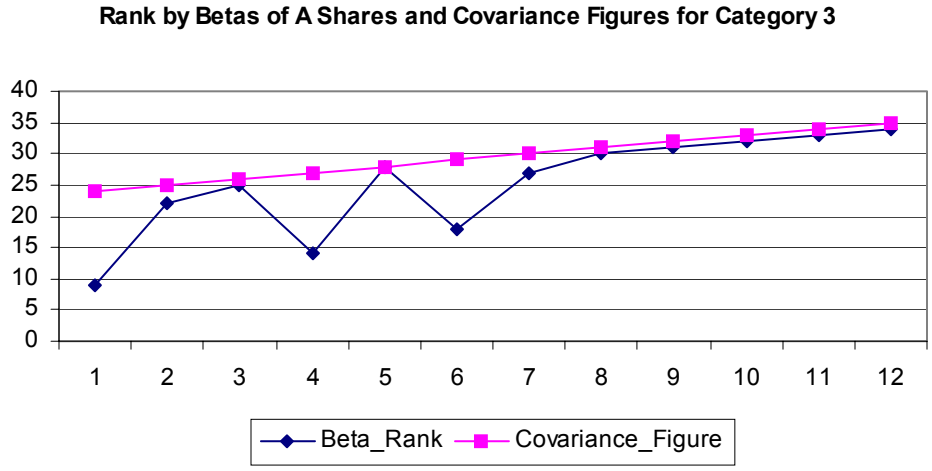


Table 20 CAPM Regression Results for the Two Sub Periods

Company	Start Date	End Date	B Shares Before 1998		B shares After 1998	
			Intercept	B-beta	Intercept	B-beta
Dazhong Transportation	12/29/1993	01/2001	**23.64**** **(11.94)**	**4.35*** **(1.9)**	14.13 (22.79)	3.34 (4.02)
Jinjiang Tower	12/29/1993	01/2001	**43.3*** **(13.25)**	**8.5*** **(2.28)**	-1.8 (18.94)	.14 (3.31)
Jinqiao	12/29/1993	01/2001	**33.48*** **(15.14)**	**6.6*** **(2.66)**	3.68 (22.33)	1.19 (3.91)
Sanmao Textile	1/4/1994	01/2001	29.15 (21.7)	6.19 (3.67)	20.53 (24.22)	3.43 (4.23)
Shanggong	3/11/1994	01/2001	10.59 (16.63)	2.91 (2.8)	24.87 (21.16)	4.3 (3.7)
Shangling Electric	2/24/1994	01/2001	2.68 (21.04)	1.5 (3.54)	49.96 (33.13)	8.63 (5.8)
Wai Gaoqiao	12/29/1993	01/2001	**46.62*** **(14.53)**	**8.71*** **(2.52)**	8.79 (17.86)	2.11 (3.11)

