The Application of Simulation to Project Evaluation for Real Estate Developers in China

by

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ABSTRACT

For developers in China to calculate project financial returns in order to make investment decisions, the traditional Excel model only gives "point estimate" (i.e. a single value) for each input variable, and therefore the model can only reflect one possible scenario. Yet in reality many different things could happen to any input variable in the financial model, which could also result quite different outcomes. Developers in China face a huge degree of uncertainties including changes in market conditions which impact sale price and time duration of selling the product and fluctuations in construction costs, in addition to the uncertainty of the land cost which is derived from the unique bidding process in China.

This thesis will thoroughly illustrate the land policy and some associated unique features in the real estate development in China, followed by an introduction of the financial model currently used by China's developers. The thesis then addresses risk management issue by introducing the Monte Carlo simulation method and by incorporating simulation into the financial model for project evaluation. The thesis will explain how and why simulation can improve the traditional Excel model, and therefore help management to make more informed decisions with enhanced efficiency and accuracy.

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Chapter 1. - Introduction

The research focus of this thesis is to thoroughly study the current methodology and process of land valuation and acquisition commonly used by major developers in China, and then propose revision or suggestions to improve the efficiency of the process. This research project will use information (in particular the current land valuation model) provided by Beijing Capital Land (BCL), one of the major developers in Beijing and also the member company of MIT's Center for Real estate.

China's real estate market, just like its economy, has experienced tremendous growth over the past few years. As the country's economy transformed from "planned" economy to "market" economy, so did its real estate sector, especially when the central government terminated the welfare housing system in 1998 and began to introduce the mortgage concept. In 2004, the government announced a new bidding system under which all developers would have to go through the public bidding process in order to acquire land for future developments. The development right of the land will be awarded to the highest bidder. Therefore how to decide the "right" bid price for the land has become one of the major issues faced by many developers.

Beijing Capital Land is a leading developer in Beijing with most of its projects in the capital city and some in the other growing cities in other parts of China. Although the company does develop office, retail, and hotel, its primary focus is on residential development. Most of its projects are for residential "district" or block, with some mixed-use components complimenting the residential portion.

The developers in China, including BCL, face the challenge of how to make more informed decision when it comes the time to bid for land acquisition. Some companies, such as BCL, do have a basic model to evaluate the land value for future development projects. However, there exists the opportunities to improve the efficiency of the model by the application of Monte Carlo simulation method to better manage risks or uncertainties associated with development projects.

The research methodology of this thesis includes three steps. Step One involves thorough study and examination of the land policy and some associated unique features in real estate development in China. Step Two introduces the current financial model and decision making process at China's development companies. Step Three introduces the concept of Monte Carlo simulation and explains how simulation will help management make more informed investment decisions. In this part, I will also apply simulation method to the current model and illustrate that the incorporation of simulation will improve the efficiency and accuracy of decision making process.

Chapter 2. – Beijing Capital Land / Company Information

2.1 Company General Information (www.bjcapitalland.com)

Beijing Capital Land Ltd (Group) was founded on December 5th, 2002 and has been a public company listed in Hong Kong Stock Exchange (HKSE stock code: 2868) since June 19th, 2003. The price of the Company's stock in 2005 is in the range of HK$1.590 to HK$2.700 (06/05/06 closing price HK$2.475). With approximately 1.7 billion total shares outstanding, including 680 million domestic shares in mainland China, 358 million non-H foreign shares (foreign corporate interests), and 677,556,000 H shares in Hong Kong, the Company has a market capitalization value of 1.66 billion HK$ (for listed shares, as of 06/05/06).

The Company achieved RMB 1.1 billion (approximately $140 million) in sales in 2005, with RMB 0.2 billion (approximately $24 million) or 18% in profit. Headquartered in Beijing, the Company invests in mainland China only and is a large conglomerate engaging in real estate development, with total assets of RMB 10 billion (approximately $1.2 billion) as of year-end 2005. The Company is financially sound, with good liquidity and solvency. It has strong relationship with multiple banks in China to conduct business so that the Company is exposed to minimal currency risks since most of its debt and repayment are in RMB. Its parent company is Beijing Capital Group (which holds 55.7% of the BCL's share), a large-scale conglomerate providing an integrated range of services, including property development, infrastructure facilities construction, and the finance business. Because of Beijing Capital Group's involvement in Beijing's major infrastructure projects and its tight relationship with the government, the Group has been able to acquire priority development rights for large-scale

residential projects on behalf of Beijing Capital Land. Singapore's governmental investment arm GIC owns 9.2% of Beijing Capital Land's shares and it has assigned a non-executive director to sit in the Company's board of directors.

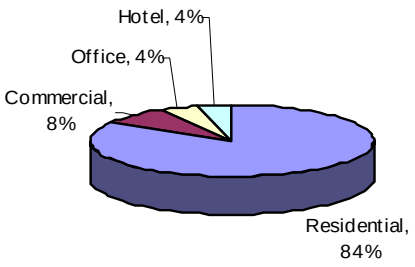
The following table summarizes the Company's financial information.

Table 1. Financial Summary - Beijing Capital Land Ltd. (RMB '000)

Year Ended December 31st	2005	2004	2003
Sales	**$1,134,769**	$1,629,332	$1,874,169
Profit Before Income Tax	**$230,559**	$391,776	$404,029
Income Tax Expenses	**$38,242**	$97,500	$139,948
Profit For The Year	**$192,317**	$294,276	$264,081
Total Assets	**$10,058,779**	$8,772,438	$8,013,951
Total Liabilities	**$6,873,312**	$5,969,496	$5,264,127

The Company is a solid player in the property market in China and specializes in the investment and development of medium to high-end residential apartments, class-A offices and high-end commercial properties. It also plans to hold hotel properties and shopping malls in its portfolio as long-term investment. Even though the Company has development experience in several real estate sectors, its core business is still residential development. As of March 2006, 84% of the Company's land bank is for residential uses, while commercial, office, hotel land uses only account for 8%, 4%, and 4% respectively (see following chart 2-1).

Chart 2-1. BCL Land Bank by Use



Partially because of its strong relationship with local government (e.g. the current chairman and president were both former officers at Beijing Municipal Planning and Development Commission), most of its projects are located in Beijing, especially during the early years when the Company was founded. As a leading developer in Beijing, the Company has 57% of all its developable land located in Beijing as of March 2006. Since 2005, the Company has entered the market of several major cities in other parts of China, including Tianjin, Taiyuan, Wuxi, and Chengdu. Company-controlled developable land accounts for 12%, 15%, 8%, 8% of its land bank in the above cities respectively. Developing markets in cities outside Beijing will help the Company become the integrated property developer in China and will enable the Company to rapidly expand operation scale and promote its brand name. This will also enable the Company to capitalize on the different stages in development cycles to effectively allocate resources and diverse operational risks, so as to balance the property portfolio and development progress.

As of March 2006, the Company's land bank, when fully developed, will amount to a total GFA of approximately 4.26 million square meters (45.9m sqft), which is sufficient for the Company's development for the next four years. It is important to mention that having abundant land bank has always been one of BCL's competitive edges. Even though as it currently states by the

government regulations that the developer has to perform significant development activities within two years after acquiring the land, developers more often have their own ways to handle the issue and control the land for longer period of time.

In addition to project development, the Company recently entered land development business. Land development, which people refer to as 1st-grade development, involves improving the "raw" land by providing some basic infrastructure development for the parcel and making it ready for further property development known as 2nd-grade development. Even though not a major current business focus, the breakthrough of land development helped the Company gain experiences of major work flow and procedures after the implementation of public land transaction, which established a solid foundation for developing professional and standardized land development business as well as creating synergies between land development and property development.

Overall, the Company has unique opportunities to strengthen its competitive advantages in the property development market. Externally, the 2008 Olympics Games to be hosted in Beijing and China's entry into the WTO will support the upward momentum of the property market in China. With the GDP growing at approximately 10% per annum, the accelerated urbanization process, and increased demand from the 70's baby boomers, the real estate industry in China will proceed to the golden stage of long-term development with residential properties as the core sector. Internally, the Company's strong historic tie with the local/Beijing government, together with its excellent reputation and local brand name recognition, will further enhance its leading position in the development industry in Beijing. The Company is also ready to leverage its sound financial

strength and prominent management capabilities to expand its business to other developing cities with high potential for growth.

2.2 Company Strategy

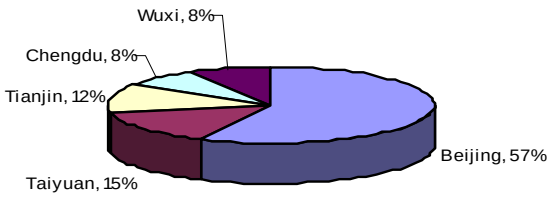
The Company envisions itself to become the “best residential developer” (or “the most premium integrated real estate developer” as it states in its mission statement) in China, by providing high quality housing to realize the home ownership dreams of consumers. In order to achieve this goal, the Company has implemented, and will continue to reinforce, the following strategies:

- Continue to position residential real estate development as the Company’s core business. And in order to provide support and added value for the core business, the Company will develop new emerging businesses such as land development and property finance. Judging from its business expertise and experience, the Company decided to strengthen its residential development with distinctive and innovative features such as product mix and associated services, and to increase the launch of middle to high-end residential properties for small to medium sized families. The Company wants to create an ideal living environment for customers through a combination of innovative building concepts (e.g. unique product mix tailored for local market), excellent construction expertise and quality, and comprehensive services (e.g. high quality school system for residential community).

- As a result of the first strategy, the Company will continue to adjust non-residential projects to enhance the synergy between its commercial properties and core residential properties and to explore new business model for commercial properties.

