The Chinese stock market : a casino with 'buffer zones' ?

Eric **GIRARDIN**[**]
GREQAM,
UNIVERSITE DE LA MEDITERRANEE
AIX-MARSEILLE II
e-mail : girardin@romarin.univ-aix.fr

Zhenya LIU
PEOPLE'S UNIVERSITY OF CHINA
BEIJING, P.R.CHINA
AND UNIVERSITY OF BIRMINGHAM
zhenya_liu.@hotmail.com

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[**] Corresponding author, Université de la Méditerranée, 14 avenue Jules Ferry,
13621 Aix en Provence, FRANCE. We thank participants at the 13th annual conference of the Chinese Ecxonomic Association of the UK for useful comments but remain solely responsible for all remaining errors.

Abstract

This paper uses Markov-switching techniques to examine the presence of different market conditions on the Shanghai A share market since the start of active trading in the mid-1990s. The originality of the paper lies in the identification of three contrasted regimes: a speculative market, a bull market and a bear market. Overall the 'Casino' character of the Chinese stock market is the main feature which is substantiated by the present paper. However, the bull market regime is always a buffer zone between the other two regimes.

1. Introduction

In a recurrent way, indications of speculation in the Chinese stock market have attracted the attention of the authorities. However there is no available evidence enabling them to distinguish between an active optimistic market and a speculative one. Moreover, in the recent past, investors have been puzzled by their inability to distinguish bull and bear markets. A lively debate has been developing on these issues over the last few years in China. Some eminent observers argue that the stock market looks like a 'casino' (Wu Jing Lian), while others deny this. This makes all the more difficult the task of the newly set up independent regulating authorities.

Existing empirical work on the Chinese stock market has focused exclusively either on explaining the apparent puzzle of lower prices in the B-share than in the A-share segment of the market (Fernald and Rogers, 1998; Chakravarty et al. 1998; Gordon and Li, 1999; Su, 2000; Sjöö and Zhang, 2000) or on modelling day-of-the-week effects (Chen et al. 2001; Tsui and Yu, 1999). Even though the high volatility during certain periods in the A-share market has been considered by some of the above researchers, none of them has tried to distinguish between different regimes.

By contrast, a number of papers have endeavoured to establish the timing of bull and bear markets in advanced countries, particularly in the U.S. The definition of bear and bull markets is quite diverse in the existing literature. A general definition is that "bull (bear) market corresponds to periods of generally increasing (decreasing) market prices" (Chauvet and Potter, 2000, p. 90, fn. 6). Some authors use a more restrictive approach such as in Lunde and Timmerman (2000, p.1), where the stock market is considered to switch "from a bull to a bear state if stock prices have declined by a certain percentage since the previous (local) peak within that bull state". In other words the switch presupposes that cumulated changes exceed a certain threshold. Sometimes, as in Pagan and Soussounov (2000), such studies rather impose minimal duration constraints on bull and bear markets. By contrast we will allow the data to determine the actual average duration of the states.

We consider here capital gains and not stock returns. In the Chinese context this is a natural step since firms hardly distribute any dividends[1]. However, even for other markets where the latter is not the case, some work favours uing on capital gains (Pagan and

[1] Even in the U.S., the majority of listed firms hardly ever distribute dividends, according to a recent survey by *The Economist.*

Sossounov, 2000). At any rate the volatility of returns is similar to that of capital gains since the dividend yield has small variation at low frequencies.

This paper uses Markov-switching techniques to investigate movements in capital gains on the Shanghai A share market since active trading started in this market in the mid-1990s. We consider weekly capital gains with weekly data, in part because we are not concerned with high frequency movements in the stock market, in part because the sample is too short to examine monthly capital gains with monthly data.

We consider that capital gains are the outcome of a discrete Markov process. In other words, expected capital gains may be subject to occasional, discrete shifts. The Markov switching technique is a useful tool which will enable us: to distinguish between different regimes in the behaviour of capital gains; establish to what extent a multiple regime model is a better description than a single regime one; isolate the nature of the difference between regimes; and get precise information on the frequency of regime changes and the timing of their occurrence.

