Designing a New Automobile Insurance Pricing System in China: Actuarial and Social Considerations

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"To make simple things complicated is simple; to make complicated things simple is complex."
-- Schpagin

I. Introduction

There are numerous articles extolling the future potential of the insurance industry in The People's Republic of China (hereafter referred to as China) since the implementation of economic market reforms. While the current size of the Chinese insurance market is much smaller than many industrialized nations, the rate of premium growth is among the highest in the world. The national premium income had reached nearly US$60 billion in 2005, up 13.95 percent over 2004, and 3.09 times of the amount in 2000. Although the insurance industry has garnered increasing interest from researchers, little has been written about actuarial practices in the world's most populous nation.

Supreme Court Justice Stephen Breyer recently commented that international opinion can be relevant in determining fundamental freedoms in a more global society. According to Breyer, "U.S. law is not handed down from on high even at the U.S. Supreme Court," he said. "The law emerges from a conversation with judges, lawyers, professors and law students. ... It's what I call opening your eyes as to what's going on elsewhere." While the role foreign countries should play in dictating American law is debatable (and beyond the scope of this study), social researchers, including those in economics and business, have unearthed valuable insights when researching corollary issues beyond our borders. Examining the inimitable challenges facing casualty actuaries in China, recognizing the unique history of their social and legal framework, and studying the creative solutions used to overcome these obstacles should improve the understanding of our global diversity and is warranted.

The automobile industry in China has a relatively short but impressive history. Backed by technical assistance from the Soviet Union, China started producing automobiles in the 1950s. The automobile sector was under strict central planning in terms of investment, production, and consumption until the early 1980s. Total production of automobiles was only 100,000 in 1971. Because motor vehicles were categorized as capital rather than consumer goods, private ownership of cars was not allowed. There have been a number of peaks and valleys in automobile production over

the past three decades, but the overall trend since the mid-1990s has been steadily accelerating.

When China's economic reform was introduced in the 1980s, the automobile sector gained momentum and began to expand significantly. Automobile production in China exceeded one million units by 1992, and that figure was doubled eight years later. Over the past two years the number of automobiles produced in China has doubled yet again with China surpassing France to become the fourth largest producer of automobiles in the world. Around 2008, China will likely surpass Japan to become the second biggest producer of automobiles in the world (Pan, *et al.*, 2004).

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Originally, the People's Bank of China (PBOC) was responsible for regulating the insurance industry, but in 1998 this sector was transferred to the China Insurance Regulatory Commission (CIRC) in order to streamline intensify financial reforms, minimize financial risks, and shore up the fledgling financial services industry. The CIRC oversees insurance business operations; formulates and enforces related laws and regulations; protects the interests of policyholders; develops the insurance market, maintains order and ensures fair competition; promotes insurance industry reform and restructuring; and sets up a risk evaluation and advance warning system to minimize insurance risk. Because many firms were making up for losses in their life insurance business by borrowing from their property insurance business, in 1998 the CIRC decreed that insurance companies could no longer handle both life and non-life business (Allison, 2001).

To acquire a better understanding of the insurance industry in China, a discussion of the auto market's history and previous versions of auto insurance is constructive. The Chinese insurance industry was initiated with the first insurance company established in Shanghai in 1885. By 1949, the total branch network of the domestic insurance industry in China consisted of more than 600 firms, but its market penetration was only about 25%. In comparison, foreign insurers totaled about 60 firms, yet had a 75% market share. After the People's Republic of China was established, it created a state-run insurer, the People's Insurance Company of China in 1949. For various social, political and economic reasons, foreign insurers were increasingly motivated to discontinue their operations in China and were completely out of the country within a few years. From this point forward, the state-owned insurer, the Peoples' Insurance Company of China, was essentially the only insurer

operating in China. In January of 1959, the domestic business of PICC was suspended due to the restrictions on private ownership of property and the implementation of comprehensive social entitlement programs which lasted until 1979. A major policy shift to reform and open-up China was initiated shortly after the death of Mao-Tse Tung in 1976. China re-established its insurance sector with property business-lines resuming in 1980 and life assurance in 1982. The monopoly of PICC remained in place until the creation of a second insurer, Xinjiang Corps Insurance Company in 1986, followed in 1990 by Ping An Insurance Company and CPIC.

At the beginning of the 1980s, the property casualty loss ratio was about 64%, peaking at 82% in 1986. By 1994 PICC insured 5,400,000 vehicles, 920,000 tractors, 2,190,000 motorcycles, 97,000 ships, and 12,000 fishing boats, with a total premium of 14,088 million RMB, an increase of 39.04% from 1993. The insurance contract wording during this time was relatively simple with broad coverage and few exclusions. Due to the combination of increasing exposure to thievery, higher accident frequency, and premiums lagging the rising prices for cars, accessories, and automobile parts, the loss ratio rose to nearly 79%.

In response, PICC applied to the regulator, Peoples Bank of China, for a premium increase and for permission to restrict coverage. In 1995, coverage for theft was removed, third party liability changed from unlimited to limited, and the premium nearly doubled. Insight into the ownership of an automobile in China during the late 1980's can be found in an article by Bates and Goldstein (1989), who were expatriates in Beijing at the time. Chinese cars were purchased directly from the manufacturer as China had yet to open dealerships. Cars, trucks, motorcycles, bicycles, pedi-cabs, animal-drawn carts, and pedestrians competed for limited road space. In addition, widespread public awareness of traffic regulations was not well understood by pedestrians, and traffic lights were routinely out of service during power cutoffs. Night driving posed its own challenges in China, as trucks would frequently drive with only one working headlight or none at all. Often, the Chinese authorities would hold the driver of a motor vehicle automatically liable in an accident involving a motor vehicle and a pedestrian or bicyclist. If liability was split, Chinese police would unilaterally determine the apportionment.

The decision by China to join the World Trade Organization (WTO) has resulted in numerous changes to that its insurance laws and regulations. The Standing Committee of the Ninth National People's Congress made the proclamation to modify significantly the insurance laws governing China

on October 28, 2002. Guided by a combination of governmental promises, required changes contingent to joining the WTO, new objectives, and international traditions, the Committee identified 38 items for revision. The amended terms under the new insurance laws involved the areas of insurance company operations, contracts, inspection and management, insurance agent and broker duties, and general rules. In addition, substantial technical modifications on rate filing examinations and relaxation of rules regarding the item and rate approval system were modified.

The China Insurance Regulatory Commission (CIRC) asks for the same information as the U.S. for filings: actuarial memoranda, illustrations, sample policies, and details of the calculations. The CIRC does not request cash flow testing, and all reports are done on a statutory basis. Companies do not need approval before selling their products, and only unusual products receive closer attention. However, credentialed actuaries are required to sign for life filings. The CIRC also is implementing a requirement for property casualty filings to include a review by a Fellow of the Casualty Actuarial Society (Yang and Lu, 2004).

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Another influential factor advancing these changes was the Road Traffic Safety Law of the People's Republic of China, which was adopted at the 5th Meeting of the Standing Committee of the National People's Congress on October 28, 2003, and took effect on May 1, 2004. It is China's first national law on road traffic safety and is expected to improve current road and traffic conditions. The detailed implementation methods are formulated by the State Council.

The effect on motor insurance and development in China, as expected, has been profound. For example, Article 17 of the Law requires that the State implement a third party liability insurance system on motor vehicles and set up social assistance funds for road traffic accidents. In addition, the current tort system for resolving road accidents will be replaced with a "no-fault" system.