- Continue focusing on Beijing as a key area for development, while expanding its business (including well-developed products and management) to other cities rapidly and effectively in order to extend strategic geographic distribution, enhance operation standards, and increase the revenue contribution from other cities to the Company. (See the following Chart 2-2 for Beijing Capital Land's current land bank by location)

Chart 2-2. BCL Land Bank by Location



The Company's long-standing relationship with Beijing government, its local knowledge and expertise, and the opportunities presented by the upcoming 2008 Olympics Games, present tremendous potential for the Company to consolidate its leading edge in Beijing. Meanwhile, tapping onto markets outside Beijing will help the Company better utilize its resources, diversify its development risks, and balance its property portfolio and development progress.

- Strengthen the strategic planning and enhance the strategic management capability; Optimize management model and business work flow according to its strategic objectives while strengthening investment planning, standardized operation as well as sales and marketing capabilities of brands.

2.3 Company Management and Its Organization

Beijing Capital Land is a reputable quality developer in Beijing, and, to a less extent, in the nation. The Company is admired by its peers and by the general public. In 2005, the Company was selected as one of "The Top 10 Listed Property Enterprises" by New Real Estate (top three are Vanke Co., Shanghai Lujiazui Real Estate Co., and Hopson Development Holdings), and was recognized as a Top 10 Property Brands for "15 Years of Beijing Real Estate Development" by the Beijing News. It was also selected by the Asia Pacific Human Resource Research Association and the SmartFortune Magazine as one of the Top 100 Best Employers in 2005.

The Company has a team of approximately 330 professionals. Its senior management team has years of experience in development, planning, finance, legal, and economics. Listed in Hong Kong Stock Exchange, the Company is organized in a more western style. The Company segregates Chairman and President, establishes board of directors, as well as other committees such as Audit Committee, Nomination Committee, Remuneration Committee, which helps the Company to maintain high standards of corporate governance. The structure also makes it clear the accountability system, information disclosure, and corporate transparency, which will enhance operational efficiency and strengthen profitability.

2.4 Sample Projects of the Company

To better understand the business model and company strategy, the following information represents sample projects that Beijing Capital Land has developed or the ones that are under development. Since the Company's primary business focus is in Beijing, it makes sense to introduce a couple of major projects in the city of Beijing.

(1) The Upper East Side Project, Beijing (www.upper-eastside.com)

The Upper East Side project is located on the northeast corner of the Fourth Ring Road in Chaoyang District in Beijing. The parcel is about 190,500 square meters in size (approximately 2.1 million sqft) and the final project will comprise of approximately 484,800 square meters (approximately 5.2 million sqft) gross floor area. Upon completion, this phased project will have approximately 407,800 square meter residential/commercial space and 77,000 square meter hotel space.

Targeting middle to upper-middle income customers, the project was very well received by the market. The residential part of Square Street No. 1 and Round Street No. 1 are sold out, with East Garden and Phase II also showing strong sales records. (In China, pre-sale is allowed and is widely used by developers in practice to minimize their equity capital investment.)

(2) The Reflections Project, Beijing

(http://www.bjcapitalland.com/chinese/xmzs/yyt/index.asp)

The Reflections (a.k.a Yu Yuan Tan Apartment) is an ultra high-end residential project with some retail space. Located just inside the West Third Ring Road and right next to Yu Yuan Tan (the Yu Yuan Lake) and the National Guest House, the project enjoys a rare sight in Beijing. Designed by the world renown Spanish architect Ricardo Bofill, three high-rise buildings emphasizes comfort, quality of life, luxurious and modern living, and bring out the elegance of the landscape and architecture. Upon completion in 2007, the project will have a total of 300 units and complimentary luxurious facilities for distinguished residents, with 150,200 square meter (approximately 51.4 million sqft) of GFA on a 17,900 square meter (approximately 0.2 million sqft) parcel.

Beijing Capital Land has opened a sales office for this project and seen positive market reaction: the average selling price for the unit reached 17,700 RMB per square meter, which tops the Company's 2005 unit sale price of all other residential projects.

(3) The Beijing Plaza (a.k.a. Beijing World Center)

(http://www.bjcapitalland.com/chinese/xmzs/gjxq/index.asp)

This is another phased, mixed-use project that has office/residential/retail components. Located right next to the East Third Ring Road with the proposed new CCTV headquarters and the Fortune Center at its south, the project sits to the north of CBD, which is an ideal CBD northern gateway location offering its tenants a superb opportunity to fully capture the enormous business potential in the vicinity.

The project sits on a parcel of about 86,300 square meters (approximately 0.9 million sqft). Upon completion, the project will have approximately 590,000 square meter (approximately 6.4 million sqft) total space, comprising offices, deluxe apartments, SOHO-style districts and commercial facilities.

According to the Company, the Beijing Plaza project was also very well received by the market, with the exception of its retail component. The Company is working on its strategy to figure out the best way to deal with its retail portfolio.

Chapter 3. – Land Policy and Unique Features about Real Estate Development in China

Because most developers in China focus on residential development and because housing issue has become a key focal point in real estate development in China nowadays, the following discussion focuses primarily on the residential sector.

3.1 A Brief History

From ancient China to until early 20th century, even though the emperors owned all the land of the country, individuals were allowed to actually own and trade the land and the associated properties. The last emperor of Qing Dynasty was forced to resign in the early 20th century and, after years of wars (including civil war and WWI and WWII), the Chinese Communist Party finally took over the power and controlled the whole country in 1949. Under the new regime, the central government owns all the land of the country (namely all the people share the "ownership") and no individual person or entity is allowed to own any piece of it. People and entities, however, do get "assigned" a piece of land or property to live and to perform activities such as manufacturing products. In other words, individual (or entity) has the right to use the land or the property, but can not claim ownership. This has been the case for nearly 50 years since 1949.

Welfare Housing System

Before 1998, there was no housing market or real estate market in China, since urban housing was almost entirely administered through government welfare system. Even though the country started its economic reform in 1978, the reform of its housing system lagged far behind, and the

main reason for this is that people were so used to the "welfare housing system" that had lasted for nearly fifty years.

Here is how "welfare housing system" works: For people working for the state-owned enterprises and the government, they will get an "assigned" unit from their employer (as part of their employment benefit) based on such factors as their title, years of service with the organization, etc. The unit could range from a shared apartment to a three-bedroom apartment, and the workers, as the renters of the unit, will pay a nominal rent to the enterprise that actually owns the building. The rent was so low that most people would consider it close to free housing. People can live in the unit as long as they continue their employment with or retire from the enterprises.

A married couple, if they both worked for state-owned enterprises, could only get one unit from either side of their employer. When people pass away, the unit could be "inherited" by their children, unless the children would be able to get "assigned" a better unit by their own employer so that they can evacuate the old unit. Even though people can live in the unit for as long as they want, they do not have ownership to the unit.

Similarly there was no commercial residential real estate development in China, meaning no purchase or sale of housing unit or subletting for rental income was allowed. Housing development was primarily conducted by state-owned construction companies operating exclusively according to state and institutional planning. As a result, residential housing was in

short supply and of poor quality (in terms of design, size, equipment, etc.), even years after the country started its economic reform in 1978.

This welfare housing system generated a series of problems as the country tried to push its economic reform. From an individual/employee perspective, most people were not happy with the "assigned" units for various reasons: They either felt that they should have been assigned a better (most times it meant bigger) unit because of their contribution, or they were unsatisfactory with the features of the unit such as the orientation and the number of bathroom. As the economic reform went on, some people were able to generate more income and they wanted to improve their living conditions. However they were not able to change the physical characters of the unit (for example, only one bathroom for a three-bedroom unit) because of the outdated design under the planning economy. At the same time, the welfare housing system became an increasing burden for the employers. It has been harder and harder for state-owned enterprises to compete with the emerging and dynamic non-state firms since the economic reform started. Most state-owned enterprises faced serious financial problems, and yet they would have to provide welfare housing to their employees and retirees, which further distressed the financial situation of these firms.

1998 Housing Reform

Aimed at relieving the government and state-owned enterprises from the burden of providing welfare housing and at stimulating domestic consumption by promoting real estate and its related market, the housing reform was introduced in 1998 by the new prime minister Zhu Rongji.

Before 1998 the commercial housing market was still very limited in size despite the fact that the government re-introduced the concept of private housing. One of the main reasons for that was the welfare housing was still largely available and people did not feel the imminent need to own or upgrade their homes. Another reason was that, since the price for purchasing private housing was far beyond people's savings and people needed to finance the purchase, the necessary mortgage mechanism was not available in China.

Basically the 1998 housing reform included the following four interrelated components: (1) the traditional welfare housing system would be completely terminated by July 1998, and after that only individual purchases would be allowed; (2) to commercialize all existing residential properties, and current residents were given a limited time frame to purchase their unit at a discount price; (3) four large state-owned banks (Bank of China, China Construction Bank, China Industrial and Commercial Bank, Agricultural Bank of China) would offer home mortgages; (4) to establish a secondary real estate market.

These housing reform policies helped release huge demand for housing from the people who have benefited from the economic reform of the past twenty years and who have accumulated a fair amount of individual wealth. The rising demand in return fueled the development of the non-state-owned real estate sector.

Mortgages

Before 1998, there was no mortgage concept in China. But stimulated by the housing reform policies, mortgage loans, promoted by the 1998 Personal Housing Loan Management

Regulation, became available to ordinary Chinese people. The original (1998) regulation allowed individual to borrow up to 60% of the property value for as long as 20 years. The numbers were revised to 80% loan-to-value ratio and for a maximum of 30-year term in 1999.

The introduction and promotion of mortgage loans not only instantly increased consumers' purchasing power, but also expanded the number of potential residential real estate buyers, which in turn further stimulated the real estate development in China.

Government Role / Macro Adjustment & Control (Hong Guan Tiao Kong)

The central government of China plays a key role in managing and impacting the real estate industry and the real estate market. The real estate market is a fairly new concept in China and the government has very limited experience dealing with market situations. The central government always feels the need to closely manage the industry and its market so that it can have better control and bigger impact on the industry when things go off track or against what the government had hoped. This kind of close governmental management or supervision was given a famous term in China - Macro Adjustment & Control (MAC for short or "Hong Guan Tiao Kong" in Chinese).