The theoretical case for the presence of regime switching in stock market returns can be viewed within two strands of the literature (van Norden and Schaller, 1993). One of them is the rational stochastic bubble analysis developed by Blanchard and Watson (1982). The latter implies that, in every period, a bubble would either survive or collapse. In such a world, returns are drawn from one of two distributions, surviving bubbles or collapsing ones. Another strand of literature is based on the asset pricing model developed by Lucas. Within such a model, the economy's endowment switches between high economic growth and low economic growth. Such switching fundamentals have been shown by Ceccheti, Lam and Mark (1990) to account for a number of features of stock market returns, such as kurtosis and mean reversion.

A number of different papers have implemented for stock returns the Markov-switching technique developed by Hamilton (1989) in the case of the business cycle. In the late 1980s-early 1990s, the focus was on the U.S. stock market and authors considered, in a two-regime world, to what extent the mean and/or the variance of returns could vary across regimes (van Norden and Schaller, 1993). Much more recently, a concern has been raised for the extent of mean reversion across regimes (Nielsen and Olesen, 2000).

We start by reviewing the developments in the Chinese stock market over the last ten years. We then introduce the regime-switching methodology that we will use subsequently. Finally we present the results of the decomposition of movements of the Shanghai stock market index between bear, bull, and speculative periods.

2. Developments in the Chinese stock market

The Chinese A-share market, whose access is restricted to Chinese residents, has developed some peculiarities since its inception in the early 1990s. The market is characterised by the absence of institutional investors and, as a corollary, is driven by a myriad of small individual investors holding in excess of 50 million accounts in 2000. Such investors lack the experience and skills necessary to make fully consistent trading decisions. As a result they are very much subject to herd behaviour (it is "a market of wild rumours and panic", Nam, Park and Kim, 1999, p. 78), ignoring most of the time relations with fundamentals (P/E ratios) and focusing almost exclusively on capital gains. Given the high turnover ratios of stock transactions, the investment horizons of stock investors in the PRC is likely to be very short, and share price volatility should be very high (Nam, Park and Kim, 1999). As a result the 10 percent daily price limit is often reached. The development of Mutual Funds since 1997 did not improve matters much, since such Funds build upon, or participate in, the general wave of herd behaviour, instead of stabilising the market as was hoped by the authorities.

The spontaneous short-termism of individual investors is even reinforced by some built-in mechanisms such as: the underpricing of IPOs, leading to a high initial turnover in such new stocks; limited disclosure, which hides away fundamentals from individual investors and leaves them no choice but follow other investors; short-termism by security companies due to their lack of long term sources of finance, which compel them to match short term liabilities with a short horizon for the holding of assets; and the dominance of the State in corporate governance, which implies that shareholders have no incentive to exert their monitoring role in order to influence the profitability of firms. Such a market cannot be information efficient in as much as investors mostly ignore publicly available information.

The decision to set up a Securities Exchange in Shanghai took effect on 19 December 1990. The initial four years of existence were rather hectic (Lan, 1997). From a base of 100 in December 1990, the Shanghai Composite Index reached 1500 in February 1993, but bottomed out very soon with 340 in July 1994. The implementation of the Company law took effect on July 1st 1994. This had a major impact on disclosure of information by listed firms. Accordingly, listed firms have to provide investors and the public with financial and non-financial information in the form of prospectus, listing report, and periodic reports. False disclosure became a criminal offence. This has led to a steady improvement in information disclosure since 1995 (Chen, Kwok and Rui, 2001).

