AUTOMATION OF CHINA'S SECURITIES MARKETS

BY CHRISTOPHER WESTLAND AND SO SIU MING,
HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY, HONG KONG*

1997 continues China's long march towards affluence. GDP growth was 8.7% in 1996, preceded by two years of 10% growth, and forecast to increase again in 1997. Patriarch Deng Xiaoping's death in early 1997 did little to stem the flow of bullish economic statistics. China's gross domestic product reached US$ 3.6 trillion at purchasing power parity[1] or about half that of the US, generated by a population of 1.226 billion. 1996 retail price inflation was contained to around 10%, while private consumption growth accelerated to 8.5%, with gross domestic investment growth projected to average 13.8% per year (Two-year economic outlook: China 1996).

China's stockmarkets play a vital enabling role in the direct financing of the burgeoning Chinese economy. In general, borrowers prefer to obtain long-term funds, thereby minimizing income risks and reducing transaction costs, while lenders prefer to lend for short periods because of their uncertainty about future cash needs. This conflict of preferences can be resolved through the activities of a secondary market in securities. Some predict that volume through the Shanghai Stock Exchange will, over the next decade, exceed that of the Hong Kong Exchange, making it the preeminent stock exchange in China. Several mechanisms need to evolve before the Shanghai Exchange can realize its potential.

Shanghai established the first stock exchange in China's history in 1891. Operations ceased during the Japanese occupation, and no securities were traded on exchanges again until Deng's restructuring of private enterprise in the 1980s (Thomas 1993). In 1981, treasury bonds were issued for the first time; by 1987 a secondary market emerged in Shanghai with three major features:

- Enterprise bonds were issued by several big enterprises
- The number of financial institutions buying and selling increased from one to six as enterprise bonds and stocks were increasingly traded in the secondary market
- Securities came to be preferred to bank deposits, due to their higher yield

By 1990, the trade network in Shanghai had expanded to include 47 counters and agents. The Far East Credit Rating Corporation, designated in 1988 to give ratings to enterprise bonds and commercial paper, provided some transparency to this informal market. That year, the Shanghai Stock Exchange moved into the former Astor Hotel. To this network was added another exchange in southern China across the border from Hong Kong – the Shenzhen exchange.

Table 1
Market Capitalization of Representative Markets (Asiaweek 1997)

Exchange	Capitalization Billions of US$
New York	7600
Tokyo	2685
London	1500
Frankfurt	695
Hong Kong	440
Kuala Lumpur	316
Taipei	298
Sydney	267
Singapore	185
Seoul	137
Shanghai-Shenzhen	140
Bombay	122
Bangkok	102
Jakarta	96
Manila	81
Karachi	11

[1] Nominal GDP was US$ 660 billion in 1996

Despite the large size of China's economy, combined market capitalization at China's exchanges in Shanghai and Shenzhen amounts to no more than US$ 150 billion. China's market capitalization is only 10% of nominal GDP; compare this to Hong Kong's market capitalization with three times GDP. This is less than one-fiftieth the size of the New York Stock Exchange, less than one-third the size of Hong Kong's stock exchange, and roughly at parity with regional exchanges in Seoul and Bombay (Table 1).

The market is dichotomized into "A" shares of China's State owned enterprises (SOE) which only PRC citizens may buy, and "B" shares in which only foreigners can invest. "B" shares are quoted in renminbi (RMB) but must be purchased in US dollars. Share ownership is restricted because the Exchange feels that unbridled foreign participation distorts the market, forecloses opportunities for Chinese investors, and is difficult to regulate (Potter 1992). Most "B" shares are also those of State owned enterprises where industrial output is growing at around one-twentieth the growth rate in the private sector. "B" shares tend to trade at price earnings multiples of about half those of "A" shares. In 1992, CSRC announced the creation of "H" shares of Chinese companies listed on the Hong Kong exchange. The same share of a given company may sell at significantly different prices in the "A", "B", and "H" markets. In addition, Chinese corporations that have listed on the Hong Kong Stock Exchange for several years, have come to be called "red chips."