It is important to notice that the Marco Adjustment & Control is also, to some extent, widely applied to other industries or economic aspects in China. But within the scope of this research thesis, I will limit my discussion about MAC to real estate industry. It is also fair to mention that the original intent of MAC is always good (i.e. when the government sees something in the economy that is either against the public interest or might hurt the long-term growth of the

economy, the government will try to regulate the sector by providing more detailed directions or more tight supervision). But the MAC just does not work all the time.

3.2 Government Role in Real Estate – Detailed Discussion / Policy Tracking

Since the 1998 housing reform, commercial real estate development has experienced tremendous and rapid growth and has become one of the pillar industries of the national economy. Investment in real estate accounted for approximately 25% of total domestic fixed asset investment after 2001. However, despite its impressive growth, the real estate industry in China is still largely impacted by the government regulation and is vulnerable to market risks due to its unprofessional operation. As the industry's development reached its peak in 2003 and as the concerns of a real estate "bubble" in China became more severe, the central government started a recent round of MAC towards real estate industry in the early of 2003.

On August 12, 2003, the Department of State issued document #18 which clarified the purpose of the MAC is to support and promote healthy development in China's real estate industry. Before that in February of 2003, the Department of National Land Resources had issued other documents to control the supply of land, especially land for residential and office development, and to stop supplying land for cottage development. In June of 2003, the People's Bank of China (China's central bank) published its file #121 which provided guidelines for real estate financing and for financing risk management. The file suggested strict control over the loans for up-scale housing development and over personal mortgage towards ultra high-end housing. It highlighted that the equity investment for a development project should not be less than 30% of the total project development cost in order for the developers to apply and qualify for

construction loan. This limit posted a serious challenge to many developers in China since many of them used to get much higher loan-to-cost ratio for their projects because of their relationship (Guan Xi) with the banks and their officials.

2004 is another critical year in the real estate development history in China, mostly because of the now famous "8/31 deadline". On March 31 of 2004, the government published its document #71, which required that all land for commercial real estate development (residential, office, hotel, retail) go through public auction process and the highest bidder would get the right for development. It further required that the developer who successfully bid the land pay the land cost in time and perform actual development within two years since its land acquisition. If no development activity is conducted within two years, the government has the right to take back the land from the developer. This document #71 completely terminated the old land acquisition system, which used to be through negotiation among the involved parties. Here again, the relationship (Guan Xi) used to play a critical role during land acquisition in the old system, which created a so called "black box" to general public who did not know how the deal was reached or how the price was determined. Some developers could make abnormal profit from this negotiation system and push the housing price to record high in major cities in China, which has been widely criticized.

During the year of 2004, the government also issued other regulations to control the amount of rural land being converted for urban development, and to strictly control the size of the relocation resulted from project development. The People's Bank of China also raised the

interest rate (e.g. one-year prime rate raised from 5.31% to 5.58%) trying to cool down the red-hot housing market.

If it were fair to say that the rules/regulations before 2005 are more of high-level guidance, the more detailed documents published in 2005 by the government are trying to impact the real estate market to greater extent. First the People's Bank of China increased the down-payment amount from 20% to 30% for regions/cities with fast increase in housing price and raised the mortgage interest rate again. Second, the Department of State, in association with other departments such as Ministry of Construction, published and implemented a series of more detailed guidelines to manage the price increase and to control housing/land speculation. For example, one of the guidelines states that the seller would pay full sales tax if the seller has held the property for less than two years. It also encourages the development of affordable housing and more stringent management on land supply. These guidelines helped, to certain extent, cool down the real estate market in some cities.

2006 so far marks another year of detailed Macro Adjustment & Control on real estate industry. It also appears to be the trend that the government is trying to get more relevant departments involved in setting new more detailed regulations, sometimes with one or more departments (e.g. Ministry of Construction, Ministry of Finance) taking the leading roles in the designated groups. The Department of State, in association with other relevant departments, is trying to deal with the problems such as fast increase in housing price and real estate investment, especially in some major cities. The new 2006 guidelines look to adjust the supply structure by focusing on the development of low to mid-priced housing units and affordable housing. For example, it

requires that residential developers allocate at least 70% of total building area to small to mid-sized units. It encourages the development of small to mid-sized units below 90 square meters (969 sf) in total unit square footage. For units larger than 90 square meters, buyers would have to make at least 30% down-payment (minimum down-payment stays at 20% for owner-occupied residential unit smaller than 90 square meters). The new regulation also extends the minimum holding period from two years to five years for the owner to sell his/her unit without paying sales tax, and it looks to provide more related information to the general public to improve transparency.

In summary, the main purpose of Macro Adjustment & Control (MAC) in real estate is to stabilize the housing price and to ensure the supply of low to mid-priced units so as to make it affordable to general public. From 2003 to 2006, the guidelines of MAC have become more and more detailed as the price increase has not achieved what the government and ordinary consumers are willing to accept or able to afford. It is worth noticing, however, that what the central government wants is a healthy real estate market and a reasonable increase in housing price. It has never been the government's intent to reverse the direction of real estate market and go back to the stage of planning economy. Instead the government wants to see a market-driven real estate industry in China with stable and sustainable growth.

3.3 Current Land Policy and Acquisition/Development Process

Developers in China used to acquire land by negotiating terms and price with land "owners" before 2004. Under the old planning economy, the government owned the land and it "assigned" the land for free to different public entities such as schools, plants, government agencies, etc. No

individual or entity was allowed to actually own the land it was assigned to, even though the entity could transfer the land for various reasons such as factory relocation. Therefore, developers would have to deal with the land "owners" directly in order to acquire the target parcel. This created lots of problems, with the major one being the huge loss of national land assets.

Since there was no market value for the land, it was up to the developer and the other involving party (i.e. current land "owner") to determine the transfer price of the land. This negotiation process was known to many people as the "black box" because only a few people knew the price and the details of the deal. The land "owner" could, for various reasons sometimes even for its leader's personal interests, transfer the land to the developer at an incredibly low price. The developer would make enormous amount of money from the development and "share" some of the profit with the decision maker of the land "owner". This "black box" process had no transparency, incurred many corruption cases, and was widely criticized.

On March 31 of 2004, the government published it document #71, which states that all land for commercial real estate development (residential, office, hotel, and retail) will need to go through public auction process after August 31st of 2004. The auction (or the bidding process) will award the development right of the land to the highest bidder. The major local newspaper will have to report the information about the parcels that made the next auction list, and will report the same information to the Ministry of Land and Resources at least four weeks prior to holding the auction. The Ministry of Land and Resources will then publish the information on its website (www.mlr.gov.cn) to make it available to the general public and potential bidders. The bidders

(i.e. developers) will have some time to perform their due diligence on the parcel to determine their bid price.

Interested buyers/bidders will have to submit a certain amount of deposit in order to participate the auction. The non-interest bearing deposit is refundable if the bidder does not win the bid. On the day of the auction, the highest bidder will get the development right of the land, and that winner has to follow the instructions in the auction notice to pay the full land cost (normally within a year or less). The final bid will have to be equal or higher than the original "list price", otherwise the auction will be postponed.

The "list price" of the land being auctioned is determined by the government. There are two so-called "grades" in China's real estate development: 1st-grade development and 2nd-grade development. 1st-grade development refers to land development, which primarily includes putting basic infrastructures in the raw land to make it ready for further development. The 2nd-grade development refers to the commercial real estate development on the "mature" land that has been developed by the 1st-grade developer. Within the scope of this thesis, for the most part we focus on the 2nd-grade development, which is building the actual real estate products on the parcel.

It is also important to mention that the "list price" of the land for the 2nd-grade development includes the cost of the 1st-grade development, and it also reflects the government's estimate/appraisal for the market value of the land. In addition to the cost of infrastructure, cost of the 1st-grade development also includes relocating existing tenants/residents in some re-

development projects. This relocation used to be a big headache for most developers and now is being taken over by the government or its designated entities, but the cost is again factored in the "list price" of the development-ready land. So the government won't allow the bid price to go lower than the "list price".

After the developer gets awarded the development right of the land, not only does the developer need to pay the land cost according to the pre-specified schedule, it also needs to show the government agencies that it can and has made solid development progress within two years since land acquisition. If the developer fails to make any development commitment within the two-year time frame, the government has the right to take back the land for free. The government will also charge a certain fee to the developer if the developer does not start its development activities/construction within one year after land acquisition or the investment committed is less than ¼ of the total project costs within certain time frame (typically it refers to accumulative one year time). The so-called "development right" is equivalent, to certain extent, to the concept of "ground lease" in the United States. The government still owns the land, but the developer has long-time control right, typically 70 years for residential and 50 years for commercial development.

3.4 Permits Needed to Conduct Real Estate Development in China

Typically the developer, after successful acquisition of the land, will need the following four permits to start project construction:

(1) Land Use

Issued by the Ministry of Land Resources, this Land Use permit is not transferable nor can it be used as mortgage collateral.

(2) Planning for Land Use

This permit is issued by local/city's planning committee, a government entity equivalent to the zoning board here in the U.S. Once issues, the developer will have to start construction in two years, or the permit will become void.

(3) Project Planning

Issued by the same local/city's planning committee and, again, the developer should pay attention to the two-year time limit.

(4) Project Construction

This permit is issued by local/city's construction and development committee. Even though the permit can be renewed, the developer will have to start construction within three months once the permit is granted.

The above four permits play key roles in the development/construction phase. Developers will have to have all four permits to be able to start construction.