The period from April to December 1996 was characterised by intense speculative pressure (figure 1a). The Composite index rose 120 percent and reached 1258 on 12 December 1996. The daily transaction value increased threefold in the Autumn

1996, to reach 19.6 billion on the Shanghai market, which is one and a half times the highest daily turnover in Hong Kong, while the capitalisation was twenty times smaller in Shanghai than in Hong Kong. "From April through October 1996, China's securities market stepped out of two-year sluggishness, heading towards a new rally. After October however, *over-speculation* started to prevail and became more and more rampant" (PBOC, Annual report, 1997, p. 71, emphasis added). This led the government to take measures to ease the overheating of the market and official newspapers to openly warn individual investors of the great risk they were facing with their speculation. The Shanghai market reacted with sharp price falls : 10 per cent on 16 December, nearly 8 per cent on the 17th, and 10 per cent on the 18th" (Lan, 1997). The 16th of December 1996 became known as the 'Black Monday' of China's stock market. Subsequently the stock markets calmed down for a while, with the Shanghai index around 1000. But this did not last long, and the market moved up again from February 1997, and even reached a record high in April 1997, leading the government to cool it down again. The developments in the A-segment of the Chinese stock market were not influenced by the financial crisis in east Asia beginning in the Summer of 1997, confirming the fact that such a market is closed to international influences. The rise was indeed abruptly interrupted in mid-1998, but this was because of government intervention preventing state-owned enterprises (SOEs) from operating on the stock market. As a result the price fell over the subsequent year. Government intervention then led to a new sharp rise in the index for two months in mid-1999, when SOEs were again allowed to buy their own shares on the market (19 May 1999). However this rise proved to hasty and was followed by a phase of market adjustment also lasting four months up to late 1999. Also the authorities decided to speed up the new listing of companies, which put further downward pressure on share prices. A lasting period of price increase followed for a year and a half from early 2000. In the early summer 2001 the price collapsed, in part because the authorities started checking the source of the funds invested by firms on the stock market but mainly because they implemented a crackdown on illegal trading, while strengthening their monitoring of stock market operations. On top of this, discussions started on the possibility of allowing all shares of SOEs to be traded on the market as opposed to the current 40% limit.

Overall the number of listed companies rose fivefold between 1992 and 1995 to reach 242 (of which 188 in Shanghai). It rose more again than fivefold by the end of the 1990s. Market capitalisation at that time represented more than 2000 billion yuan but only a fifth was negotiable.