Chinese exchanges are designed to provide floor trading and settlement facilities, to supervise members and listed companies, and to be sources of market information. But their power over listing selection is very limited. Listing a company on the Shanghai Stock Exchange is strongly influenced by forces external to the exchange, a situation that creates some problems with responsibility and control for the Exchange. The State Council, China's most powerful political body, reigns

over the entire process, through its Securities Policy Committee, chaired by vice-premier and People's Bank of China governor Zhu Rongji. Under Zhu lies the China Securities Regulatory Commission (CSRC). The Shanghai and Shenzhen Exchanges are subordinate to the CSRC.

Shanghai recognizes only one public market and no private placement market. The authority in charge has full discretion in granting the right to publish issuance of shares, leaving the applicant company uncertain of the outcome. Once a company obtains the right to issue, however, no restriction is placed on its listing as long as the issuer has more than one million yuan in paid-up capital, a positive book value in the previous two years, and more than 300 identifiable shareholders with more than 10% of the shares in public hands.

Obligations for disclosure include issuance of a prospectus for securities, semiannual and annual financial reports – the basic information most investors expect to receive. Because of differences in Western and Chinese accounting practices, reporting may still be perceived as inadequate. Application for public issuance is submitted to the local branch of the People's Bank of China (the authority in charge of securities administration). False disclosure is punishable by a fine of between 100,000 and 200,000 yuan (US$ 12,000 to US$ 24,000) plus damages to third parties (Zhao and Li, 1992).

As with other securities exchanges, many of the trading decisions take place outside of the stock exchange, in the offices of the large securities firms. China's securities firms have been hard put to keep up with the demand for stocks. Volume rapidly increased after 1992, fueled by the wealth of Chinese businessmen looking for higher returns than banks were able to offer. Participation extended even to peasants from mountain areas, who were keen to purchase quick turnover of shares in the market called zha-gu, or "stir-fry" stocks. Connected to the markets by computer, fax and telephone, investors outside the two exchange cities now outnumber those inside, despite the rudimentary development of China's telecommunications. The influx of new investments has caused Shanghai's volume to surge over the past three years.

*J. Christopher Westland (westland@ust.hk) is Associate Professor of Information & Systems Management at the Hong Kong University of Science & Technology, Hong Kong. His current research interests include the valuation of technology investments and information systems, software development and reengineering, electronic commerce/ electronic securities exchange/ the Internet and network investments.

So Sui Ming (shermans@ust.hk) is a MBA student at the Hong Kong University of Science & Technology, Hong Kong. She is currently working on a project about how information providers are going to make money on the Internet.

Chinese securities laws impose some order on the off-floor brokerage function. Brokers are required to comply with customers' explicit terms for transactions conducted on their behalf, including (1) type of security, (2) volume of trade, (3) bidding conditions and margin level, and (4) time of authorization. To prevent "insider" trading, employees of securities authorities, managers of the securities exchanges, employees of the broker handling the transaction and employees of the governmental agency regulating or controlling the issuing company are prohibited from trading in its shares (Zhao and Li, 1992).

As could be expected in fledgling markets, regulations are still evolving, and room for abuse exists in the current under-regulated environment. For example, China's regulations offer scant guidance for takeovers. It takes a 30% stake to trigger a general offer. In one high profile takeover, a Shenzhen conglomerate legally obtained a controlling 20% stake in Yanzhong Industrial office-supply manufacturers, one of the oldest companies in Shanghai, before the directors discovered the stock transfers.

MARKET OPERATIONS

Both Shanghai and Shenzhen markets use an order driven trading system, assisted by a computer network to transfer order information from brokers to the floor, and back again. Both exchanges have supporting clearing houses. Standard board trading lots are used with aggregate par value of RMB 1000 (about US$ 175) in Shanghai, and 2000 shares in Shenzhen.