The method of insurance supervision and management has been improved with decentralization and regulations on insurer financial strength has been toughened. The Supervision Department continues to be responsible for monitoring standards as previously, but individual insurance companies now have the latitude to design their own products and rating structures.

Currently, there are four main kinds of motor insurance coverage in China:

- Motor physical damage (without theft coverage)
- Compulsory traffic accident insurance (limited liability, with 20% no-fault)[1]
- Voluntary traffic accident insurance (fault, one of the three kinds of coverages recommended by the Insurance Association of China, or excess of the limited compulsory traffic accident insurance)
- Endorsement (designed by insurers)

As a result of these regulatory changes, the requirements for both vehicle and driver will be stricter and more standardized. Motor insurance coverage has been extended with provisions in place to mandate that insurers adjust rates for both private and commercial vehicles. Foreign insurance companies will be excluded from Part 2 coverage as compulsory insurance is not covered in China's WTO agreements with other countries.

The purpose of this paper is to provide an overview of automobile insurance regulation reforms currently taking place in China. Comparisons to and contrasts with the more mature, yet continuously challenging, automobile insurance industry in the United States and other developed nations are incorporated throughout the paper. Current actuarial principles in practice, given the low availability of credible data, are a focal point of much of the paper. Ratemaking challenges faced by casualty actuaries in China, cultural and regulatory hurdles, as well as the state of the actuarial profession in China today are also discussed.

1.a. Transformations Affecting the China Insurance Market – Automobile, Traffic, and Road Conditions

The average retail cost of an automobile in China has been dramatically reduced since 2002. The cheaper auto prices were brought about by tariff adjustments for imported cars, and increased production domestically. This trend is expected to continue. The China Auto Price Index (CAPI)

[1] Also known as compulsory third party liability insurance. All owners and/or managers of vehicles on China's roads are required to pay premiums for this compulsory insurance by October 1, three months after the new rules were enacted on July 1. The third party liability of the compulsory traffic insurance policy has a limit of 50 thousand Yuan (about US$6,000) for fatalities and injuries, 8 thousand Yuan for medical treatment, and 2 thousand Yuan for property. The average annual premium for a family car is about US$125.

shows the average prices of cars have decreased about 13% from January 1, 2004 to 2005 and continue to descend.

The rationale for tracking automobile prices is that the most important rating factor for automobile insurance in China is what's known as the "sum insured." The sum insured is basically the value of the asset being insured, which in this case is the price of a new, this year's model car (not the depreciated value of the original vehicle).[2] Therefore, insurance premiums are expected to be positively correlated with decreasing automobile prices. As can be seen in Figure 2 and Table 2 below, automobile prices are trending lower, but are still relatively more expensive than in more developed countries. Utilizing SAS to calculate the sample CPIC data from 2003 to 2005 on an accident year basis, the sum insured estimates are found to be weakly correlated with paid losses (the correlation coefficients, calculated by using Pearson's product-moment coefficient, are between 0.150 - 0.189).

See Figure 2, page 100

See Table 2, page 102

The number of vehicles registered in China has increased sharply in recent years. Changes in the national economic policy, coupled with this decrease in prices, have stimulated the demand for individuals to have their own private automobile. National car production in 2003 increased by 38.5% compared to 2002, and sales increased about 36.7%. By the end of 2003, more than 96 million motor vehicles traveled the roads of China, including 24 million private passenger automobiles. China has more than 100 million vehicle drivers. Of this total, 54 million were drivers of automobiles, according to statistics. Rising consumer wealth has been a major contributory factor to the sudden explosion in the private passenger automobile market. The purchasing power of Chinese consumers, defined as the value of a particular monetary unit in terms of the goods or services that can be purchased with it, generally measured by income, has risen to the

[2] This caused quite a number of problems, such as giving rise to the risk of fraud as the "asset" depreciated with usage. To address these problems, CPIC uses a total loss sum insured and part damage sum insured calculation.

critical level traditionally associated with car consumption in other markets (Min, 2005). Similar relationships have been found in auto insurance. Outreville (1990) developed a model specifically for property-liability insurance demand and tested it with a cross section of 55 developing countries. He found that the level of the gross domestic product combined with the level of financial development were the only factors explaining the level of development of property-liability insurance demand in developing countries.

The vehicle product structure is also undergoing changes. According to a 2004 report by the China Association of Automobile Manufacturers, the 2001 market share of annual output for trucks, buses, and cars was 63.8%, 24.8%, and 11.4%, respectively. In 2003 the percentages of vehicles produced by class were 27.7% (trucks), 26.9% (buses), and 45.4% (cars). The China Council for International Cooperation on Environment and Development has identified the following major problems associated with the automobile sector:

- First, the scale of production by individual manufacturers is small. While production efficiencies are improving, there are still geographic and supplier-related problems.
- Second, the increase in motor vehicles causes air pollution, especially in urban areas. The World Bank reported in 1997 that Beijing had one tenth the number of cars as Los Angeles, but emissions of pollutants were almost the same.
- Third, demand for oil poses a serious challenge for the energy supply in China. One response by China to the oil situation is a move toward producing liquid fuel from coal, which is more abundant in China.
- Fourth, encroachment on land for roads and parking constitutes an increasing challenge for the expansion of the automobile sector. In some cities, space is already at a premium. Rent for an underground parking space in downtown Beijing can cost more than the annual income of an unskilled worker (Pan, *et al.*, 2004).

The vehicle retention rate, i.e., number of vehicles in use, is also increasing quickly. Despite improvements in the country's infrastructure, accident numbers continue to be a problem due to the layout of many major cities. Another factor contributing to the accident rate is the lack of parking in many residential areas. According to statistical data covering the year 2005, there were 450,254 traffic accidents, resulting in 98,738 fatalities and 469,911 injuries. The direct economic impact of

these accidents exceeds US$235 million. [3] Efforts to improve the safety of road conditions are not keeping up with the rapidly increasing vehicle ownership rate. As a comparison, the National Highway Traffic Safety Administration reports that the United States had 6,181,000 police-reported motor vehicle traffic crashes, 42,636 traffic crash fatalities, and 2,788,000 injuries in 2004. There were 198,889,000 registered vehicles in the United States in 2004.

1.b. Transformations Affecting the China Insurance Market – Competitive and Agency Considerations

Since China joined the WTO in 2002, insurance companies in China have faced many challenges. One major hurdle has been meeting the need for more agents in a concentrated Chinese insurance market. Statistical analysis using both the Herfindahl Hirschman Index and the x firm concentration ratio (CRx) empirically tests for market concentration and is illustrated in Table 3 below.[4]

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Do insurers in China have to deal with hard and soft markets? In a study comparing underwriting cycles in emerging markets in Asia with developed markets, Chen, *et al.* (1999), found that second-order auto-regression results support the existence of the underwriting cycle in Asia. Their results also seem to indicate that underwriting cycles are mainly related to the pace of the economic growth in those countries, and that factors affecting changes in premiums generally differ from those found in developed nations.

The numerous small scaled non-life insurance companies are eager to increase their market share, and generally do so by pursuing a strategy of cost efficiencies and competitive pricing. As a result, many suppliers of insurance are operating below normal equilibrium levels. If this state of affairs continues, the consequences of market failure could potentially reverberate throughout the insurance industry, with a contagion effect that would negatively impact even healthy insurers. There are both

[3] For comparative purposes, according to the CIA World Factbook, China's estimated Gross Domestic Product (purchasing power parity) in 2005 is estimated at US$8.859 trillion.