Table 21 Indicators for Companies Whose B Shares Reject and Accept CAPM Model

Name of Company	1999 Net Profit In 1,000 Yuan	1999 Net Profit Per Share in Yuan	1999 Net Asset Return Rate (in %)	2003 % of State Shares	1995 % of NonNegotiable Shares	1995 % of Negotiable B shares
DazhongTrasnport	187017.42	0.33	10.02%	20.07%	44.44%	47.62%
Jinjiangtower	148.872	0.00029	0.01%	0%	63%	29%
Jinqiao	47396.9712	0.075	2.97%	49.18%	55.33%	29.30%
Sanmaotextile	40806.77	0.273	8.49%	36.11%	49.29%	33.14%
Shanggong	5725.48566	0.0227	0.90%	42.97%	50.05%	38.62%
Svaelectron	323269.0758	0.422	12.02%	37.24%	44.78%	30.08%
Waigaoqiao	30495.35917	0.045	2.16%	58.47%	58.50%	26.90%
Average	**90694.28**	**0.17**	**5.22%**	**34.86%**	**52.23%**	**33.55%**
Autoinstrument	-140159.0897	-0.35	-34.92%	60.90%	64.74%	26.83%
Baosight	-182831.1384	-0.7	-55.53%	57.22%	61.41%	33.56%
Chinatextile	-175911.8475	-0.49	-115.19%	52.91%	59.16%	33.63%
Chloralkali	35757.73247	0.0023	1.10%	52.51%	62.70%	34.91%
Dajiang	6903.86552	0.01	0.72%	0%	87%	9%
DieselEngine	75932.731	0.158	4.56%	50.32%	61.14%	33.40%
EasternCommunication	287790.3596	0.5	14.68%	0%	N.A.	N.A.
Erfangji	6805.79344	0.012	0.76%	46.31%	46.31%	41.12%
Firstpencil	13751.78891	0.055	3.06%	33.10%	42.78%	47.68%
Forever	-339550.0605	-1.28	N.A.	0%	68%	26%
Friendship	40734.22853	0.18	10%	32.12%	41.14%	47.06%
HainanAirlines	135689.892	0.2	6.70%	2.37%	N.A.	N.A.
Haixin	94539.79303	0.34	11.59%	0%	65%	27%
HeilongjiangElectric	184128.1435	0.31	10.92%	0.00%	N.A.	N.A.
Hero	13113.66798	0.043	2.03%	52.92%	52.92%	31.81%
Huangshantourism	86152.837	0.284	12.60%	0%	N.A.	N.A.
Huaxincement	4235.628	0.013	0.60%	36.41%	46.30%	34.61%
Jinanmotorcycle	19725.04829	0.02	0.66%	40.90%	69.03%	0.00%
Jinzhouport	147261.528	0.23	11.10%	22.19%	N.A.	N.A.
Lianhuafibre	5249.9082	0.0314	1.86%	0%	73%	22%
Lujiazui	26433.81001	0.014	0.64%	60.03%	64.10%	27.30%
Materialtrading	-9664.27184	-0.038	-2.84%	57.13%	68.40%	26.33%
NarcissusElectronic	-197137.471	-0.834	-243.88%	0%	46%	47%
Phoenix	5439.677	0.0117	0.62%	63.04%	65.88%	28.43%
Posttelecom	12132.53836	0.04	2.32%	42.22%	50.20%	40.93%
Rubberbelt	1071.23662	0.009	0.66%	29.50%	56.50%	36.20%
Shanghainewasia	117941.741	0.213	10.15%	42.32%	70.21%	29.79%
Shanghaiworldbost	96302.19219	0.34	11.91%	0%	NA	NA
Shanglingelectronic	244333.0134	0.455	9.09%	47.28%	64.55%	28.87%
tianjinmarineship	49533.10879	0.11	6.64%	37.37%	Na	NA
tyrerubber	2595.7783	0.0029	0.12%	68.40%	70.10%	27.30%
Wingsung	6442.95024	0.04	1.99%	26.43%	NA	NA
Average	**23300.93**	**0.004**	**-9.66%**	**30.72%**	**61%**	**31%**

Note. The data are obtained from http://stock.homeway.com.cn. The Net Profit Per Share is calculated by dividing net profit figure by the number of common stocks issued by the company. The Net Asset Return Rate is calculated as: Net Profit/ (End of the Year Net Asset)