Figure 1a. : Shanghai A-share index weekly data

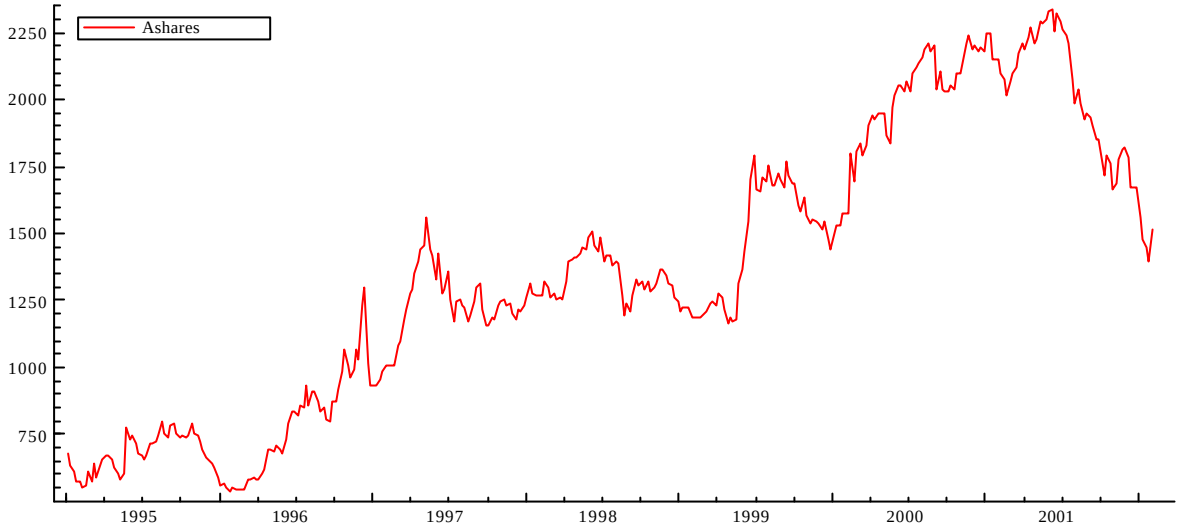
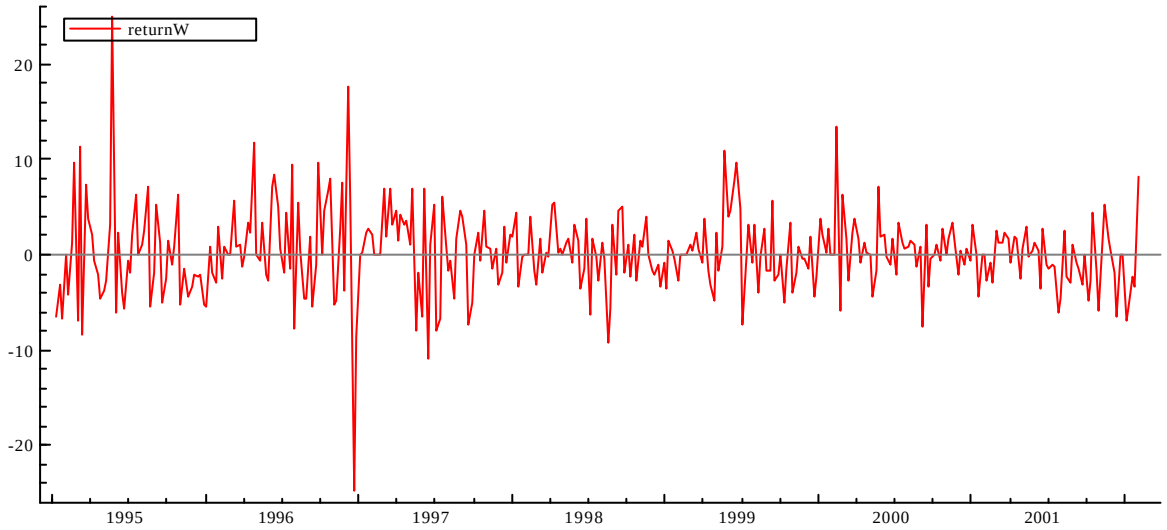


Figure 1b : Weekly capital gains (%)



Source of data: Datastream, Weekly frequency (every Wednesday), Jan. 1995 through Feb. 2002

Capital gains are close to 0.22 per cent per cent at a weekly rate with the maximum capital gain and the maximum capital loss equal in absolute value (25 per cent). Their standard error is 4.30.

Table 1. Autocorrelation of capital gains

	Weekly capital gains
Lag 1	0.031
Lag 2	-0.051
Lag 3	0.077
Lag 4	-0.050
Lag 5	-0.116
Lag 6	0.099

Sample : weekly : 1995 (2) - 2002 (5)

Table 1b. reports autocorrelations of capital gains. The R squared of a regression of capital gains on a constant and its first lag is the square of the slope coefficient, which is the first autocorrelation. Accordingly, an autocorrelation of 0.031 implies that 3.1% of the variation in weekly capital gains is predictable using the weekly return up to the previous week.

3. Methodology

In line with Hamilton's (1989) original work on business cycles, we start from a model of the Chinese stock market as a model of the capital gains (Δp_t), such as :

$$\Delta p_t - \mu(s_t) = \alpha_1 [\Delta p_{t-1} - \mu(s_{t-1})] + \alpha_2 [\Delta p_{t-2} - \mu(s_{t-2})] + \alpha_3 [\Delta p_{t-3} - \mu(s_{t-3})]$$

$$+ \alpha_4 [\Delta p_{t-4} - \mu(s_{t-4})] + u_t \qquad (1)$$

We actually consider sub-sets of such a model by testing for the optimal lag with usual information criteria. We depart from Hamilton's model by considering a three-regime model as an MSMH(3)-AR(4) model of the capital gains on the Chinese stock market (Δp_t), where the conditional mean $\mu(s_t)$ switches between three states :