[4] Two commonly used measures of market concentration are the Herfindahl Hirschman Index (HHI) and the x firm concentration ratio (CRx). The CRx is simply the sum of the market shares of the x largest firms in the market in question. The Herfindahl-Hirschman Index (HHI) is generally considered a superior measure of market concentration. The HHI is the sum of the squares of the market shares of all firms in the market.

formal and informal sharing arrangements in place in China. Effective January 1, 2005, a guaranty fund type assessment was initiated. Every property and casualty insurer must contribute one percent of their premiums (net of reinsurance) into the fund until the value equals 6% of all insurers' assets. While in the future, all insurers will be ultimately responsible for all losses, such is not the case today. Because the Chinese market is developing, most insurers are still owned directly or indirectly by the state. As a result, if a small insurer were to lose market share quickly and its solvency margin falls below regulatory minimums, shareholders can be easily "persuaded" to provide supplemental capital.

In the meantime, the number of agents is growing quickly. There were 209 entities prepared to start business as of May 15, 2003 (the most recent data available). The 209 entities consisted of 157 agencies, 18 brokerage, and 34 appraisers. There were also another 551 companies categorized as medium-sized poised to begin insurance operations in the near future.

Standardization of the overall insurance market is proving difficult, mainly due to the PICC's special position as a state-owned insurer with over half of the market share. During reformation of the motor insurance industry in 2003, PICC's near monopoly of the property insurance market resulted in an abnormally low profit balance point which posed operational difficulties for the rest of the property insurance market. This situation has been alleviated somewhat since the Chinese government privatized PICC through an Initial Public Offering on the Hong Kong and New York stock exchanges in November of 2003. Privatization is generally considered a benefit to market development - by improving the transparency of the whole industry and bringing greater security to policyholders. Increased creativity in the market stimulated by this shift to a more capitalistic environment is expected to move the insurance industry closer to the modern business enterprise system.

Another regulatory challenge is protecting the continued solvency of smaller insurance companies and their ability to compete in the area of compensation. With market conditions resulting in 10% of insurance companies owning 95% of the market and the other 5% of market share split among 90% of insurers, the competitive environment is increasing the risk of default for a number of companies.

Changes in the regulation of the insurance industry, following the transformation of China's economic policy from a centralized government system to an increasingly capitalistic system, have motivated modifications in management styles as well. For example, some insurers are focused on

increasing market share as their primary objective, while others are principally concentrating on earnings as a strategic goal. The differing structures and rating systems used in China, discussed later in the paper, have resulted in divergent measures of performance and management techniques for increasingly innovative insurance companies seeking a competitive edge.

Non-life actuarial techniques are receiving increased attention in China. Refining the existing non-life actuarial methodologies has been driven by the motor vehicle rate reformation. As a result, a number of insurance companies have contracted with foreign actuarial consulting firms or individual qualified actuaries with international work experience to assist with rate design, etc. While these collaborations have accomplished much and provided important transfer of knowledge, the relationship has not been a perfect solution. Since laws, regulations, management, roads, vehicles, etc. are in a constant state of rapid change, a number of actuarial assumptions commonly found in more established insurance markets around the world are not suitable for China's unique circumstances and market conditions. The complexity of a formerly Communistic economic system gradually incorporating capitalistic principles requires practical application of actuarial theory and distinctive tools necessary for feasible solutions. Simply transferring actuarial techniques used abroad in other insurance markets is not an acceptable option at this time.

During the initial design and calculation of the automobile insurance product and rate structure, information technology is inevitably involved, albeit at a more rudimentary level than in more advanced economies. The technology techniques are still in what most countries would consider the early development stage, and China just recently started construction of a fully integrating data bank. Network quality is still in need of major improvements, and until recently, most actuarial software was limited to EXCEL™ and other worksheet based products. Fortunately, more Chinese insurers are incorporating more sophisticated actuarial software through purchases from outside vendors or by internal development. Statistical tools such as SAS™ are being used to analyze the impact of reforms to the rate and contract clauses of motor insurance policies. It should be noted that the majority of Chinese-educated actuaries are still relatively recent college graduates. As such, there is still a learning curve that the insurance industry in China will need to endure patiently until time resolves this issue.

As can be deduced from this discussion, actuarial science in the Chinese automobile insurance market is still more of an "art" than a "science," with a little luck thrown into the mix. In other

words, the tools and training needed to adequately evaluate factors in ratemaking are lagging behind what is ideal under these volatile market conditions. For example, the city of Shenzhen in Guangdong province initiated a rate reformation (reduction) that was the first of its kind in China. This decision was derived from a combination of actuarial determinations and political motives. As a result, demand for the "cheap" insurance was greater than anticipated, resulting in woefully inadequate rates for most companies. The first insurance company to implement price reductions in the Guangdong province of China did not adequately anticipate the subsequent result of such action and was almost forced to withdraw from the automobile insurance market in Guangdong. However, since then it has been determined that the rates were not economically feasible and the city returned rates to their original levels. Effective October 1, 2001, the CIRC deregulated the automobile insurance market on an experimental basis in the Guangdong province by adopting the "file and use" system. Under this system, insurance firms are allowed to design more customized terms and premiums for specific vehicles and geographic areas. This arrangement was expanded countrywide on January 1, 2003, with the elimination of many generous insurance contract clauses and relaxation of many rate regulations.

The efforts of the CIRC, insurance companies, and various professional associations have resulted in four jointly determined objectives in the reformation of the automobile insurance market in China. The first objective is that the automobile insurance market becomes a steady and stable operation. The second objective is for reformation to push the property insurance industry's business model adjustment forward. This includes balancing risks versus premiums, and supplies versus needs (which includes matching the ability of insurance employees with need of insurers).

Third, that insurance company operations and management levels conform to new expectations; performance and market-oriented principles are to be gradually incorporated into the day-to-day functions of the business. Fourth, is that insurance companies eventually exert more control over their various operations, which in turn is expected to increase creativity in the product development, financing, and ratemaking aspects of the industry.

II. Motor Insurance Pricing and the Actuarial Cycle in China

The first year for actual implementation of motor insurance reforms in China was 2003 with the preparation work required of insurance companies completed in 2002. The actuarial working

procedures are very similar to western countries, but there is a greater difference in the actual content versus developed countries. One of the main reasons for this dissimilarity is the weak actuarial foundation and practice in the insurance industry.

2.a. Information Collection

The largest challenge facing actuaries when attempting to apply rate-making principles in China is identifying, collecting, and standardizing the relevant data. In the United States there are services such as the Insurance Services Offices, Inc. that are the state mandated statistical agencies whose purpose is to collect, standardize, and provide aggregated data to the various insurance departments and back to the participating insurers. In Europe, there is freedom to access helpful data, but little support. There is at least one market in Europe where a reinsurer's consulting arm has developed detailed pooled data for auto pricing (Schmitt, 2000). These resources are not readily available in China. Even firm-specific data provided in-house is not considered statistically credible, including PICC. To compound the difficulty, many definitions are not uniform, even across departments within the same organization. The result is a lack of a benchmark and data quality that fails to satisfy actuarial principles of data quality.

So how does an insurance actuary in China operate under these circumstances? Very creatively! Actuaries basically operate in the mode of obtaining as much useful information as possible in any way possible. Various types of information, copyrighted or not, qualitative or quantitative -- from the automobile industry, traffic department, agents, universities, even web sites – are fair game. The validity of data obtained is sometimes verified out of necessity by professional colleagues, actuarial students, and co-workers. The general principles of data quality have been revised given this challenging environment, and are described as the following:

Reliability – While much information is collected, a lot of it is not what would normally be considered credible. Some of it is also contradictory, and selected information is outright confusing. Often it is necessary to filter or combine pieces of data to uncover something of value. The actuary's mindset in China is that any data collected has some potential value. Obviously, in a country like China the cost-benefit analysis of data collection is even more critical. Nevertheless, enough data to satisfy ratemaking criteria is

essential. Actuaries in China like to say that "We have to try to redefine GIGO [garbage in garbage out] as garbage in leads to *gold* out" (loosely translated).