Both exchanges are similar in organization and systems, though Shenzhen's volume is roughly half that of Shanghai's. The subsequent discussion focuses on Shanghai's operations, but provides a good synopsis of Shenzhen's as well.

The trading system runs on a Hewlett-Packard HP9000-890 computer, with peak processing of 1800 transactions per second. This is more than sufficient to handle average Exchange volume of 100,000 transactions per day, with peak periods at the beginning and end of the trading day. The Shanghai Stock Exchange computer network supports about 2600 booths with microcomputers and telephones. These are used by around 4000 red-jacketed traders on the floor, representing the 500+ authorized financial institutions who are members of the Exchange. Firms must have registered capital of more than 5 million RMB to be members.

Limit, buy and sell orders are put into a database on the central data server which is responsible for matching orders when buy and sell prices cross. The system is able to automatically distribute dividends and handle payment for subscription of new stocks of listed companies. The floor provides no formal trading or market making functions. The trading floor, which consists of computer desks set in a square around a central post, is considered to of-

fer some value to the trading, though. It provides a focal point for market management and supervision. It also provides atmosphere and a focus for market sentiment.

China is a continent sized country which needs sophisticated communications systems to allow access to its exchanges. To this end, China has invested in two networks: STAQ a nation-wide system for broadcasting transaction prices, and NET an automatic security trading system for stocks as well as government bonds. Sixteen networked securities trading centers with broadcast and screen facilities have been established around China. In 1993 these received new fiber optics and satellite communication systems which replaced dedicated telephone lines. Communications are now supported by an optical fiber network throughout the city of Shanghai and the dedicated satellite communication system offers two-way communication with 1100 trading counters in over 300 cities around China. There are roughly 5 million investors around China, and around half of the monetary trading volume originates outside of Shanghai.

To facilitate transparency of market activities, the communications network automatically disseminates trading information:

1. to the Exchange's trading room display (a large digital screen on the trading floor),
2. to a telephone inquiry network for people not on the trading floor,
3. to over twenty news organizations, TV and radio stations,
4. to Reuters, Telerate, and other global financial services, and
5. publishes a newspaper, Shanghai Security, with a circulation of several hundred thousand.

Information on all transactions is also transfered to the Exchange's market monitoring group which attempts to control insider trading, rumors, and collective efforts to control prices. First priority in automation of exchange functions has gone to the "A" shares. "B" shares are purchased in dollars, though denominated in renminbi (RMB), and information on those shares is broadcast in both English and Putonghau. Thus additional systems development is required in supporting "B" shares.

Table 2
1995 Statistics of Companies Listed on the Chinese Exchanges (Source: Shenzhen Stock Exchange)

Statistic	Shanghai	Shenzhen
Average post-tax earnings (RMB)	4017.7	3204.2
% change over 1994	-8.35%	-22.56%
Average profit margin of stock capital	15.97%	17.16%
% change over 1994	-13.16%	-28.35%
Average profit earnings of net assets	5.73%	5.79%
% change over 1994	-20.08%	-40.54%

The Shanghai Stock Exchange uses a three tiered clearing and settlement system. The first tier involves investors who have a magnetic account card to clear through their bank. The second tier handles the transactions between these banks and Shanghai Securities Central Registration and Clearing. The third tier allows securities trading centers and "registered companies" (i.e., banks) in other parts of China to clear through Shanghai Securities Central Registration and Clearing. All trade and clearing is paperless. There is no need to print a physical copy of the security, as a database is maintained of ownership of all shares.

Markets in most countries over the past decade have invested significantly in automation of various components through database and communications technologies.[2] Without automation, markets are constrained to operate at the speed of their human facilitators – frequently too slow for complex or high volume market services, and too localized for a large country like China. In order to speed transaction processing, automated markets may be stripped of all but market matching functions, and other functions dispersed to brokers, clearing houses and similar operations.