$$\mu(s_t) = \mu_1 < 0, \text{ if } s_t = 1 \text{ ('bear' market)} \qquad (2a)$$

$$\mu(s_t) = \mu_2 > 0, \text{ if } s_t = 2 \text{ ('bull' market)} \qquad (2b)$$

$$\mu(s_t) = \mu_3 > 0, \text{ if } s_t = 3 \text{ ('speculative' market)} \qquad (2c)$$

and by allowing the variance of the disturbance term to differ between the three regimes : $u_t - \text{NID}(0, \sigma^2[s_t])$,

$$\text{with} \quad \sigma^2[s_t] = \sigma^2_1, \text{ if } s_t = 1 \qquad (3a)$$

$$\sigma^2[s_t] = \sigma^2_2, \text{ if } s_t = 2 \qquad (3b)$$

$$\sigma^2[s_t] = \sigma^2_3, \text{ if } s_t = 3 \qquad (3c)$$

we expect $\sigma^2_2 < \sigma^2_1 < \sigma^2_3$

In effect, (2a) (2b) and (2c) imply that bear, bull, and speculative markets are modelled as switching regimes of the stochastic process generating changes in stock

market prices. The regimes are associated with different conditional distributions of capital gains, where the mean is positive in the bull and speculative market regimes and negative in the bear market one. After a change in regime, there is an immediate one-time jump in the mean. Besides, (3a), (3b) and (3c) imply that we allow for Markov-switching heteroskedasticity, that is the variance of errors can differ between the bear market, the speculative market and the bull market regime. Similarly, after the change in regime there is an immediate one-time jump in the variance of errors. It is expected that the variance will be higher during the speculative than during the bear market. The bull market is expected to be the least volatile.

The transition probabilities between regimes are constant:

P_{21} = Pr (bear market in t / bull market in t-1)

P_{12} = Pr (bull market in t / bear market in t-1)

P_{23} = Pr (speculative market in t / bull market in t-1)

P_{13} = Pr (speculative market in t / bear market in t-1)

P_{32} = Pr (bull market in t / speculative market in t-1)

P_{32} = Pr (bear market in t / speculative market in t-1)

For a given parametric specification of the model, probabilities are assigned to the unobserved regimes' speculative, bull and bear markets conditional on the available information set which constitute an optimal inference on the latent state of the market. Estimations are carried out using MSVAR for Ox (Krolzig, 1998).

4. Regime switching analysis of A-share capital gains

In the light of the work by Nielsen and Olesen (2000), the best strategy consists in starting from a three-regime model of stock capital gains, in order to check that the third regime is not a spurious one. Indeed, the latter authors (on Danish data) conclude that such a third regime corresponds only to a few spikes in the data, which can be dummied out. As a result they argue that a two-regime model, including such dummies, is a good representation of stock returns.

In order to check for this we adopt a specification similar to the one used by the above mentioned authors. This involves an A.R. (1) model of stock capital gains with three regimes. As is apparent from figure A1 and A2 in Appendix I, the third regime is not a figment of the data in as much as it is persistent and does not correspond only to a few spikes. This implies

that the results obtained by Nielsen and Olesen (2000) may have been due to the use of long horizon returns.

The use of information criteria to select the optimal lag length in the MSMH model (Appendix I, table AI.d) leads us to conclude that such a lag length is much longer than one. Indeed, the optimum lag is four. It is then worth considering to what extent the use of the right specification confirms or not the "spurious" character of the third regime for stock capital gains.