Completeness – Little active data comes from market research. Since the information collected is usually not complete, part of the responsibility of the data miner is to attempt to fill in the missing information. Often, sampling techniques or further market investigations are needed. Also, the types and coverage of motor insurance change frequently, so special skills are needed to re-classify the data, sometimes with the use of text mining techniques. For example, the Chinese name usually consists of two or three Chinese characters, and by excluding some of the characters which are not normally contained in the names of individuals the ability to identify privately owned cars is enhanced.

Timeliness - Changes are occurring in the world at a faster rate, resulting in more rapid obsolescence of historical data. Ensuring a solid infrastructure of ratemaking that will last for a long time is very expensive. At this time, insurers in China are relying on practical and inexpensive methods to reach this objective.

2b. Motor Insurance Rating Criteria

Driver Characteristics

Characteristics and demographics of insured drivers are extremely important factors in a mature automobile insurance market. This includes information about age, sex, occupation, etc. Traditionally, the characteristics of the vehicle being insured were of primary concern to Chinese insurers, with driver attributes given little or no consideration. Culturally, insurance agents and their customers are not comfortable with providing information about the potential insured to the insurance company. As one can imagine, this has been an area of dispute among foreign and domestic insurers, as well as regulators.

Objectively, the factors constituting the drivers ability to operate a motor vehicle safely are hard to describe by the simplest characteristics. In mature insurance markets, the claim frequency for young men as a risk category is usually high, but it is impractical to prove that an individual young man is necessarily dangerous. The degree of risk is normally judged by investigating the past record

of a set of drivers with the same or very similar characteristics.

This is not a reasonable approach in China at this time, as most families who do own automobiles only recently became auto owners. An intuitive argument can be made that all of these drivers relatively new drivers, regardless of age, sex, or occupation and therefore, have the ability to improve their driving ability with experience. This is a major difference between China and western nations, where there is typically a longer history of numerous family members with comparatively longer driving experience. The number of new private car owners and novice drivers in China is rapidly increasing.

Another complexity is the fact that a number of pedestrians are not completely familiar with the newly instituted traffic regulations, including the vast number of Chinese that are migrating from the rural areas to large urban areas in China. The combination of these factors has resulted in unusually high frequency of accidents in some instances, amounting to 50% occurrence in some risk categories and nearly 100% occurrence for some classes of individuals. There are insureds who have submitted over thirty claims to the same insurer over a multi-year period. One proposed solution to this problem has been instigated by some insurance companies, by binding the expiring loss ratio with the No Claim Discount (NCD). The CPIC, the second largest property casualty insurer in China, has also implemented this method to revise the coefficient for reward for good drivers and a debit to premium for bad drivers to recognize their propensity toward accident frequency.

Novice and young drivers

Novice drivers are particularly crash-prone in China as elsewhere. Novice drivers are 5-7 times more likely to crash than drivers with two years of experience.[5] Like other countries, young drivers also have more claims than other age categories. However, China's novice drivers are not as correlated with younger drivers as in more developed countries. Since motorization in China is so recent, there are a large percentage of novice drivers of all ages. By the end of 2004 there were 430,000 novice drivers in Beijing, out of 3.5 million total drivers in that city, and there were 5.1 million novice drivers in all of China. Unfortunately, it is difficult to distinguish the novice drivers, as it is typical for a car to be shared by a number of drivers. While some system that assigns the

[5] Based on sampling thousands of claims from CPIC and calculating the accident frequency with drivers of different experience levels.

highest risk driver to the vehicle for purposes of insurance rating is preferable, there is currently no system available to accurately identify such drivers. Because insurers in China have very limited information on drivers, related factors are sometimes used in ratemaking, such as correlating new cars with new drivers. Obviously, this is only remotely feasible while the automobile industry is in relative infancy. Insurer databases are not sufficiently accurate, and brokers will not provide the true risk characteristics of customers for fear of losing the business. At this point in time such a system is scheduled for implementation as soon as possible after compulsory insurance requirements go into effect on July 1, 2006. In the short run this will negatively affect automobile insurer loss ratios. China is a big country, with a large rural population that has not participated in the economic growth of the nation. The gap between the rich and less affluent is growing. The automobile insurance situation should improve in the major cities with time. However, the challenges discussed in this paper are expected to persist for decades on a country-wide basis.

Risk of Vehicles

Another important risk factor is information regarding the vehicle(s) being insured, which can include the price of the vehicle, the age, depreciation, etc. At this time, the "sum insured" (value of the vehicle) is the most important risk factor in China. In contrast to other countries, Chinese insurers do not use vehicle years as the exposure unit instead of sum insured. The mechanical application of techniques and methods, for a system in which the exposure base is the value of the vehicle rather than vehicle years, will create difficulties. The answer may be to use another model, such as that of homeowners insurance, where value, not home years is the base. In a mature motor insurance market, the risk factors associated with vehicles are generally easy to measure. Car repair organizations like the Research Council for Automobile Repairs (RCAR) can classify vehicles into groups. After attaining the vehicle's model and type, finding out the risk class of that vehicle can be done by checking the relevant manual. There is no such classification method in China. At the same time, with rapidly increasing numbers of vehicles, the automobile brands offered are somewhat chaotic. Even for the same make, vehicles may have totally different characteristics with large differences in risk. Generally speaking, a relationship exists between the automobile type and sum insured. However, while a reasonable classification of the vehicle type can alleviate the risk

exposure problem on sum insured differences, it does not identify properly the real risk of a loss when it uses only using the insured sum.

The automobile insurance industry's loss ratio is increasing rapidly because of the continuous decrease in vehicle price accompanied by decreases in premium, the rising price of accessories, and the relatively fixed labor rate and other monopolistic operations associated with repairs and parts suppliers.

Environment of Vehicle Use

One of the characteristics of automobile insurance is that the insured object is mobile and the differences in territorial differentials large. Territory of usage is one of the main risk characteristics. The territory factor in China not only pertains to the location where the vehicle is garaged, but also incorporates the natural environment, economic environment, customs and habits etc., that includes the safety record of the state, native road conditions, and population density (Ng and Schipper, 2005). The risk factors applicable to the vehicle and environment in which it will be used can all be represented by the characteristic values to describe the risk's category. A two-dimensional table is applied to rate construction.

Distribution

In China, the distribution system is somewhat unique. Usually the car dealer and salesman exert control over all auto-related transactions. As such, they are also often the conduit for new automobile owners to find an appropriate auto insurer. If an insurance company wants to connect with customers, it has to either make arrangements with automobile dealers or spend major resources through media marketing. Insurance companies are also reliant on automobile repair workshops for controlling repair cost expenses and indirectly for the service quality of claims.

Other factors - In addition to rating factors like personal characteristics, vehicle, and territory, there are other dynamics that need to be managed. As with insurers in other regions of the world, China's insurance industry struggles with insurance fraud. Gaps in the risk classification system can invite dishonest behavior if the system is not reputable and rigorous. Insurance companies attempt to reduce this occurrence with close analyses of various methodologies with the goal of more classification groups and smaller ranges. Sometimes, this will cause interaction between the factors.

According to the CIRC regulations, the total price change is limited to a 30% range up and down now, and the premium will not allowed to be readjusted again within six months.