There is another permit that is also critical to the overall success of the project – permit for Pre-Sale. Most developers, especially residential developers, will factor in the cash in-flows from pre-sale of the project when evaluating the project and figuring out capital structure. The permit

for Pre-Sale is also issued by the local/city's construction and development committee. It is interesting to notice that in 2005, the central bank of China actually suggested terminating the issuance of Per-Sale permit to minimize the risks (e.g. quality risk, ownership risk, risks in planning change or size change, etc.) faced by consumers. Drawing strong opponent and wide criticism in the real estate industry, especially from the developers, this suggestion was never put into practice.

Chapter 4. – Existing Decision Making Process at Development Companies in China

Even after several rounds of consolidation in recent years, there are still many developers, big or small, in China's real estate market. Each one of them may have different decision-making process to decide where and how much to invest for the next project. For this research thesis, I used Beijing Capital Land as an example to illustrate the process. In researching and talking to real estate professionals in China, I believe the process currently in place for Beijing Capital Land is fairly representative of what other major developers are now using. In addition, Beijing Capital Land is considered "quality" developer in China and its process is relatively thorough and sophisticated.

4.1 Departments Involved

In Beijing Capital Land, there are typically several departments involved in the land acquisition decision-making process:

(1) Department of Land Development

The primary focus of this department is to develop raw land instead of property development. In China, the government will select land developer to improve the "raw" land to "mature" land. The land developer will provide some basic infrastructure development for the parcel and making it ready for real estate developers to develop properties, which is called 2nd-grade development. Similarly, land development is called "1st-grade" development. The profit margin for land developers is fairly low (normally a fixed percentage number of land development costs), but it is guaranteed by the government, which also lowers the risks for

the land developer. The government then sells the "mature" land on the open market (i.e. through the bidding system / auction), but the land developer won't be able to share any upside no matter how high the final transaction price could be for the land.

The second major function of the Department of Land Development is deal sourcing. Employees in the Department communicate with land owners and brokers on a regular basis to identify opportunities and gather preliminary information about the parcel for the developer. It is also the Department's responsibility to perform preliminary due diligence on market information, entitlement, zoning/planning information, and relevant analysis.

In the case for BCL, Land Development is a newly established department as the Company trying to diversify its line of business and generate more revenue.

(2) Department of Market Research and Marketing

The main responsibility of the Department of Market Research and Marketing is to decide the product type, price, and market positioning for future projects.

Employees from the Department of Market Research and Marketing will perform market investigation, collect published data such as census and statistic information, manage and coordinate the work of consultants from third party so as to help senior management make key decisions about product positioning. To be more specific, the Department of Market Research and Marketing should provide answers to the following questions: What kind of product(s) or mix would be most appropriate for the available parcel (highest and best use in

the U.S. term)? What kind of customer base should the product(s) target? What would be the appropriate price for the product(s)? Information provided by the Department of Market Research and Marketing plays a key role in the management's strategic decision making.

(3) Department of Project Operation

One of the key responsibilities of the Department of Project Operation is to provide project cost information. Based on the current condition of the parcel or project, recent and historic project cost information (from both the developer's projects and regional information), the Department of Project Operation will estimate total project cost which includes soft cost, construction cost, operation cost during construction and lease-up/sale stage. To this extent, the main function of the Department of Project Operation is more or less similar to that of department of construction/project budgeting. Cost information is another key input for the financial/investment analysis of the project.

(4) Department of Planning and Design

As indicated by its name, the Department of Planning and Design focuses on the conceptual design (including site planning, architecture design, and project engineering, etc.) of the project for the developer.

The Department of Planning and Design has close relationship and frequent interaction with Department of Market Research and Marketing. Once the Department of Market Research and Marketing comes up with the "right" product type (e.g. three-bedroom apartment), the Department of Planning and Design will initiate the planning and design process by

coordinating with both internal and external planners, architects, and engineers to understand zoning and design requirements, suggest conceptual/preliminary design scheme, and provide other related information. Quite often, the Department of Planning and Design will adjust its original design/scheme based on the most up-to-date market information provided by the Department of Market Research and Marketing.

(5) Department of Investment Analysis

Being the last one in the "production line" in the decision-making process, the Department of Investment Analysis plays a critical role. They coordinate with other aforementioned departments frequently to get updated information during the project evaluation process, provide financial analysis of the project for senior management to review, and perform sensitivity analysis for the land price and the financial returns, which is critical during the actual land bidding process. They also need to, in working with finance and accounting department, evaluate project financing options (raising debt and equity when necessary) and coordinate and complete the bidding package for submission.

For purposes of this thesis, even though other departments are also critical in the decision-making process, I focused primarily on the functionality of the Department of Investment Analysis, in particular the financial model it uses to calculate the bidding price for the land/project and its financial returns.

4.2 Decision-Making Process and Land Price Determination

At Beijing Capital Land, three steps would have to be taken before the company actually submits its bid for the land in the auction: preliminary feasibility analysis, detailed feasibility analysis, investment decision-making.

(1) Preliminary Feasibility Analysis

Deal sourcing and potential project identification are the most important steps in this stage. In China today, most real estate developers adopt one of the following two ways to organize their practice in project identification:

The first one is that the company has local/regional office and the local team comprises of real estate manager, market researcher, financial analyst, and etc. The second option is the company has a more "centralized" team that includes market, design, and finance in its headquarters, meanwhile the company still keeps local real estate managers/partners to identify potential projects.

Beijing Capital Land uses the second option. When a potential project is presented to the Company, whether it is from internal Department of Land Development or from external resources, the Company will organize a small team to perform preliminary due diligence (physical characters, entitlement, legal issues, local land policy, etc.). The Department of Land Development plays a leading role in the preliminary feasibility analysis stage.

(2) Detailed Feasibility Analysis

Once the project passes the preliminary feasibility analysis, Department of Investment Analysis will take the lead in the detailed feasibility analysis. Other departments involved (Department of Market Research and Marketing, Department of Project Operation, Department of Planning and Design) will provide more detailed and up-to-date project forecast about costs, design, sale price/rent expectation, etc. for the Department of Investment Analysis to calculate the project financial returns and the maximum bid price for the land, and to run sensitivity analysis. The Department of Investment Analysis is also in charge of putting bid package/investment memo together to present to senior management for final internal approval.

(3) Investment Decision-Making

All the projects that pass the required financial hurdles will then be presented to senior management at the investment committee meeting (called "President Meeting" at Beijing Capital Land). Some developers have regular investment meetings. For BCL, the company normally only has three to four new projects (typically very large in scale though) every year, therefore the President Meeting will be scheduled whenever a project passes the required financial hurdles.

The project team, which includes members of multiple aforementioned departments, will present the project to the committee. The committee will then decide, based on financial criteria and company strategy, whether or not to approve the project. Once the project is approved, it is fairly quick for the company to implement the development (i.e. to spend money on land acquisition and other associated development costs) due to the relatively short

time window to bid for the land and submit the deposit and other required payments if the bid is successful.

For BCL, if the investment committee approves the project, the company will report to the Company's board of directors for final approval.

4.3 Existing Model for Land Valuation

The main focus of this thesis is to thoroughly investigate the existing model used by developers in China (use Beijing Capital Land as an example) to determine the land price, and then to come up with suggestions to improve the efficiency and accuracy of the model so that developers can make more informed decisions before developing a new project. In order to do that, we first need to understand the current model template used by the developer.

(1) Excel-based Model for Land/Project Evaluation

Most major developers in China such as Beijing Capital Land use relatively sophisticated Excel-based models to value land or acquisition projects. This was not the case a few years back when land price and acquisition were pure results of negotiation. Most companies used to do "back-of-the-envelop" project analysis in those days since making quick profit was somewhat "guaranteed" if the developer had the "right" relationship with the government or land owner to acquire the land at a "good" price. As such there was no need to perform thorough project financial analysis. But as the market evolves and becomes more competitive, especially after the land auction/bidding system was put in place in 2004, major developers gradually realized that they would have to have a

more scientific model to perform thorough analysis in order to determine the true market value of the land and to make reasonable profits.

Typically developers have a basic Excel-based "template" for their financial analysis. For major developers (such as Beijing Capital Land) often working on large-scale development projects, things are little more complicated. Because large projects in China often include multiple products (residential, retail, school, hotel, and office), most developers find it difficult to set up or use a "standardized" model that could be applied to every mixed-use project. More often in practice, they would "copy" the model they have used before in a similar project and tailor it to fit and reflect the unique situations of the new project. On one hand, project-specific features or situations can be correctly reflected in the model, which is desirable. On the other hand, the lack of standardization leaves room for making potential mistakes as input and file links among Excel tabs can be enormous and complicated.

Putting aside the unique features of the project that are reflected as special content/tabs in the Excel file, the models used by Beijing Capital Land for different projects generally include the following common information:

A brief project introduction;

Project timing/planning;

Project general information (zoning, size, product type, etc.);

Itemized cost estimates;

Cost summary (cash outflow by quarter);

Sales summary (sale proceeds by quarter);

Capital funding (project income and expenses by quarter);

Project profit margin (gross profit ratio and net profit ratio);

Project cash flow summary (by quarter, IRR calculation);

Land cost sensitivity analysis.

(2) "Forward" Method & IRR

Beijing Capital Land uses a "forward" method to determine the land value of a new project. The process works like this: They will "plug in" an estimated land value in the model as part of the project costs and, as the calculation of the model flows through (the typical revenue, cost, cash flows calculation), the model will generate a project internal rate of return (IRR). In other words, even though they want to derive a value for the land from the model, they use the estimated land value as an input. Then they compare this calculated IRR to their minimum investment hurdle rate. After rounds of tests and some sensitivity analysis (i.e. using different land value numbers as input to calculate project IRR's), they can finally identify the bottom line for the maximum land price that they can afford.