Bear, bull and speculative markets

The classification of the three regimes as bear, bull and speculative is based on the results of a switch-in-the-mean plus switch-in-the-variance model. The speculative regime (regime 3) occurred three times in a temporary way in 1995, and, in a persistent way, from the second quarter of 1996 to the second quarter of 1997, with an interruption early 1997. The recent opening of active trading on the Chinese stock market could have been responsible for this lengthy speculative phase. On top of this, the speculative market was present both in mid-1999 and the end of the first quarter of 2000. This confirms that these two periods where characterised by speculative pressures and not only by a bull-market phase. Overall, this implies that the speculative market cannot, and should not, be dummied out in a two-regime model.

The bear market (regime 1) was already present for quite a while from mid 1995 until the end of the first quarter of 1996. The second phase of bear market was much longer lasting, starting in the third quarter of 1997 and up to the end of 1999. There were, however, two interruptions in the second quarter of 1998 and the first half of 1999. The third phase of bear market started in early summer 2001. This third phase is strikingly in opposition with the perception of observers of the Chinese stock market at that time, with a consensus on the prevalence of a 'bull' market. Given the very high volatility, it was very hard for investors to make capital gains in spite of a medium run rise in the value of the index. People used to say that they saw the index rising but they could not make any money. This can be explained by the lack of concern for the volatility of the index.

There were only three bull market experiences prior to 2000. These occurred in the first quarter of 1997, the second quarter of 1998 and the end of the first quarter of 1999. The lasting bull market period prevailed from early 2000 up to late spring 2001, with the bear market creeping in a regular way. This corresponded to very unsettled market conditions and helps understand the confusion in the mind of many investors.

Figure 2.c. Weekly capital gains: probabilities of the three regimes

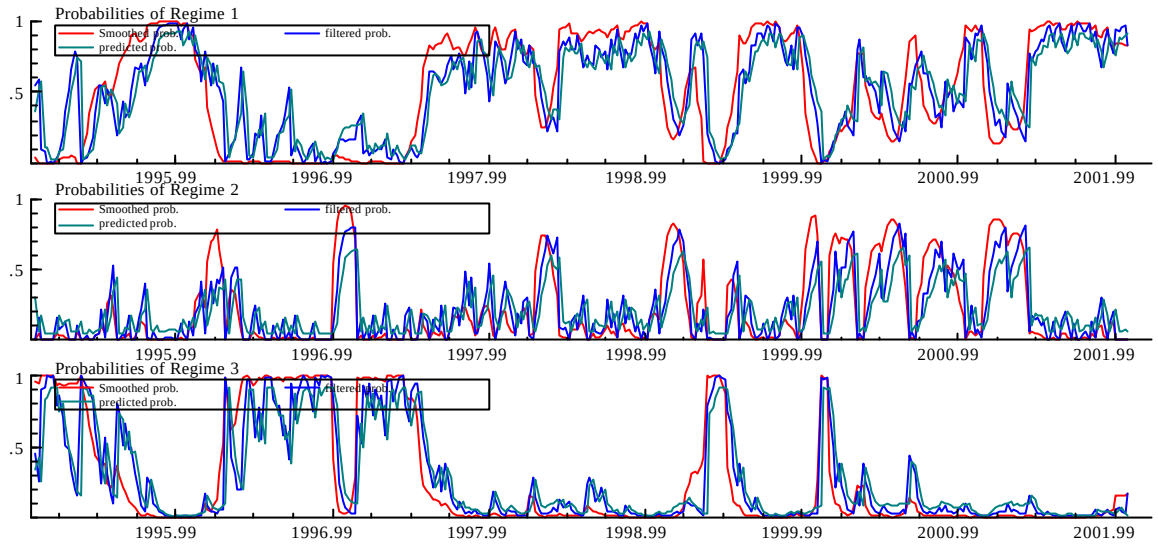


Table 2.b. gives the duration of each regime. The bear market is dominant, with 15 weeks, while the duration of the bull market is short (4 weeks). The duration of the speculative market is almost as long as for the bear market, but this is valid only until 1997.