2c. Lack of Data Sharing

A fact that cannot be over-emphasized in this analysis of automobile insurance in China is the competitive environment. This competitive market structure makes it very difficult to share information. As mentioned earlier, the market share of insurance is still very concentrated, with a handful of companies owning a significant market share in China.

These large companies have extensive branch and sub-branch networks that are vertically integrated in every aspect of the insurance market. There is an understandable reluctance by these companies to share resources and information with smaller companies. This leads to heterogeneity in underwriting practices for each company, and information that produces bigger deviations than the actual market. For example, one vehicle may not be a bad risk in the market and yet have less than necessary and sufficient data backing it than another type of vehicle. Loss ratio calculation results may show that its loss ratio is unacceptable. This conclusion will restrict the underwriting of this type of vehicles producing a "vicious circle" with less data available in the future. In fact, this kind of system deviation exists extensively, be it within an insurance company, a whole profession, or perhaps in a country. In China only a few insurers dominate the market, and individual insurers are left to collect relevant information on their own instead of relying on an industry or governmental agency. During the actual automobile insurance rate-making process, horizontal correction should be made for this kind of error and deviation by the use of other data or resources such as manual rating information.

2d. Data Cleaning

Accurate data and complete information are basic conditions for ratemaking. For a variable collected from insurers with seemingly ever-changing markets, data cleaning is the most important work among the basic operations during automobile insurance ratemaking. Assuring that data are accurate, complete, timely, and adequate is a critical problem in China. Although the automobile insurance database is more complete than for some other insurance products in China, the quality of

automobile insurance data used would still be considered poor by global standards. For larger insurers such as CPIC, the second-largest property insurance company in China, the data quantity is sufficient. However, even these data are insufficient for satisfying actuarial requests due to technical problems (business information switching, data connection variation and Chinese support functions), and general business management problems (changing products, variety in clauses, and management methods).

An investigation into these phenomena has resulted in the following conclusions. First, data standardization has been low in the past, there is an abundance of garbage data, the information value of data is insufficient, and the support function of the information technology system is relatively weaker in such areas as historical data management, which usually accompanies a system switch. Second, since there were few private passenger automobiles in the past, in many respects all customers, whether commercial or non-commercial, are combined into one general customer base. A key to efficient and equitable personal car insurance ratemaking in China is to use suitable methods to distinguish the customer. In addition, some information needs to be filtered to reduce problems such as insurance fraud and the artificial interference factor, which refers to a reasonable adjustment related to the clash between aims of regulatory rules with the operations of the insurer.

During the process of data cleaning, choosing suitable data as the benchmark needs careful consideration. More localized data, such as daily reports provided by branch managers, is preferred. On occasion, some indices can use the headquarters' average values as the reference. Moreover, samples-drawing methods for certifications can be adapted to confirm some information if circumstances and conditions are appropriate. Data mining is a potentially useful tool in this stage.

2e. Changed Rates

Despite national unified clauses practiced by domestic insurers prior to the sweeping automobile insurance reforms, there were extensive differences in actual operational processes. The past unified clause constituted by the CIRC and enforced by all general insurance companies in China is very extensive, which allows for differences in its supervisory application at the local level. Discount phenomena and other market factors should be filtered and solved for this portion of errors, and is a challenging problem for rate-making professionals, unless one doesn't use loss ratio methods when

making rates. Many branch companies' rates fluctuated multifariously in the year 2005's motor insurance data and the range was not very small. This factor needs be considered when the rate is being calculated.

2f. The Unsound Reputation and Insurance Fraud Problem

The market economy is still developing in China. Deception by both businesses and customers is still rampant. For example, potential insureds often intentionally give false information in an attempt to obtain insurance coverage at a favorable rate. Agents have been caught providing a dummy address to an insurer in a scheme to get renewal commissions. At this time, the ability to verify much of this information is cost prohibitive. The Chinese culture includes a high standard of morality, the ability to tell right from wrong. Therefore, many Chinese feel it is shameful that some individuals have violated the cultural standards of utmost good faith are violated.

Customarily, customer's information is usually controlled by the salesman and not by the company; so customer's information in the record-keeping systems can incompletely reflect the customer's true circumstances. Insurance companies run the risk of their salespeople changing jobs and taking part of their customers' information with them. There have also been problems with insurance salespeople, who can represent more than one insurer, essentially selling their services to the highest bidder. Motor insurance companies have taken advantage of this lapse in moral judgment by offering bribes for salespeople to promote their own product offerings over their rivals' products.

III. The Pricing Model

Issues normally associated with pricing models in developed countries may include such areas as class and territorial relativity analysis, reinsurance pricing, and assessment of the value of reinsurance structures to reinsured. Other required services might consist of reserve reviews, retention studies, and Dynamic Financial Analysis. The pricing models used in China are still relatively rudimentary, and an examination of the current environment provides valuable insight into the condition of the profession.

3a. Organization of Data

Organizing data is critical in a changing market. The most recent year's claims experience was chosen for analysis because this data was available on the new database. Because all claims are not yet reported for the more recent incurred months of this data, an allowance for IBNR claims will need to be added to the claim history collected. China is a rapidly growing market, and the quantity of underwriting and claims data will increase quickly with the passage of time. Since the environment is also changing, recent horizontal data is also segmented. For example, although there are some differences in males and females when estimating driving risks, other conditions are similar, enabling the entire information data supply to be utilized.

3b. The Treatment of Large Claims

Large claims or catastrophes are random events, with very high costs. Two methods are usually utilized to decide the critical value of large claims: the claim value and percentage of claim frequency. For example, when considering physical damage to the insured vehicle, a small car will not cause a large value of claim. Because China uses sum insured as the measure of risk exposure instead of vehicle year, it will produce different results from that obtained using traditional treatments. These events, if included in a particular rating classification, may make that rating classification look abnormally bad. Large claims, which will distort the data analysis, should be excluded or truncated, with the excess cost reallocated over all policies at a later stage. Since the insured sum are taken as exposure unit and there exists high relativity between the high insured sum and large claims, a great deal of the high insured sum's indemnity will be shared by the low insured sum policies. This will also lower the indemnity ratio of the high insured sum policies if the actuary uses of the usual and customary method to distribute large claims. Obviously, this is distorting results. For this reason, large claims need to be included in ratemaking in a functional relationship to the insured sum so as to correct the bias.

3c. The Usage of Loss Distribution

Zero claims usually arise if there is a dispute as to who was at fault in the accident, or if the

amount of damage in the accident was small. If the amount of damage is small, the driver might not pursue the claim, because the loss of the no claims discount on next year's premium would exceed the total cost of damage. Some actuaries have suggested excluding these zero finalized claims from the analysis, as including them would lower the average claim cost to unrealistic levels. This might be a reasonable course of action if the percentage of zero finalized claims is changing over time.

Generally, the research and investigation of those policies on which the indemnity is greater than zero is more sufficient than that on which the claims are equal to zero. In fact, high-quality customers are often included in the part of claims that is zero so that the research is positively skewed for those customers and policies.

3d. Rate Smoothing

Smoothing can be achieved by first looking for linear relationships between resultant risk premiums within a risk category. If the fit resembles a linear relationship, then the actuary can smooth the rates to fit to this linear relationship, and this will make rates easier to quote. At this point in time, some insurers fit the rate curve with a changeable or fixed inclined ratio respectively.