Despite considerable operation successes in quickly building the Exchange's infrastructure, there are still improvements which can be made. By the beginning of 1996, exchanges in Hong Kong, Jakarta and Manila had all posted gains of over 24% in the first quarter of the year, share prices in Shenzhen actually fell by almost one-third (the worst performance in Asia), and Shanghai's "B" shares, i.e., those available to foreigners, dropped about 25%. Table 2 profiles the changes that took place in China's markets in 1995.

At least some of the poor showing in 1995 was due to illiquidity exacerbated by opacity of transactions and investor questions about accuracy of corporate accounting (Varying Fortunes of China Chips 1996). Buyers and sellers seeking to participate in China's markets would like them to exhibit four characteristics.

- Fairness: i.e., particular groups of buyers and sellers should not be able to systematically profit from one another

[2] Securities markets applying some level of automation have appeared in one form or another for almost 100 years, e.g., stock tickers have provided automated real-time reporting of securities prices for nearly a century. Recent developments in computer and communications technology have made plausible the complete automation of market functions. The ultimate form that these electronic markets will take is still being defined.

- Reliability: i.e., buyers should be assured that services will be rendered, or that they can take possession of the goods they have purchased, and that quality will be adequate; sellers must be assured that they will be paid for their goods and services.
- Liquidity and orderly trading: i.e., buyers and sellers should be assured that prices will not move significantly from the underlying value of the goods or services, and that there is sufficient quantity of the good to complete the transaction they want at an acceptable price in a short period of time.
- Efficiency: i.e., price should reflect underlying value, supply, and demand, and should be quickly influenced by new information.

There remain questions concerning the current ability of China's markets to deliver in each of these areas. Continued improvement in execution, monitoring and reporting by the Exchange is likely to improve this situation substantially over the next few years.

Volatility in the Shanghai market is very high by the standards of most developed economies, a situation that poses difficulties to orderly trading. This has to do with high expectations stemming from rapid post-1989 growth, combined with a mistrust exacerbated by the opacity of accounting statements, markets and operations of the SOEs. This only compounds problems inherent in securities laws that are still evolving, and in the difficulties faced by the China Securities Regulatory Commission in policing insider trading, misuse of funds, and false disclosure.

The Chinese markets suffer from a lack of breadth and diversity of issues. Since most listed firms are SOEs, it is difficult for investors to diversify out of industry-specific risk. The market also suffers from a lack of depth. This refers to the capacity to absorb large buying or selling pressure relative to the average size of transactions without causing severe adverse price movements. Lack of depth was most apparent in the early 1990s, when demand for shares far outstripped supply. Demand was influenced by rapid economic growth in the South and by the chance given savers to diversify their savings away from bank accounts. Through most of their subsequent history, the Chinese markets have shown considerable volatility resulting from supply/demand imbalances.

Some of this volatility may abate as Chinese accounting standards are placed on the same footing as those followed in other markets. Because the listed companies are generally SOEs, their accounting practices have focused on production rather than on the consumer market, with emphasis on stewardship of State funds, costs and cash flow. Profit, depreciation, provisions for losses and asset valuation, especially for land, which is not tradable in China and thus cannot be assigned a secondary market price, are all poorly accounted for, yet pivotal to proper securities pricing.

With so few issues available to foreigners and such meager capitalization, and with the potential for well managed Chinese firms to list on larger, more liquid exchanges such as the Hong Kong or New York Stock Exchanges, one might question the need for China's exchanges at all. Probably the main motivation to stay with China's exchanges is the significant difference between Western and Chinese accounting.

Accountants are the main source of quality and performance information about the products sold in securities markets. Information disclosure in China may differ substantially from comparable Western statements, because of difference in Chinese accounting principles from Generally Accepted Accounting Principals (GAAP). Reconciliation of the two standards can be daunting, as illustrated by the case of Brilliance China Automotive Holdings. Brilliance decided to list on the New York Stock Exchange in 1992. Conversion of its financial statements to GAAP required

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the investment of over 11,000 man-hours by Arthur Andersen's brilliant accountants, before their statements met the requirements of the New York Stock Exchange (Sender 1992). The adoption of Western software packages for automating corporate accounting and for providing reports of financial performance would greatly improve investors' assessments of fairness and, by lowering investors' perception of market risk, could increase liquidity.