Most developers in China calculate IRR for the projects instead of calculating the net present value (NPV), since most people, especially senior management, are more familiar with the concept of IRR. The concept of NPV is not widely used, at least not as popular as IRR, in the real estate industry in China. Since the concept of NPV is closely related to the opportunity cost of capital (OCC), it is also fair to say that most developers do not

really understand the concept of OCC or do not know where and how to derive the correct OCC of the company. Based on my research, some major developers require a minimum hurdle rate from 12% to 18% (the after-tax project level IRR) for their development project. Sometimes developers, including Beijing Capital Land, do not calculate equity level IRR because of the low interest rate of construction loan (around 6% in China) and hence the almost guaranteed positive leverage if the project IRR is higher than 6%.

(3) Other "Hurdles"

Beijing Capital Land also calculates other hurdles when evaluating development projects. Two of the most popular ones are gross profit ratio (GPR) and net profit ratio (NPR). GPR is defined as gross profit (only after sales tax, but before income tax) divided by total revenue. NPR is defined as net profit (profit after income tax) divided by total revenue. These two ratios are widely used by developers in China since they are easy to understand and calculate, and because the management teams are familiar with the relevant concepts.

(4) Sensitivity Analysis

At Beijing Capital Land, the Department of Investment Analysis will also provide senior management a land value sensitivity analysis when bidding for the land. After the "bottom-line" number for the land price is derived from the model (i.e. the highest bid price, at least in theory, the developer is willing to pay for the land), the Department will run different scenarios based on different land price and summarize the IRR's or other

hurdles for all the scenarios accordingly. The analysis reflects the impact on project returns from the incremental increase/decrease of land price (e.g. every 5% increase in land price will decrease the project IRR by certain amount). This summary table will be used by the management teams during the land auction.

(5) Actual Bidding Price

In theory, the "bottom-line" price is the highest price that the developer can afford for the project. Of course, the lower the actual bid price be, provided that the developer still can win the bid, the higher return the developer can get. But there are other factors that will impact the bid price for the developer, with the "strategic reason" being the major factor. For example, if Beijing Capital Land wants to enter a new market in a different city by acquiring a piece of land and develop a "brand name" project in the new city, the developer may choose to go beyond the calculated "bottom-line" price for the land in order to outbid other participants. This will sacrifice the short-term returns (i.e. IRR) for the company but may be beneficial for the developer's long-term growth in the new market territory. So the management will have to make "strategic" decision before and during the auction to acquire the land at a price that the company will not normally pay under typical situations. Here the sensitivity analysis will be very useful to the management.

4.4 Existing Problems/Difficulties with Current Financial Analysis

(1) At Company/Strategic Level

If there are multiple projects that pass financial hurdles, the developers sometimes do not select projects according to their projected financial returns (IRR, NPV, etc). Instead, developers have to take other factors into consideration, such as company strategy, local land policy and other regulations. Even though most developers want to, they find it very difficult to quantify some of these factors and to incorporate them into standardized decision-making process.

Another problem that bothers most developers is that it is hard to find standard criteria for entering new markets outside of their home base. For example, should they lower the target IRR in order to break into new market territory? Most developers want to quantify the factors they should consider when making decisions to break into new regions in China.

(2) At Project Level – Financial Model Efficiency and Accuracy

Even though the current "Forward" method works in practice, it still has room for improvements. The existing model requires that users input an estimated land value to calculate project returns. Since the developer only has the minimum asking price of the land posted by the government and it has no clue what price would other developers bid on the same land, it is very difficult for the developer to come up with a "good" estimate for the land value as model input. In reality, any number within certain range can be the final price of the land for the winning bid. How to reflect this kind of uncertainty? How to manage other risks in the development project such as future price fluctuation?

In the next chapter, I will introduce the concept of Monte Carlo simulation and the relevant software to solve these problems, and incorporate simulation into the financial model to calculate

project financial returns. With simulation, developers can see all possible outcomes from the investment, and this will enhance the decision-making process.

Chapter 5. Proposed Modeling Improvement - Simulation

5.1 Basic Concepts of Simulation

Simulation is a procedure in which random numbers are generated according to probabilities assumed to be associated with a source of uncertainty, such as stock prices, interested rates, or currency exchange rates. Most people refer this technique as Monte Carlo simulation, which is named for the city of Monte Carlo famous for its casinos. Monte Carlo methods are stochastic techniques - meaning they are based on the use of random numbers and probability statistics to investigate problems.

Probability Distribution Functions (or PDF) and Random Number (RN) are probably two of the most important concepts in Monte Carlo simulation method. PDF's help define how likely certain events are going to happen. The goal of the Monte Carlo method then is to simulate these events by random sampling from these PDF's and by performing the necessary supplementary computations needed to describe the events and analyze the possible outcomes. Let's take a manufacturing plant for example. The management needs to forecast the cost for raw materials in order to make production plan for the next year. Let's assume the cost of the raw material today is $20 a piece and it could go up or down in the next year. The management could, for simplicity reasons, put $20 into their projection for next year. But more sophisticated managers would, being more realistic and aware of simulation, assume a distribution for all possible prices. Let's again assume the cost of the material could be anywhere from $19 to $22 a piece for the next year and the management has absolutely no way to figure out which number the real cost is likely going to be. They can simply apply a Uniform distribution function which assumes that chances for any price between $19 and $22 are equal. This way, the simulation method will

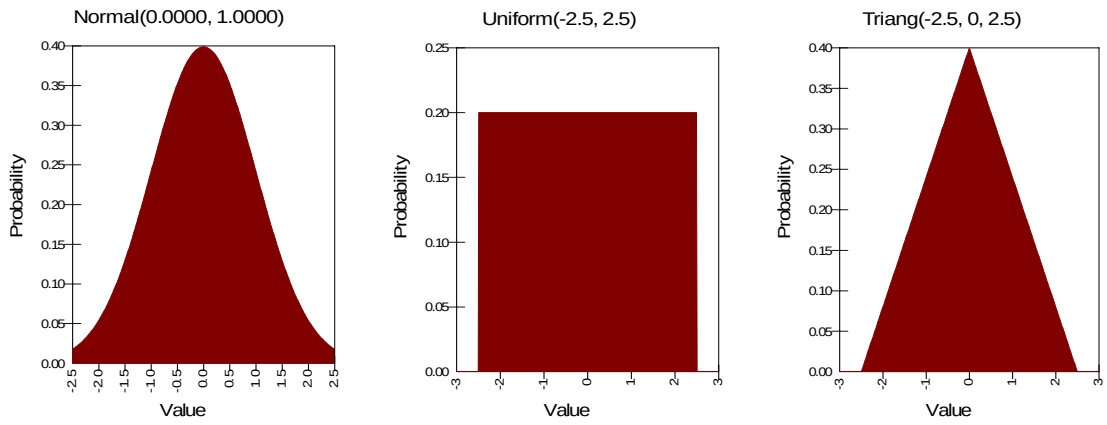
include all possibilities of different cost number in the defined range, which makes this variable or condition more realistic. In short, all the events or conditions are replaced by random sampling of possible values from PDF's, and are then used as input variables. Accordingly the output is also reflected as a probability distribution with all possible outcomes.

Some commonly used sample PDF's are briefly explained here:

Normal Distribution – a widely used PDF which has symmetric "bell shaped" curve with defined Mean and Standard Deviation. With the Mean having the highest possibility to occur, the probabilities of other values to occur are the same if these values are symmetric to the Mean value (see the following graph).

Uniform Distribution – a uniform probability distribution with defined Minimum and Maximum values. Every value across the range of the uniform distribution has an equal likelihood of occurrence (see the following graph).

Triangular Distribution – it is defined by three points (Minimum, Most Likely, and Maximum). Triangular distribution can be "skewed" and the shape depends on the size of the Most Likely value relative to the Minimum and the Maximum (see the following graph).



Random Number (RN) is closely related to the concept of PDF. Interestingly enough and somewhat diverging from what the name seems to suggest, RN's are not truly random in the Monte Carlo method. The generation of the RN's should follow the desired distribution or PDF's. In other words, even though each RN seems "random", the probabilities of each RN is going to happen actually comply with the pre-defined PDF.

We can find Monte Carlo methods used in everything from economics to nuclear physics. Of course the way they are applied varies widely from field to field. In real estate industry, the uncertainties could include key factors that will impact the investment decisions, such as sale price of the project (e.g. the unit price of the condominium/apartment), cost (e.g. infrastructure cost, building hard cost and soft cost) and expenses of the development project, future price growth rate of the selling units if the project is sold or developed in phases. Outcomes associated with these random drawings are then analyzed to determine the likely results and the associated risks.

5.2 Risks and Simulation

We deal with risks every day. In the business world for example, management has to make a decision about the production level for the company in the next year. The decision is based on the projected or estimated factors such as market demand for the product and competitors' activities, which are all uncertain at the point the decision will have to be made. Risks refer to this kind of uncertainty.

In real estate, risks or uncertainties also exist everywhere. For example, for a developer evaluating a potential residential development project, the sale price of the residential unit will be a key input. But how does the developer know for sure that a 3-bedroom condominium unit will be sold at $300 psf in two years? Well, he does not, and nobody does. Traditionally, based on the "best" estimate at current time, developers will use a so-called "point estimate" (in this case, $300 psf) in the decision-making process. They will put $300 psf into the financial pro forma as unit sale price and, together with other assumptions/variables such as cost, duration of the project, calculate the financial returns of the project and make an investment decision accordingly. This calculation, typically in Excel spreadsheet that is widely used, provides only a single estimate of the result. Here we should notice that the developer has to use estimated values as input because the actual values that will occur are not know with certainty when the decision is made.

In reality, however, many things just don't turn out the way that we have estimated or planned. In our case for example, maybe the developers were too optimistic with sale price forecast and also underestimated construction costs, and they made the decision to invest in this project based

on the calculated high returns. It could turn out that the actual sale price decreased because of economic recession while the construction cost experienced sizable inflation due to tight material supply, which made the project a financial disaster. As we can see, the combined errors in the estimates often lead to a real-life result that is significantly different from the estimated result. In some cases, the decision we made based on our "expected" result might be the wrong decision, a decision we never would have made if we had a more complete picture of all possible outcomes. Hence, we need to better monitor the risks (i.e. uncertainties) associated with each variable so that we can make more informed decisions.