Table 22 Trading Volumes of *A* and *B* Shares for Stocks in Group 1 and Group 2

Name	*B* share (avg. daily) Trading Volume In 1000 shares	*A* share (avg. daily) Trading Volume In 1000 shares
DazhongTrasnport	555.66	506.40
Jinjiangtower	381.02	558.88
Jinqiao	446.33	1753.22
Sanmaotextile	134.55	781.85
Shanggong	330.57	474.63
Svaelectron	609.95	4037.49
Waigaoqiao	388.86	496.35
Average	**406.71**	**1229.83**
Autoinstrument	416.08	815.93
Baosight	389.45	458.47
Chinatextile	386.96	788.62
Chloralkali	940.73	593.00
Dajiang	222.66	511.05
DieselEngine	869.57	457.43
EasternCommunication	505.56	997.51
Erfangji	938.43	1643.99
Firstpencil	369.87	442.52
Forever	203.82	389.13
Friendship	270.02	441.62
HainanAirlines	229.43	5659.32
Haixin	238.49	403.01
HeilongjiangElectric	1054.50	1111.84
Hero	278.55	518.82
Huangshantourism	436.36	803.62
Huaxincement	324.44	1373.06
Jinanmotorcycle	781.41	1586.72
Jinzhouport	922.19	1646.00
Lianhuafibre	113.21	238.74
Lujiazui	1010.78	1410.59
Materialtrading	228.43	287.32
NarcissusElectronic	360.13	294.85
Phoenix	484.87	519.07
Posttelecom	322.94	401.66
Rubberbelt	103.67	278.93
Shanghainewasia	757.41	865.07
Shanghaiworldbost	917.87	1116.51
Shanglingelectronic	376.46	1057.57
Tianjinmarineship	695.72	1008.09
Tyrerubber	870.90	457.52
Wingsung	103.95	270.14
Yaohuapilkton	333.70	594.70
Average	**495.40**	**731.43**

Source: Data purchased from www.tei.com.tw

CONCLUSION

The dramatic economic growth achieved by East Asian countries and some transitional economies is a major episode in world economic history in the past few decades. In the process of understanding these nations' unique experience, we are often forced to re-think some of the well established and widely accepted economic and financial theories.

For example, free market is often regarded as the foundation for the economic prosperity in many developed nations. But East Asian experience shows that government-led growth or heavy influence from the official sectors can lead to rapid and tremendous economic advance.

The popular belief on the positive relationship between finance and growth is also challenged. Most recent empirical work provides strong evidence to support the view that finance does matter a great deal to economic growth (King and Levine 1993). However, many scholars point out that we have exaggerated the role of financial system (Lucas 1988). East Asian experience serves as a great example to show that huge growth can occur with primitive, wasteful and inefficient financial systems. The heated debate as well as East Asian's unique experience indicate that economists still do not fully understand the relationship between finance and growth.

This dissertation study is inspired by such deep issues even though each chapter focuses on a specific aspect in China's emerging capital market. The discoveries made in each chapter of the dissertation apply to specific fields such as capital market integration and asset pricing of portfolio theories. But what is more important than the obvious results reached in each chapter is the inspiration and insight into those deep issues mentioned above. For example, Chapter 1's conclusion that China's commercial sector started to display important elements of integration (contrary to the current popular belief) shows that traditional approaches and well-established

beliefs can be misleading and inaccurate in appraising a transitional economy's financial system. The failure in the current literature to systematically integrate the commercial sector's contribution to economic growth can lead to false or incomplete conclusions. The dramatic difference in the behavior of capital flows obtained with aggregate level data and with commercial sector data only serves as a good example to such problems. Such distinction found in the dissertation suggests the importance and necessity of studying the commercial, unofficial sector and its contribution to economic growth.

Since the size of commercial sectors is substantial not only in many major economies, but also in many emerging economies who are often referred to as "government-led" economies (such as some East Asian countries), one could not help wondering that it might be possible that we have misrepresented, therefore, misinterpreted the growth path and history of many East Asian countries and transitional economies.

Such recognition serves two purposes:

First, it will help to improve our understanding of East Asian economies' growth history. In explaining these countries' growth, we have employed an inconsistent theory that focuses on finance when analyzing economic slowdowns and ignore finances when analyzing causes of economic advance. Such a gap might be the result of the failure to place the inefficiencies and apparent problems mainly arising from the "government-led sector" in perspective with the sectors outside strong government influence. Our finding of a vibrant commercial sector in China with strong market characteristics provides a good example and starting point to integrate the contribution of informal, unofficial and commercial lending into the whole economy.