3e. Bonus-Malus Systems

The traditional no claims discount system is designed with the assumption that the percentage of novice drivers is small relative to the total number of drivers, and that the drivers who hold the licenses driving experience is proportional to their age. This is not necessarily the case in China. Most drivers of private passenger vehicles are new drivers getting their driver's license for the first time, regardless of their age. Given that novice drivers have more accidents than experienced drivers, the claim frequency for the insureds in China is much higher than that in developed countries. If traditional Bonus-Malus Systems are used in China, there will be extensive losses suffered due to inexperienced drivers (those newly licensed and those holding a license but having never driven before).

3e. Generalized Linear Modeling

The main focus here is to seek the best-fitting model after making certain of the risk

classifications. The Generalized Linear Modeling (GLM) has been one of the most popular tools used to rate motor insurance for decades. It is a highly valid methodology for vehicle insurance ratemaking, and can easily handle a large quantity of risk combinations being examined and establish complex relationships related to claim experiences. GLM is used extensively by actuaries world-wide and is the core technique for most rate-calculating software.

GLM primarily includes the additive and multiplicative models. The additive model, despite imperfect theoretical deductions, is created under some assumptions which cannot necessarily be satisfied in actual applications.

Chin Pacific Insurance Company, for example has encountered some problems during the process of additive model application. The sum of all increments totaled more than 100%, which exceeds the regulated limitation value (50%) mandated by the CIRC. Actuaries have had to construct a method of selecting one factor from among the three factors initial factors. It has been very challenging to implement in practice due to difficulty in distinguishing the loss factors. As a result, the applicability of the multiplicative model is considered superior to the additive model, and is being applied most extensively now in China.

3f. MAX model

There are some problems in appropriately identifying which factors are highly correlative with the risk dynamic. Different factors can have similar results; repetitive usage of single-variable techniques may cause repetition of calculations. Therefore, one of the obvious advantages of multi-dimensional analysis is to deal with the interaction and connection of many risk factors in order to seek the optimal combinations. Results can therefore be achieved more accurately than under a one-way analysis of claims experience. On the other hand, as the number of rating factors being examined increases, the volume in each data cell decreases. Multi-way analysis can create unwarranted fluctuations in the data simply due to random variation rather than any inherent differences in the data.

The key to the GLM application is in handling correlations of pricing factors effectively. Generally, actuarial theory suggests selecting the most important factor and discarding the others. As mentioned above, this approach is not feasible for ratemaking in China. Additional factors,

whether correlated or not, are used to narrow the gap among relativities. Policyholders providing incorrect information will not receive a substantial discount from the rate system, and there is enough redundancy to correct it. For example, actuaries in China can use the price of the car, size of cylinder, manufacturer or type, age of vehicle, etc. to estimate the risk of the vehicle, although they are all correlated. It does not satisfy the assumptions of GLM. Other factors also may make it difficult to distinguish risks. For example, consider the case of an experienced driver with a defective car or vice versa. Often major problems can be traced to one specific factor, while the other factors in the model are considered accurate and reliable.

The Max model is recommended to solve these problems,. For those correlated risk factors K_i (i=1, 2, ...N), a variable MAX(K_i) is utilized in the calculation in order to improve the accuracy. This method can be still further extended to that non-correlated risk factor. It can also be combined with the traditional model as a mixed model.

For example, driving record, age and no claim discount are correlated or interaction effects. If for policyholder "A" is age 25 with a decent driving record and the relativities of the risk classifications are 1.50, 1.20 and 1.30 (no claim discount is compared with the average) separately; therefore, the relativity of these risk factors is 1.5 if the Max model is used, compared with 1.50*1.20*1.30 = 2.34 using the multiplicative model and 1.0+0.5+0.2+0.3 = 2.0 using the additive model.

For policyholder "B" age 45 whose driving record is bad and the relativities of the risk classifications are 0.85, 1.50 and 1.20, therefore the relativity of these risk factors is 1.50 if using the Max model, compared with 0.85*1.50*1.20 = 1.53 using the multiple model and 1.00-0.150+0.50+0.20 = 1.55 using the additive model. It should be noted that the Max model can be generalized with a special function G(k1,k2,...,kn), and mixed with other models to fit the actual risk classifications. This approach has limited practical applications for a variety of reasons that go beyond the scope of this paper.

3g. Forecasting the Target Market's Price

The purpose of the various analyses is to forecast of the price of the target market in the future. It is the core competency of the for-profit corporation. Loss development analysis estimates the number and value of claims not yet reported as well as adverse (or favorable) development on known

claims, with each different type of risk, such as third party versus property claims requiring a separate development pattern. It generally takes more time for insurers to receive and settle third-party bodily injury claims than third-party property damage claims. Claims for damage to the insured's vehicle take the least time to be reported and settled. Furthermore, claim settlement takes much longer in countries with a common law legal system than in those with a civil law legal system.

To estimate expected claim severity and frequency projected into the future, historical estimates need to be trended to consider future changes (e.g., inflation).

Determining accurate loss reserves is one of the most challenging tasks facing the actuary. In a rapidly changing environment, an approach that previously provided accurate results may no longer be appropriate (see Lester and Fisher, 1975). During the process of calculating the automobile insurance rate, the cash flows and funds receivable accounts should be considered. The receivable account ratio, an important supervising and management index for some insurers, has increased up to 20% for certain special customers and channels in China. This perpetuates the existence of fraud premium and indemnity, by artificially boosting management incentive measures.

Financial checks as a support function of rate-making remains weak in China. The ABC method (Activity-Based Costing) is still considered to be in the early stages. The method for expense-sharing is somewhat simplistic at this time, so there is no reasonable and valid method for calculating the shared expenses for automobile insurance and non-auto insurance, such as the fixed and variable expenses, commission and brokerage expenses, and administrative expenses. This will directly affect the accuracy of rate-making and also result in difficulty analyzing operation and profits capacity and improving the management level.

Distribution channels are becoming increasingly important in China, and are influencing the indemnity ratio (total indemnity divided by total premium). Since the market is far from standardized, there are obvious differences in the service charges among the channels and even among the customers for the same channels, and this has a direct influence on the property insurance company.

The loss ratio has proven to be a very confusing concept in China. In the past a simple paid loss ratio was used. It was defined as the value of paid losses over gross premiums during a period of time. A similar definition of loss ratio is used today, but the value of the case estimates and IBNR are usually not calculated correctly, the raw data varies quite significantly, and it is extremely difficult

to adjust the data and satisfy the assumptions. A significant percentage of shareholders at most insurers in China are still associated with the state, so there is not stockholder pressure to increase profits. These shareholders are more responsive to such measures as scale and market share. With ongoing efforts to privatize the financial services industry in China, i.e., the initial public offering of PICC, there is a greater interest in areas directly related to profits and earnings, although there remains a contingent of investors still focused on bigger scale. The diversity of assessments used to evaluate a company's progress by various stakeholders has created an interesting environment for corporate strategic planners and investor relations.

3.h. The Pricing Enviroment in Today's China

Pricing is not only a science; it is also an art. When results are finally obtained, it is after almost all the data have been adjusted. Most of the information collected has been filtered out, and added dummy variables to the model. In spite of this extensive fine-tuning and tweaking of results, occasionally absurd conclusions result. Under those circumstances, experience and intuition may come into play to judge the usefulness of such results.

As with other regions of the world, the most difficult and important course of action in China involves communication with top management. Since the history of non-life actuarial science in China is short, actuaries usually have middle and low level positions in the company. This results in certain barriers for communicating with administrative officers. There is also a balancing act involved when sharing important information with company executives. On the one hand, if the topic is too technical, the officers do not understand what it means and therefore are not willing to provide their support; on the other hand, if the topic is too elementary there is a tendency to believe that it is nothing new and has limited value at best. There is also the importance of balancing conflicts of interest within different units, which often requires an actuary to quickly develop diplomatic skills. Interestingly, company presidents must sign off on all claims over $50,000 to ensure that no fraudulent claims are paid. This is in contrast of the practice in North America where the claim VP signs off on all declined claims to ensure all legitimate claims are paid (Yang and Lu, 2004).