Simulation is an extremely powerful tool to help us manage risks/uncertainties since it can explicitly include the uncertainty present in our estimates to generate results that show all possible outcomes. Monte Carlo simulation is able to replace variables of "point-estimate" value with a range of different possible values based on a pre-defined probability distribution. This simulation function, by using probability distribution, can deal with risks or uncertainties with ease. The housing unit price, for example, could be any value between $250 psf to $350 psf based on the probability of the occurrence of each value. By using probability distribution functions to represent a range of possible values, simulation will let users take the uncertainty or risk into account. Running simulation hundreds or even thousands of times is like running multiple "what-if" scenarios in traditional Excel spreadsheet that has "point-estimate" input.

In short, simulation takes into account all possible situations that could happen in reality and it reflects the likelihood that every situation is going to happen. We can include all we know about the variables, including their full range of possible values and the measure of likelihood of the

occurrence for each possible value in order to analyze every possible outcome in our analysis. Since it transforms a single value of uncertain variables into a range of possible values, simulation will greatly enhance risk management.

5.3 Simulation Benefits

The Monte Carlo simulation method replaces uncertain values in whatever situation we are interested in studying with probability distribution functions. So when we run simulation (typically in Excel), it will recalculate the spreadsheet hundreds or even thousands of time, each time selecting random numbers from the PDF's that we selected. The process is just like running hundreds or thousands of "what-if" scenarios all at once. In other words, simulation helps us "live" through the situation over and over again, with each time under a different set of conditions which were pre-defined by PDS's.

Accordingly, the Monte Carlo simulation will show us many possible outcomes about the situation we are studying, and will tell us how likely these outcomes are to occur. Running a simulation will "upgrade" our traditional spreadsheet from representing just one possible outcome (we referred to as single "point-estimate" spreadsheet) to representing hundreds or thousands. In other words, the power of Monte Carlo simulation method lies in the picture of all possible outcomes it creates. When decision makers look at a whole range of possible outcomes including the probabilities they will occur, they will have much better understanding of the situation and the relationship between different variables and the outcomes. They will also be able to identify the critical situations to seek out or to avoid more quickly and easily. Therefore,

the management can choose the best strategy based on the available information, better manage risks, and make more informed decisions.

5.4 Simulation Software

Commercial simulation software is typically based on Excel template as an "add-in" function. For this research thesis, we chose the industrial version of @Risk software to help analyze the decision-making process for major developers in China. Produced by Palisade Corporation, @Risk is one of the leading simulation products in the U.S. and it provides powerful tools for risk analysis and management.

5.5 Application of Simulation in Decision-Making for Developers in China

For management to make investment decisions in real estate, managers would have to get or assume some values for certain variables before performing financial analysis. These information or assumptions are critical to the investment analysis since changes in value or timing might have huge impact of the bottom line – the financial returns of the project. Let's first simplify and summarize those variables and categorize them into two categories: Revenue (cash inflows) and Cost (cash outflows). Of course both Revenue and Cost include other more detailed input variables. For example, Revenue might include sale proceeds from residential units, office, or hotel; Cost might include land acquisition cost, construction cost, marketing cost etc. Also the project will generate Revenue or incur Cost on an on-going basis, meaning through a certain time period (e.g. two years).

Most real estate developers in China use discounted cash flow analysis (DCF) when evaluating a project. Some sophisticated developers, like Beijing Capital Land, use fairly complicated Excel spreadsheet to calculate financial returns. These developers calculate, after making assumptions based on their research and experience, periodic (normally in quarters) cash inflows (from Revenue side) and cash outflows (from Cost side) to derive quarterly net cash flow. Then they will calculate the project's Internal Rate of Return (IRR) based on the projected net cash flows, and will approve the project if the IRR is higher than their financial return hurdles or reject the project if the IRR is lower.

Due to the unique land acquisition process (i.e. the auction process), some developers including Beijing Capital Land will plug in a "test" value for the land price to calculate the project IRR. This "test" value could be based on the experience or their best estimate of what the land is worth.

Let's now examine some key variables in greater detail and see how simulation can help make better and more informed decisions.

(1) Revenue (or cash inflow)

Revenue, or quarterly sale proceeds, is one of the most important input variables in the financial model. The project that I used for illustration purposes in this thesis is one of Beijing Capital Land's recent projects. It is a mixed-use project consisting of residential towers, office, hotel, and retail. It is assumed that the Company will develop and sell the project (all components),

and no operation income such as rent is projected. As such, the sale proceeds from each component are the only cash inflows from the Revenue side.

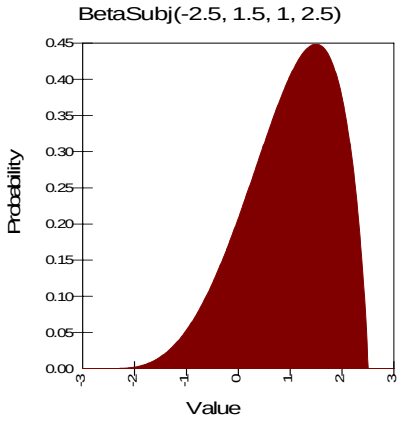
In the current Excel spreadsheet, sale proceeds are derived by multiplying total salable square meters by projected unit sale price (RMB per square meter). Here since total salable area is, to certain extent, controlled by zoning requirement, the unit sale price becomes the most critical input variable. The developers have to, at the time when they evaluate the future project, make their best estimate about the future price. Most developers use a single value projection for the price (e.g. RMB 15,000 per square meter) of each component. Because they have to forecast future price now, and this input is so important for the model, an accurate "point-estimate" projection is often quite challenging, and this posts an even more serious problem if the project includes different uses or will be developed and sold in phases that could take several years.

Simulation can help solve this problem by introducing the concept of probability distribution. With simulation method, the developers no longer are forced to reduce what they know about the unit price to a single number/value. Instead, they can include all they know about the unit price, including its full range of possible values and some measure of likelihood of occurrence for each possible price. For example, based on their market research and experience, the developers expect the unit price can be anywhere from RMB 14,000 per square meter to RMB 16,000 per square meter. If they know or can assume probability distribution of the unit price, they can replace the "point-estimated" value of RMB 15,000 per square meter with an appropriate probability distribution function (PDF), such as uniform distribution (which assumes equal probability of occurrence for any value between 14,000 per square meter and 16,000 per square

meter) or truncated normal distribution (which assumes the price will be normally distributed with 14,000 per square meter as lower limit and 16,000 per square meter as upper limit). When calculating the bottom line (project IRR in our case), the simulation method will repetitively calculate the "upgraded" spreadsheet hundreds or thousands of times, sample random values from the PDF we have defined, place them in the model, and record the resulting outcomes. This way, the decision makers can look at a whole range of possible outcomes, as well as the likelihood these outcomes will occur. For example the managers should be able to see, other variables being equal, how likely (e.g. 73% probability or 94% probability) the project is going to achieve an IRR higher than their return hurdles, and decide if the company wants to take on the associated risks and proceed with the project.

Another very important question the developers have to answer is which PDF is most appropriate to use for the unit price estimate. It is well known that most developers are optimistic (otherwise they won't be in the development business) and they tend to overestimate the future price for their project, at least to certain extent. Therefore it is understandable that they want to use a "left-skewed (see graph below for illustration purposes)" distribution for the price. It is particularly true in China's real estate market, especially in the residential sector. China's economy has experienced fast growth (on average around 8% per year) for the past thirty years. Increased per capita disposable income, together with the recent housing reform policies such as the introduction of mortgage and the continuous urbanization process, created strong demand for residential housing, especially in major cities. This gives more leverage to the developers in China and they have relatively more "control" of the market price for the residential units, and hence gives them reasons to be optimistic. It might be therefore justifiable and reasonable, at

this stage in China's real estate market, for developers to use "left-skewed" distribution for unit price, with the most likely price (the one with highest probability) higher than the actual mean of the value distribution (i.e. the expected value or weighted average of the sample distribution values). (see graph below for illustration purposed).



"Left-Skewed" Distribution

Again it is up to the developers or the decision makers to decide which PDF to use for the projected unit price, I'd agree that a "left-skewed" PDF is appropriate to use. If we look at China's real estate market in the long term as the market matures and becomes more competitive and more market-driven, it appears to me that the "perversity-of-nature" will occur that the distribution of the desirable outcomes are left skewed. That is to say the probability of a modest success is greater than that of a spectacular one.

In the attached project case study with simulation method, which is based on a recent project analyzed by Beijing Capital Land, I used "left-skewed" PDF to replace the original "point-estimate" value for unit price. The PDF I chose is called "BetaSubj" distribution function in @Risk software. BetaSubj is defined in the format of (minimum, most likely, mean, maximum)

and it specifies a beta distribution with a minimum and maximum value as specified. The distribution shape parameters are calculated from the defined "most likely" value and "mean". The details of BetaSubj for sale price for each product are summarized as following:

Unit Sale Price - BetaSubj

	Minimum	Most Likely	Mean	Maximum
Residential - 1	12,000	16,000	15,500	18,000
Office	15,000	19,000	18,500	21,000
Hotel	16,000	20,000	19,500	22,000
Retail	25,000	30,000	29,500	33,000

The growth rate of unit price is another key input in the Revenue section since it impacts the total sale proceeds from the later stage of the project. Sometimes in large scale development projects in China, the developers want to "control" the speed of selling the units in order to observe and react to market performance and maximize profit. In other cases, project will be developed and sold in phases. These all make projecting price growth rate very important.