Despite the central role of computers in matching, electronic brokerage transaction systems in China are still in their infancy. This reflects the rudimentary state of telecommunications, which makes transmission of voice (let alone data and fax) difficult in much of China (out of the 800,000 recognized villages in China, 500,000 lack even one telephone). Electronic transactions systems bring reliability, increased size of the client base, and speed of access to the market. This gives liquidity and consequently the ability to pass on risk to the market rapidly. These advantages make them attractive to small institutions that interact with the market infrequently and that may be especially keen to pass on risk rapidly. Their ability to link into a settlement system reduces transaction costs.

These shortcomings currently put China's markets at a distinct disadvantage to Hong Kong's well networked and more modern markets. In the related banking sector, banks have been undergoing a technological revolution. Electronic transfer of funds, the use of automatic tellers, the transmission of accounting records through telecommunications, and the offering of a full range of banking services are moving retail banks into the modern world. This should provide a positive impetus to the integration of China's investment banking, brokerage and market functions into global financial networks.

CERTIFICATION AUTHORITY GUIDELINES IN JAPAN

BY MINORU YASUDA, ELECTRONIC COMMERCE PROMOTION COUNCIL OF JAPAN*

BACKGROUND

The Electronic Commerce Promotion Project partially funded by the Japanese government was started in late 1995. The project consists of 19 test-bed projects which experimentally provide various kinds of electronic commerce between consumers and businesses. Currently over 350 companies participate in the projects and more than 500,000 consumers are presumed to have joined.

To foster Electronic Commerce (EC) in Japan, and also to support and coordinate these projects, the Electronic Commerce Promotion Council of Japan (ECOM) was established in early 1996. ECOM has set up 14 Working Groups to study a wide range of EC related issues. One of these Working Groups is the Certification Authority (CA) Working Group which focuses on the technology, practice, and legal environment of CA. One of objectives of this CA Working Group is to develop the CA Guidelines. The primary draft of the Guidelines was made public in December 1996.

OBJECTIVES OF THE CA GUIDELINES

CA Guidelines provide the foundation for the operation of CAs which issue digital certificates. A digital certificate, which electronically verifies the identity of business parties during network transactions, will play an important role in electronic commerce conducted via open networks. Digital certification guarantees the security of transaction information transmitted through networks, and information transmitted between organizations, within organizations and between individuals, by eliminating problems such as wiretapping, tampering or repudiation. This fosters reliance and trust required to conduct business.

Minoru Yasuda (tawara@ecom.or.jp) works for the Electronic Commerce Promotion Council of Japan (ECOM). ECOM has been established with the aim of combining distributors, manufacturers and service providers from a wide range of industries with computer vendors and information processing services to build common platforms for the use of electronic commerce.

STRUCTURE OF THE CA GUIDELINES (ALPHA VERSION)

INTRODUCTION

This section first defines the basic terminology related to CAs, such as public keys, certificates, and revocation of certificates, etc. The section then deals with the following subjects concerning public key infrastructure, which can be regarded as the technological foundation of the guidelines: (1) certificate management service for issuance, publication, and storage of certificates, services relating to the registration and management of personal information, and electronic notary, etc.; (2) hierarchical structure of CAs; (3) purpose of use and format of certificates.

MANAGEMENT REQUIREMENTS

As management requirements are important for increasing the reliability of CAs, establishment and publication of policies relating to certification, requirements needed by organizations, operational security requirements, and information disclosure requirements are stipulated. Within the policy arena the establishment and presentation of provisions concerning the requirements for secure operation of equipment and facilities, and of provisions concerning standards for issuance of cer-