Presentation of the pricing structure is also very important. It must be clearly explained and straightforward for the underwriter or agent to use, in a manner that facilitates easy understandability for the insured as well. Otherwise, the insured will go to other insurers where the structure is easier to follow or because they are used to the old structure. In China, PICC dominated the market for a long time, so people are used to the pricing configuration in use there. Because of well entrenched habits, it will take time for consumers to become used to an innovative pricing composition.

IV. Other Considerations

A rate is an estimate of the expected value of future costs, and automobile insurance is a critical consumer service. So it follows that regulation in this market has an important direct impact on consumer welfare. There are many factors to consider and adjust in such a changing environment, yet as alluded to throughout this paper, most of the factors are full of uncertainty making it hard to model with accuracy. In reality, only rough estimates can be provided, making actuarial activities more intuitive than discrete in many respects. Unfortunately, a number of people, including company management, believe the results should be exact. Some of the designs under consideration are discussed during the ratemaking application in this section.

4a. Social and Cultural Environment

On May 1, 2004 the benchmark for compensating personal injury claims was revised in China. Additional items associated with the claim were included, and some of the existing items were valued higher than before. These changes are based on writings contained in a document with the lengthy title of "Interpretation of the Supreme People's Court of Some Issues Concerning the Application of Law for the Trial of Cases on Compensation for Personal Injury." The financial consequences of these changes are estimated to result in an increase in the cost of Bodily Injury of about 260%.

In recent years, Chinese has managed to grow its economy and maintain very low inflation or even deflation. Since 2003, however, signs of inflation have begun to emerge. The Consumer Price Index came in at about 4.4% in May 2004. Experience shows that the rate of inflation applicable to automobile insurance is usually higher than the inflation rate for all items.

The use of deductibles is very popular in other countries, but is not acceptable in China by most

consumers. As one can imagine, this causes a high frequency rate, with the cost of claims settlement sometimes exceeding the actual loss. PICC set up a deductible within many of its policies for RMB500, which caused many of their policyholders to become angry and switch to another carrier. [6] It is a considered a major reason for the loss of market share by the company.

Despite the migration of young people from the rural areas to the urban areas, there are currently 30 million motor vehicles, more than 60 million motorcycles, and 10 million agricultural vehicles - including 8 million tractors – in the rural parts of China.[7] This is important because vehicles associated with the countryside and agriculture usually have experienced a very high loss ratio. If an actuarially fair premium was derived and charged to these rural insureds, most vehicle owners will be unable to afford it. With large numbers of such vehicles, it has been difficult to come up with solutions to resolve these problems.

To illustrate the vast gulf between insurance products designed in China compared to the United States, consider the following. A controversial new insurance policy that provides coverage for drunken driving activities in China has been approved by the China Insurance Regulatory Commission. Offered by Tian'an Insurance Company, the policy stipulates that the insurer will compensate a third party for injuries or property losses caused by a policyholder as a result of drunken driving. It is a common practice for Chinese businessmen to have dinner and drink alcohol with their colleagues, which they claim improves their relationships and business opportunities. (www.starinfo.net.cn)

4b. Compulsory Third Party Liability

The primary objective of compulsory automobile insurance in China is "to provide affordable, fair, and accessible treatment, rehabilitation, and compensation for bodily injury to, or the death of, third party road accident victims." Secondary objectives are to provide education and information to the community on scheme entitlements/procedures, and to promote road safety awareness with the aim of reducing road accident rates and resulting injuries and disabilities.

Although the Road and Traffic Safety Law already took effect on May 1, 2004, compulsory automobile insurance laws have not yet been enacted. There are a number of problems that need to

[6] The exchange rate was approximately 8.3 Renminbi (RMB) Yuan = 1 U.S. Dollar at the time of this article.

[7] Source: http://auto.news.hexun.com (a Chinese-language website)

be resolved before it becomes effective. Scenarios such as compulsory Third Party Liability Bodily Injury (TPL) with no-fault, and Physical Damage with fault or no-fault tort system must be carefully examined. Some estimates show that premiums will increase sharply if Physical Damage is within a no-fault tort system. Other issues currently being debated are: Should voluntary third party liability still be maintained under a fault basis? What should the limits of compensation be?

Social assistance funds for road traffic accidents will be created and maintained by legal mandate. This is expected to raise the premiums of automobile insurance as well. It is estimated that less than 30% of vehicles in China have any insurance coverage at all. With continued economic development and accompanying wage increases, the percentage of insured vehicles is projected to eventually rise to about 80%. The loss experience of vehicles not insured will continue to be much higher than vehicles that already have insurance.

There is concern within China that if it selects the no-fault basis of tort system, issues of fraud, abuse, and overuse will result in a very challenging environment for the insurance industry. Hopefully China will closely examine the no-fault tort system in place throughout the United States to assist in making an informed decision. The insurance industry in China is also working to build a platform for sharing information among insurers in the market.

At the present time, foreign providers are not allowed to enter the third-party motor insurance market. However, there is not a great desire to enter this line of insurance, as it requires more capital and is much riskier. If restrictions are lifted in the future, it will make the market more attractive for overseas companies.

4c. Additional Regulatory Issues

Although the history of the CIRC is very short, the criterion and standards of administration are developing. CIRC is still in the midst of a paradigm change. Areas such as the basis of insurance accounting and solvency margin techniques as they relate to regulation are under review, and will hopefully be improved. One impediment to smoothly and rapidly implementing these improvements is the shortage of skilled staff and board members with knowledge and experience in the insurance industry. There is also a shortage of experienced actuaries qualified to write financial condition reports.

4.d. China's Actuarial Profession

Actuarial services are developing in China, but still have a long way to go before it can be considered comparable to the standards experienced in other countries. The actuarial profession in China is relatively young, but the greatest immediate concern is the shortage of experience in the operations of well-run companies. As recently as November 2003, the Asia Insurance Review e-weekly noted that, "with the explosion of the insurance industry in China, there is now a shortage of actuaries as out of the 400 plus people working as actuaries today in the industry, only 30% are qualified, according to industry sources."

The first actuarial exam center in China was established in 1993 as an extension of a comprehensive training program for the People's Insurance Company of China by Manulife (Shen, 2000). However, formalized non-life actuarial education only began in earnest during the fall of 2004. Actuarial students have the option of taking the Fellow of the Society Actuaries, FIA, or China's internal exams. Most take the FSA exams as the FIA exams require better English skills and the Chinese internal exams have exceptionally challenging calculation problems. Lack of qualified and experienced actuaries limits the ability of companies to provide financial condition reports to an adequate standard. As a result, many companies employ well qualified and experienced actuaries from Hong Kong or overseas to set appropriate standards for the financial condition reports, and non-life actuarial work usually is a very closed practice of business. Ideally, when professionals and consultants from outside China come in to perform this work, they need to spend sufficient time to clarify the meaning of data. Sometimes when faced with the choice of explaining Chinese data to foreign actuaries, and spending the time and resources to train local staff on specific facets of actuarial principles, it is more efficient to do the latter. In many respects, actuarial principles are similar around the world, but practical applications can be quite different.