The second point is related to a broader issue in general economics and finance theories – what is the relationship between finance and growth? Does finance matter at all? Economists

often credit economic growth in currently advanced nations to their relatively stable and efficient financial systems. However, East Asian experience shows that huge growth can occur with primitive, wasteful and inefficient financial systems. Accurate understanding of the particular growth history of East Asian economies (as mentioned in the first point) offers highly attractive incentives to answer the finance-growth question. Because the core functions of financial systems are exemplified by the positive and essential contribution of the finance to initial development of the sort that occurred in Japan, Korea and China, as well as the role of negative and impeding elements of the very same financial systems in subsequent slowdowns. What exactly worked in these countries' seemingly inefficient financial systems to stimulate economic growth tremendously? And what elements became the impediments for further growth? These questions cannot be answered accurately without integrating both official and commercial sectors.

Although generally it is difficult to measure the scale and impact of commercial sector's activities, the approach adopted in the dissertation as well as our discoveries provide the encouragement that such a task can be achieved.

This dissertation serves as a beginning step to carry out a study which I believe is essential to understanding East Asian economies from a new perspective. This new perspective will bring insight into the fundamental links between financial activities and economic growth. The results of this study will also provide substantial evidence to challenge our conventional but not fully accurate views on East Asian countries' development path.

APPENDIX A

Appendix for Chapter 1

A.1 General Data Source

The provincial level savings data (including sources of government savings, household savings and business savings) are obtained from each province's statistical yearbooks (1986-2001). Similarly, the provincial level investment data (including sources of funds from state appropriations, bank loans, foreign investment, self-raised funds and others) are from each province's statistical yearbooks (1986-2001). If any of these data are not reported in provincial statistical yearbooks, we also collect data from the following publications from National Bureau of Statistics: Xinzhongguo 50 Nian Tongji Ziliao Huibian (Comprehensive Statistical data and materials on 50 years of New China), Gaige Kaifang 17 nian de Zhongguo Diqu Jingji (China Regional Economy: A Profile of 17 Years of Reform and Opening-up), Zhongguo Caizheng Tongji 1950-1988, and Zhongguo Caizheng Nianjian (various years).

A.2 Approximation f or Individual/ Household Savings

In our data set, we use the increased flow of urban and rural residents' bank deposits as a proxy for individual savings each year. This figure is smaller than the actual individual savings because it omits other forms of savings, which may not show up in the banking accounts. For example, a resident may purchase bonds directly from his/her earnings without ever depositing the money into the banks. But we checked the provincial statistical yearbooks and survey data for household income and expenditures and found that the household income is divided mainly between consumption expenditures and new deposits in banks. Other expenditure items only accounts for a small percentage of the household income. For example, in 1990, cash income per capita (before tax) of the urban residents in Jiangsu was 1852.45 yuan, living expenditures were

1338.66 yuan, and the deposits in banks were 278.38 yuan. The sum of the last two items is 1617.14 yuan. The security purchase was only 6.5 yuan. Although the security purchase expenditure keeps increasing each year but compared to the bank deposits, it is still a rather small portion. For rural residents in Jiangsu, cash income per person in 1990 is 1119.1 yuan. The sum of living expenditure (787.0 yuan) and the savings and credit expenditures (153.8 yuan) is 940.8 yuan. Average area of rooms newly built per capita is 1.7sq. meters. Value per square meter is 145.8 yuan. We also examined the same measures for rural and urban residents in Guangxi, which is a much poor province. Our investigation shows that using increased flow of bank deposits as the proxy for individual savings will under-estimate the real amount of individual savings, especially for rural residents.

A.3 Approximation for Total Investment

Total Investment has two components: fixed asset investment and changes in inventories. Because we would like to collect data on investment funds from various sources and only fixed asset investment has such information available, currently in our calculation, we use fixed asset investment as the proxy for total investment, i.e., changes in inventory is omitted. In the period we are looking at, the ratios of inventory changes to total capital formation fluctuate between 13% to 30%, which means that our components on investment are also underestimated due to the exclusion of inventory changes.

A.4 Government Savings and Expenditures

Government savings are obtained by subtracting government expenditures from government revenues. We include extra-budgetary items for both revenues and expenditures. In 1994, China introduced a new taxation system “fenshui zhi,” which might have changed the local government revenues significantly. We divided out data set to two subsets: before 94 and after

94 to estimate the same equations, we reach similar results with both data sets. Therefore, the change in the taxation system did not distort our conclusions seriously.

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