Similar to deciding the PDF for unit price, the developers have to decide which PDF to use for the projected growth rate of the price. The factors that they may consider include projected GDP growth, household income growth, local market supply in the future, historic information, etc. In the attached project case study with simulation method, I used the same distribution function (BetaSubj) that I used in simulating unit sale price. Because of the continuously strong demand in the residential sector as well as the accelerated urbanization process in China, even with tighter government control on price increase, we will still see healthy price growth in the long term. Again this PDF is "left-skewed". The details of BetaSubj for price growth for each product are summarized as following:

Price Growth - BetaSubj

	Minimum	Most Likely	Mean	Maximum
Residential - 1	8.0%	12.0%	11.5%	14.0%
Office	4.0%	8.0%	7.5%	10.0%
Hotel	-2.0%	0.0%	0.0%	2.0%
Retail	-2.0%	0.0%	0.0%	2.0%

There are, of course, other detailed input variables in the Excel model such as the timing of the project. But to the scope of this thesis, I focused on the above mentioned two variables (unit sale price, price growth rate) on the Revenue side.

(2) Cost (or cash outflow)

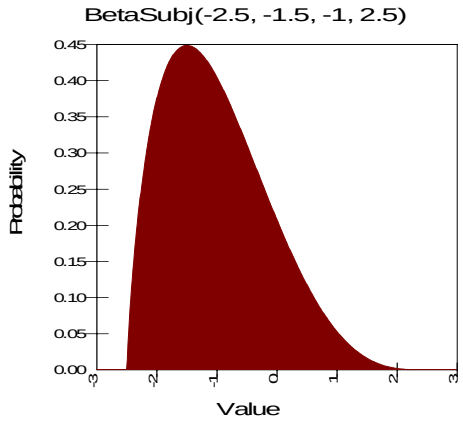
Similar to the Revenue side, the Cost side in the model currently used by the developer includes some detailed line items such as land acquisition cost, pre-construction cost, construction cost, contingency, marketing expense, sales tax, and income tax. It is important to point out again that some big developers including Beijing Capital Land use project-level after-tax IRR as the hurdle when making investment decisions. So the income tax is included in the Cost side (cash outflow) of the model.

Because of the unique land acquisition process and policies in China and because of the fact that land cost in China could account for 30% to 50% of total development cost, how to determine the bid price for the land (or in other words, how to evaluate the land value) becomes the number one question faced by many developers. For Beijing Capital Land, they use the land price as an input to calculate project IRR and make their investment decisions accordingly. That is to say they "pretend" to know the land price in advance. Typically when the government is ready to

put a piece of land for auction, it has to make public the "bottom-line" price, which is the lowest bid the government will accept. The actual transaction price will have to be higher than (or at least equal to) the government's "bottom-line" price. So Beijing Capital Land uses the "bottom-line" price as a starting point and also runs sensitivity analysis to see what price is acceptable. Because the land price is such an important input variable, it tops the list of Cost variables that I want to study using the simulation method.

The developers know the "bottom-line" price (lower limit for the bid) from the government, and the "acceptable" price for them (upper limit for the bid). But they do not know how much other developers are going to bid for, until after the auction. Simulation method can be helpful in estimating all possibilities.

Since most developers are optimistic, they sometimes underestimate the project costs. It is another "perversity" of nature that costs are typically "right-skewed", meaning the probability of exceeding cost budgets is normally greater than under budget (see graph below for illustration).



"Right-Skewed" Distribution

Again, similar to the process that we discussed in the Revenue section, it is up to the developer to decide which PDF to use to simulate the land price. The PDF, its range, and its most likely value can be impacted by many factors such as historic information, number and quality of participants in the auction, and internal market research.

In the attached project case study with simulation method, I used "right-skewed" BetaSubj PDF to replace the original "point-estimate" value for land price. The details of BetaSubj for land cost are summarized as following:

Land Cost - BetaSubj

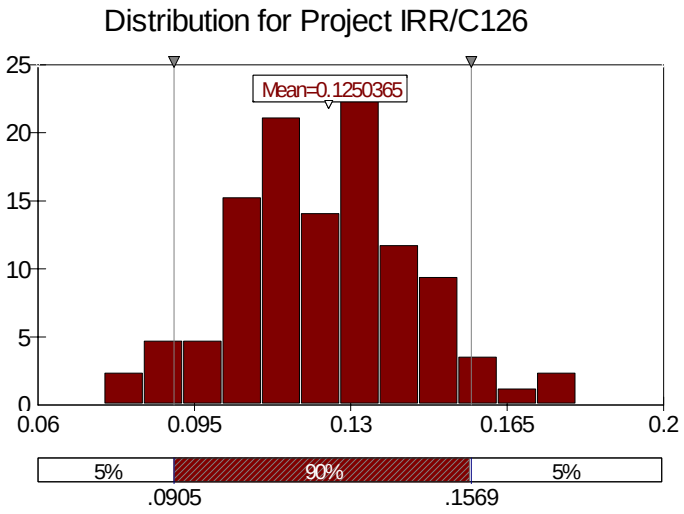
	Minimum	Most Likely	Mean	Maximum
Land Cost	800,000,000	1,133,000,000	1,300,000,000	2,000,000,000

(3) Simulation Results Analysis

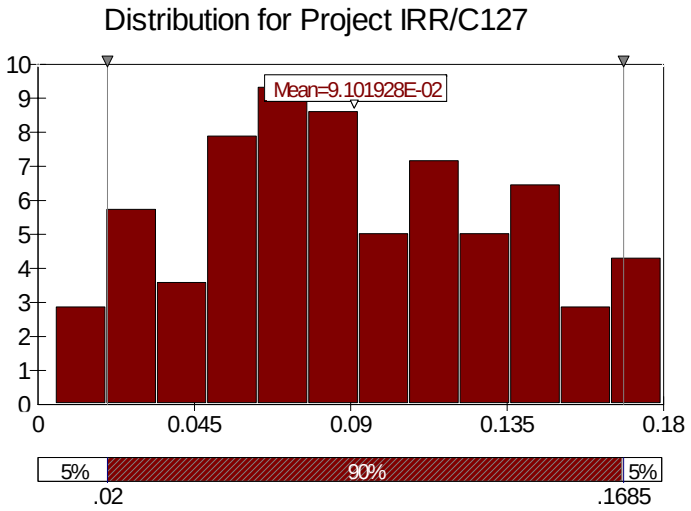
As shown in the attached Exhibit 5-1, the spreadsheet currently used by Beijing Capital Land reflects "point-estimated" values of unit sale price for different components (RMB 16,000 psm for residential, 19,000 psm for office, 20,000 psm for hotel, and 30,000 for retail). It also includes an estimated land price of RMB 1,133,000,000. The whole project achieved a 12.37% after-tax IRR. (More details of the spreadsheet used by Beijing Capital Land are reflected in Exhibit 5-2 and 5-3.)

In order to compare simulation with traditional "point-estimated" spreadsheet and to show how simulation improves the decision-making process, I set up two scenarios with different PDF's to the simulation variables (unit sale price, sale price growth, and land cost).

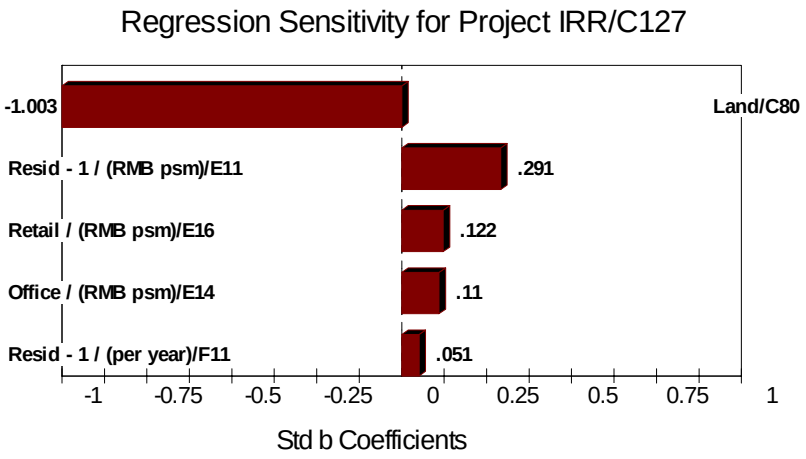
In Scenario I (shown in Exhibit 5-4), I used symmetric bell-shaped normal distribution function to replace single value estimate for all these variables, with the mean (also the most likely value in this case) of the distribution variables equal to the original "point-estimated" value used by Beijing Capital Land. After setting up the simulation model, I ran the simulation 100 times. This scenario gives an "expected" project IRR of 12.50% (mean of the IRR distribution for these particular 100 simulations – the 12.42% IRR shown in Exhibit 5-4 is the mean of all possible IRR based on pre-defined PDF's). It is not surprising that this simulation IRR is fairly close to the IRR calculated by traditional spreadsheet since we assumed Normal PDF's for our variables. But this scenario can still be useful. For example, it shows that based on this 100 simulation runs, the project has approximately 56% of chance to achieve an IRR higher than 12.0% and it has about 98% chance to achieve an IRR higher than 8.0%. If 12.0% is the financial hurdle for the company to make investment decisions, the management has to decide if or should they want to take a 44% chance the project may achieve a below hurdle return. See the following graph for the IRR distribution for this scenario. The input summary for this Scenario I is attached in Exhibit 5-4.