The most difficult problem when applying actuarial science in China is not the techniques, but the theory and communication. Actuaries in administrative positions are considered to be in relatively lower standing than other disciplines. Subsequently, in situations where theory is quite complicated, the administration usually gravitates to the simple choices. Educating the industry on what exactly actuarial science is, and its importance to the insurance concept, takes patience.

Conclusion

The motor insurance market in China is developing at a rapid pace, and business models are continuously changing to avoid being left behind. It was only a short time ago that non-life actuarial techniques were introduced in the rate-making and motor insurance product design segments of China. Cultural and governmental hurdles need to be overcome before traditional techniques will be widely applicable in China. As a result, many projects to integrate generally accepted actuarial principles into the unique Chinese model are being studied and gradually implemented. The Chinese saying "May you live in interesting times" certainly applies to the casualty actuarial profession in China both today and into the future.

References

Allison, Tony, 2001, "Risks and Rewards in China's Insurance Market." *Asia Times – Special Reports, February 16.*

Anonymous, 2004, "The Development of China's Auto Industry." *Presentation at the China Association of Automobile Manufacturers (CAAM).*

Bates, Laurence W. and Andre T. Goldstein, 1989, "Sunday Drivers – All Week Long." *The China Business Review*, December: 36-39.

Chen, Renbao, Kie Ann Wong, and Hong Chew Lee, 1999, "Underwriting Cycles in Asia." *Journal of Risk & Insurance*, 66: 29-47.

Hall, Eric, 2005, "Foreign Insurers in China: Opportunity and Risk." KPMG-Reuters joint briefing paper.

"Insurance Offer Triggers Debate." http://www.starinfo.net.cn/english/news/enews/65.htm.

Lester, Edward P. and Wayne H. Fisher, 1975, "Loss Reserve Testing in a Changing Environment." Proceedings of the Casualty Actuarial Society, Vol. LXII: 154-171.

Min, Zhao, 2005, "Five Competitive Forces in China's Automobile Industry." *Journal of American Academy of Business, Cambridge*, 7: 99-105.

National Highway Traffic Safety Administration, "Traffic Safety Facts 2004." National Center for Statistics and Analysis (NHTSA).

Ng, Wei-shiuen and Lee Schipper, 2005, "China Motorization Trends: Policy Options in a World of Transport Challenges." Chapter in Growing in the Greenhouse: Protecting the Climate by Putting Development First, World Resources Institute, December: 48-67.

Outreville, J. Francois, 1990, "The Economic Significance of Insurance Markets in Developing Countries." Journal of Risk & Insurance v57: p.487-498.

Pan, Jiahua, Huaiguo Hu, Fei Yu, and Limin Cheng, "Automobiles." An Environmental Impact Assessment of China's WTO Accession, 2004, A Report by the Task Force on WTO and Environment, China Council for International Cooperation on Environment and Development

"Research & Markets Issues Study of China's Insurance Industry." Insurance Journal, September 1, 2006.

Satyaprakash, PGPIB, 2005, "China's Automobile Industry Post-WTO." White Paper, K.J. Somaiya Institute of Management Studies & Research.

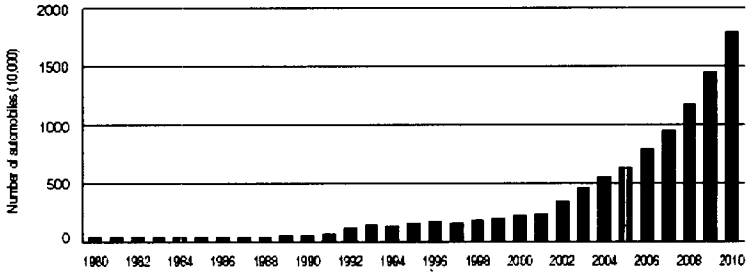
Schmitt, Karen E., 2000, "European Auto Insurance Pricing Considerations." Casualty Actuarial Society Forum, Winter: 141-158.

Shen, Yiming, 2000, "China's Insurance Market: Opportunity, Competition and Market Trends." *The Geneva Papers on Risk and Insurance*, 25: 335-355.

World Factbook, 2006, Central Intelligence Agency.

Yang, Nian-Chih and Wilfred Lu, 2005, "China Insurance Industry." Chinese Actuarial Club Article, January.

Figure 1
China Automobile Production, 1980-2010



Source: Data for 1980-1999, Yearbook of the China Automobile Industry 2000; for 2000-2003, actual production figures from various sources; for 2004-2010, estimates from various Web page sources.

Figure 2

New Automobile Price Trends in China

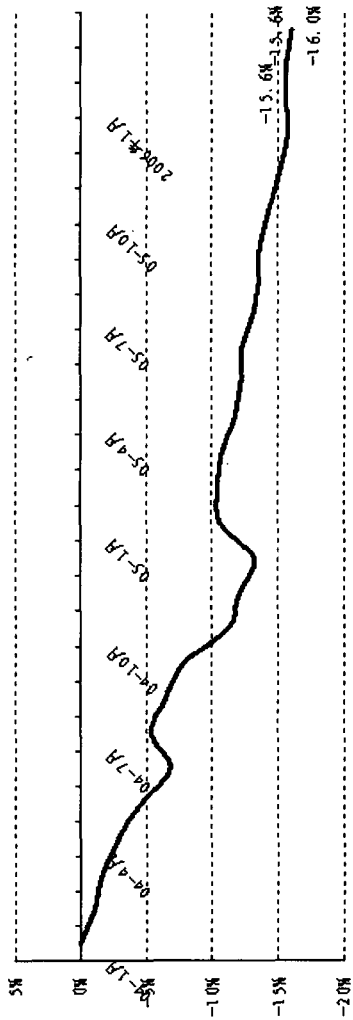


Table 1

Changes in Automobile Industry Post-WTO

	Before Entry into WTO	After entry into WTO
Tariffs	200% in 1980s;80-100% in 1990s	25% by 2006
Import quotas	30,000 vehicles a year allowed from foreign car makers	Quota increases 20%a year, phased out by 2006
Local content	40% in final year of production increasing to 60%,80% in second and third years, respectively	No local-content ratio required
Foreign participation in sales, distribution	Limited to wholesaling through JVs; prohibited from consolidating sales organizations of imports, JVs	Will be allowed to own vehicle wholesale, retail organisations;integrated sales organisations permitted by 2006
Auto financing for Chinese customers	Foreign, non-banking financial institutions prohibited from providing financing	Foreign, non-banking financing permitted in selected cities prior to gradual national roll out.

Source: Satyaprakash, PGPIB, 2005, "China's Automobile Industry Post-WTO." White Paper, K.J. Somaiya Institute of Management Studies & Research.

Table 2
Comparison of Auto Prices in China and World Markets (2003)

	Type	World market price (10,000 RMB)	China (10,000 RMB)	China/world
Higher price spectrum	Audi A6	17.8	37.9–42.7	> 2.0
Middle spectrum	Honda/Accord	19.6	25.9	1.32
	Mazda	15.3	26.3	1.72
Lower spectrum	VW/Jetta	7.5–8.4	10.00	
	Aoto/Xiali	3.0	4.0	
Imported	Toyota/Camry	18.5	> 41.6	2.25
	Benz S600	100	> 200	> 2.0

Survey made by Automobile Digest, September 23, 2003.

Table 3
Market Concentration Indices for China Auto Insurance

	No. of domestic Insurers	CR1	CR2	CR3	CR4	HHI
2002	10	70.67	84.21	95.3	96.41	5304
2003	10	70.75	82.51	91.64	94.68	5242
2004	11	68.69	76.94	85.42	89.44	4904
2005	17	53.34	67.84	76.64	82.70	3218