Table 2.a : Transition matrix

	weekly	capital	gains
	Regime One	Regime Two	Regime Three
Regime 1	0.936	0.133	0.026
Regime 2	0.063	0.781	0.048
Regime 3	0.00	0.084	0.926

Table 2.b. : Duration (weeks)

	Weekly capital gains
Regime 1	15.6
Regime 2	4.58
Regime 3	13.5

Table 2.c. : Coefficients

	Weekly
	Coeff.
Mean (Reg.1)	-0.554
Mean (Reg.2)	0.835
Mean (Reg.3)	1.37
A.R (1)	-0.013
A.R. (2)	-0.087
A.R.(3)	0.05

A.R. (4)	-0.101
	Variance
Regime 1	9.5
Regime 2	2.11
Regime 3	45.1
Sharpe ratio	
Regime 1	-0.058
Regime 2	0.395
Regime 3	0.030

weekly data : 1995 (2) - 2002 (5)

When considering the stability of the different regimes, the low persistence of the bull market is striking (table 2.b). The latter leads more easily to the bear than to the speculative market. There is no possibility of transition form the bear to the speculative market, and hardly any of the inverse transition. The bull market is thus always in between the two other regimes. In other words the bull market acts as a safety net for investors in a speculative market. The stock market provides buffers against both violent crashes and too rapid upward movements.

Risk-return trade-off

We do not find the standard pattern where the bear market regime with average capital losses has lower variance than the other regimes with average capital gains. Indeed the bear market has a much larger variance than the bull market. On the other hand the very high return with the speculative market is accompanied by a very high variance of capital gains in this same regime, i.e. a much higher variance than in the bear market. This is confirmed by the ratio of mean capital gains over their variance (Sharpe ratio), given at the bottom of table 2.c. Based on the mean-variance trade-off, the weekly horizon corresponds to weakly risk averse behaviour.

Table 2.d. Monthly one-step-ahead expected capital gains

Starting regime	Capital gains, weekly rate (%)
Bear	-0.466
Bull	0.693
Speculative	1.284

Expected capital gains are computed as follows: for example, when starting from bear market ($P11*\mu_1 + P12*\mu_2 + P13*\mu_3$). The result is given at a monthly rate.

The computation of one-step ahead expected capital gains from the transition matrix and the mean capital gain in each regime is given in table 2.d. The ranking of the regimes is unchanged.

We noted above that, after the third quarter of 1996 until the end of 1999, the speculative regime vanishes and the bull and bear markets alternate. The bull market becomes dominant during 2000, and the bear market takes over in mid-2001. All this should be taken

into account when computing expected capital gains after the end of 1996. One should in particular include in the computation the 'actual' duration of each regime. When this is done, as in table 3, we find that the expected capital gain is positive. Such a result is opposite to an intuitive reading of the timing of probabilities of the regimes with different horizons. In spite of the bear market being the most durable, the very high mean capital gain of the bull market are enough to tilt the result in the positive direction.

Table 3 : Computed expected capital gain after 1996

	Mean (%)	Duration (weeks)	Frequency (%)
Bear	-0.554	104	47
Bull	0.835	97.5	44
Speculative	1.37	19.5	8.8
Expected return	0.227		

Overall, after 1996, an investor with a weekly horizon most of the time find herself in the bear market and makes capital losses. Only during very short periods of 'luck' does she make big capital gains, which on average will more than compensate her for the losses. These results provide a rationalisation of the assessment in a recent ADB study on the Chinese stock market, when talking about domestic Chinese investors, that "many of them treat the stock market like a casino" (Nam, Park and Kim, 1999, p. 78).

5. Conclusion

We considered the regime switching behaviour of weekly capital gains in the Shanghai A-share market from January 1995 through February 2002. The three regimes identified include a speculative market. The latter is a full regime that cannot be pinned down to a few outliers. However in the Chinese case, it occurred mainly in the initial stage of development of the stock market.

Investing on the Chinese stock market appears a rather risky business. Indeed, the bear market is the rule, but the few appearances of a bull market with high capital gains are such that overall it is possible to make profits with such a strategy. Risk, as measured by the variance of capital gains, is skyrocketing in the speculative market. Overall the 'Casino' character of the Chinese stock market is the main feature which is substantiated by the present results.

However there is a message of hope in as much as the change of mood seems to be occurring with some moderation, as testified by the absence of direct transition

between bear and speculative markets. The bull market regime is indeed always a buffer zone between the other two regimes.

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Appendix 1

The MSMH(3)-A.R. (1) model for stock capital gains

Table A1.a. : Transition matrix

	Weekly capital gains		
	Regime One	Regime Two	Regime Three
Regime 1	0.895	0.043	0.074
Regime 2	0.06	0.926	0.032
Regime 3	0.04	0.03	0.893

Table A1.b. : Duration (weeks)

	Weekly capital gains
Regime 1	9.55
Regime 2	13.6
Regime 3	9.38

Table A1.c. : Coefficients of MSMH(3)-AR(1) model

	Coeff.
Mean (Reg.1)	-0.88
Mean (Reg.2)	0.39
Mean (Reg.3)	1.53
A.R (1)	-0.007
	Variance
Regime 1	11.2
Regime 2	4.81
Regime 3	13.3

weekly data 1995(2)-2002(5)

Figure. A1.c.: Probabilities of the three regimes, (weekly capital gains).

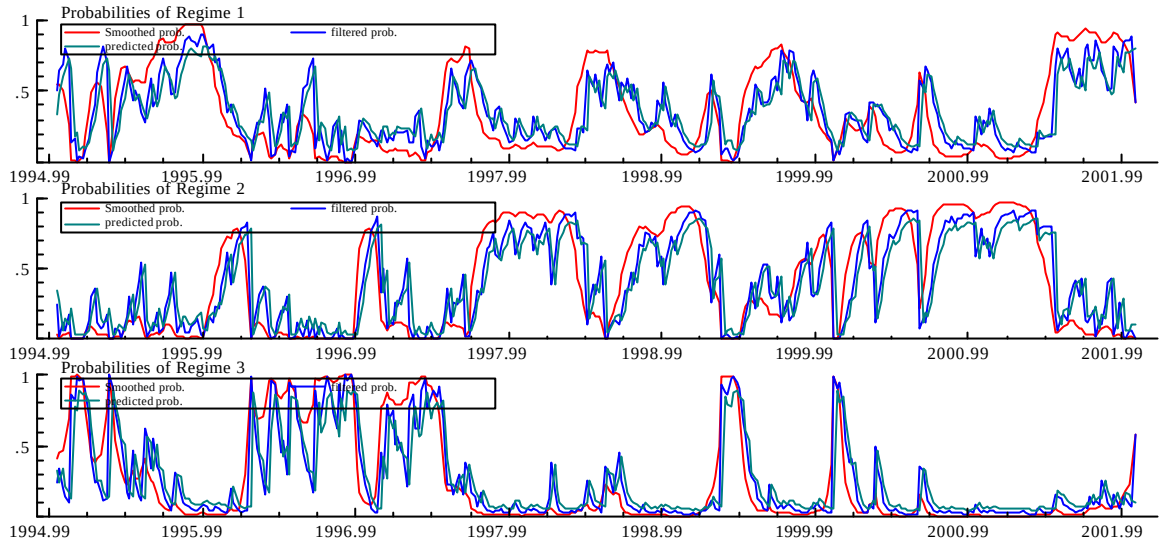

Table A1.d. Test of model specification.

	ln Likelihood	AIC	HQ	SC	LR
Weekly capital gains					
1 Lag	-1010.21	5.57	5.63	5.71	91.60
2 lags	-1006.59	5.57	5.63	5.72	93.41
3 lags	-1002.06	5.57	5.63	5.73	93.71
4 lags	-995.02	5.55	5.62	5.72	101.8

For all models : linearity test : Chi(4) =[0.0000] ** Chi(10)=[0.0000] ** DAVIES=[0.0000] **