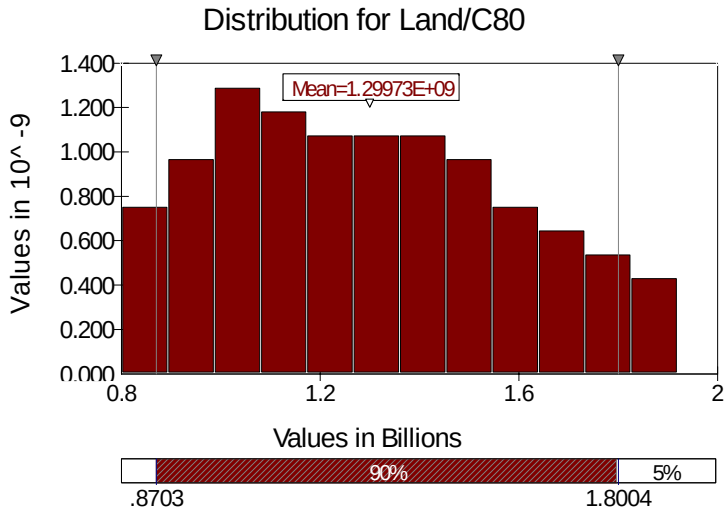
In Scenario II (shown in Exhibit 5-5), which is the revised simulation model with left- or right-skewed Beta distribution PDF's for the group of same variables, the simulation method suggests some different insights. Based on the PDF's that I chose (BetaSubj) for the input, the mean IRR of the project is only 9.10%, after running the simulation 100 times by the computer (again the 8.65% IRR shown in Exhibit 5-5 is the mean of all possible IRR). The range for the IRR for this particular simulation run is between 5.3% and 18.0%. The project will have no chance to achieve an IRR higher than 18.0%, yet there is a 73% probability that the project would achieve a below 12.0% IRR. See the following graph for IRR distribution.



It is also worth mentioning that the project IRR is, not surprisingly, closely related to the land acquisition cost. Land cost is the number one "significant" factor affecting project IRR (negative correlation), based on the variable sensitivity analysis. The second most important factor is the unit sale price of the residential units (positive correlation). The sensitivity analysis of input variables is shown in the following Tornado graph generated by @Risk.



Since land cost is what interests developers most at this stage, users of the simulation model should pay special attention to the land price range. In the simulation I run for Scenario II, the range of land cost is between RMB 0.80 billion to RMB 1.92 billion, with a mean value of RMB 1.30 billion (see the following graph for land price distribution). This suggests that, with the currently estimated PDF for land cost, the developer has only about 27% chance to achieve an IRR higher than 12.0%. It is up to the developer to decide if he wants to take this much risks.



The results of this second scenario are different from those of the first simulation scenario because scenario II considered more realistic probability distributions of price and cost, versus scenario I only included normal distribution in variables. Skewed distributions in scenario II better represent what's going to happen in reality. Therefore, scenario II simulation gives a much more complete picture of possible outcomes from the investment.

Chapter 6. Conclusions and Discussions

6.1 Conclusions

For developers in China to calculate project cash flows and financial returns, the traditional Excel spreadsheet only allows "point estimate" (i.e. a single value) for each input variable, and accordingly, can only reflect one possible outcome or scenario. Even though some developers run sensitivity analysis on the most important variable (the land cost variable in Beijing Capital Land's case), it represents only very limited scenarios of situations. It is extremely difficult, if not impossible, for the traditional Excel spreadsheet to combine different values for different variables and consider all possible conditions. Yet in reality many different things can happen which could also result quite different outcomes. This kind of uncertainty or risk exists almost everywhere, and it is especially true for people trying to project what's going to happen in the future.

Real estate development is of no exception. Developers face a huge degree of uncertainties including changes in market conditions which impact sale price and time duration of selling the product and fluctuations in construction costs (largely impacted by the cost of raw materials), in addition to the uncertainty of the land cost which is derived from the unique bidding process in real estate development in China.

Simulation provides another way to view and interpret data to help solving these risk or uncertainty problems. The Monte Carlo simulation method replaces uncertain values that the developers are interested in studying with probability distribution functions. So when running the simulation in Excel, it will recalculate the spreadsheet hundreds or even thousands of times,

each time selecting random numbers from the PDF's that the user has defined. Accordingly, the simulation method will summarize all possible outcomes about the situation being studied, and will show how likely they are to occur. The simulation method greatly improves the traditional Excel spreadsheet by replacing one possible outcome (as we referred to as "point-estimate") with hundreds or thousands different possibilities. Therefore, using the simulation method will help the decision makers to see the "whole picture". Management will then have much better understanding of the situation and the relationship between different variables and the outcomes, and will be able to choose the best strategy based on the available information, to better manage risks, and to make more informed decisions.

6.2: More Discussions - Future Improvement and Suggestions

The focus of this thesis is to introduce the Monte Carlo simulation method to developers in China and to define its application in modeling input and output variables such as land cost, sale price, and project financial returns in order to help improve model efficiency. Due to the scope of this research thesis and the time limitation to conduct the analysis, the revised simulation method still has room for further improvements.

First of all, the model could have more simulation variables. The revised model has three variables using PDF for simulation – unit sale price, sale price growth rate, land cost, in an effort to introduce the simulation concept new to the developers in China and to show what simulation can achieve. In future studies, one can use PDF to define more input variables. On the Revenue side, for example, the timing of the project could be simulated to better reflect the uncertainty associated with the progress of developing the project. On the Cost side, the detailed cost line

items, especially the major portions of project cost such as construction cost, could all use some help from simulation. Simulation is of big advantages here in that it can generate different combinations of various situations that could potentially happen to each variable and cover all possible outcomes.

Second, PDF selection needs to be studied further once more historic information is available. The PDF's that the developers choose to use in the simulation method have huge impact on the final results. It is up to the users/developers to decide which PDF to use for certain variables and the selection could be somewhat arbitrary. Unfortunately at this stage when this thesis was written, most developers in China do not have enough historic date to support their PDF selection since the unique land policy was put in place only from 2004 and most developers began to perform formal financial analysis only in recent years. But as time goes on, developers will get more experienced in the market and will be able to compile more data to be used in simulation so that they can minimize the "arbitrary" factor when choosing PDF's. The @Risk simulation software that was used in this thesis has a unique function called "BestFit", which will find the distribution that best describes the available/historic data.

Third, the "forward" process (land price as input and project IRR as output) currently used by developers (including Beijing Capital Land) could have another alternative – the "backward" method. Having significant impact on project returns, land cost is probably the most difficult variable to forecast or to select an appropriate PDF, since it sometimes depends on factors such as number of bidders for the land, quality of those bidders and how determined they are to acquire the land. Therefore, it seems to me that a more intuitive or straight-forward alternative is

to adopt the “backward” method in determining the land value (i.e. the land value as final output of the spreadsheet).

To calculate the land value as an output, we will have to introduce the concept of opportunity cost of capital (OCC – to be used as the discount rate) to the developers in China. We then discount all the cash flows (excluding land cost) at OCC to derive the present value (PV) of the project, which equals the maximum price the developer can pay for the land. As this thesis focuses on the simulation method, the detailed explanation of the “backward” method and its relevant concepts were not covered in this paper but are certainly interesting for future studies.

Overall, this thesis focuses on introducing the simulation concepts to the developers in China and incorporating these concepts into financial modeling. It is my hope that this thesis will be the first step to help the developers realize the value and power of the simulation method when applied to project evaluation, and therefore make more informed decisions.

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Beijing Capital Land 2005 Annual Report

Internet Resources

Beijing Capital Land company website (www.bjcapitalland.com)

Hong Kong Stock Exchange (www.hkex.com.hk)

The Upper East Side Project, Beijing (www.upper-eastside.com)

The Reflections Project, Beijing (http://www.bjcapitalland.com/chinese/xmzs/yyt/index.asp)

The Beijing Plaza (a.k.a. Beijing World Center)
(http://www.bjcapitalland.com/chinese/xmzs/gjxq/index.asp)

The official website of China's Ministry of Land and Resources (www.mlr.gov.cn)

The Network for Beijing Real Estate Transactions (www.bjfdc.gov.cn), administered by Beijing Development Committee.

The Information Network for Housing and Real Estate (www.realestate.gov.cn), administered by the Ministry of Construction of China.

The official website of the Ministry of Construction, China (www.cin.gov.cn).

Other Resources

Sample project financial models provided by Beijing Capital Land

Exhibit 5-1.

Cash Flow Analysis - CHINESE VERSION

全部投资现金流量表

序号	项目	合计	2006年			2007年				2008年				2009年			
			2季度	3季度	4季度	1季度	2季度	3季度	4季度	1季度	2季度	3季度	4季度	1季度	2季度	3季度	4季度
一	现金流入	329759	0	0	0	0	4800	14688	18375	12858	8873	9139	21494	43738	52112	57746	85936
1	销售回款	329759	0	0	0	0	4800	14688	18375	12858	8873	9139	21494	43738	52112	57746	85936
二	现金流出	263555	114128	5547	15143	9309	19162	18021	19853	9868	1534	1078	2536	5161	6149	6814	29251
1	土地成本	113300	113300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	前期工程费	2728	273	682	682	546	546	0	0	0	0	0	0	0	0	0	0
3	建安工程费	77955	0	3898	11693	7796	15591	15591	15591	7796	0	0	0	0	0	0	0
4	基础设施费	4500	0	0	1800	0	1350	0	1350	0	0	0	0	0	0	0	0
5	园林环境设施费	470	0	0	0	0	141	141	188	0	0	0	0	0	0	0	0
6	开发间接费	546	68	68	68	68	68	68	68	68	0	0	0	0	0	0	0
7	不可预见费	2586	287	287	287	287	287	287	287	287	287	0	0	0	0	0	0
8	管理费用	1800	200	200	200	200	200	200	200	200	200	0	0	0	0	0	0
9	营销费用	11542	0	412	412	412	556	441	551	386	266	274	645	1312	1563	1732	2578
10	营业税金及附加	18137	0	0	0	0	264	808	1011	707	488	503	1182	2406	2866	3176	4726
11	所得税	29993	0	0	0	0	158	485	606	424	293	302	709	1443	1720	1906	21946
三	净现金流量	66204	-114128	-5547	-15143	-9309	-14362	-3333	-1478	2990	7339	8061	18958	38577	45963	50932	56685
四	累计现金流量		-114128	-119676	-134819	-144128	-158489	-161822	-163300	-160310	-152971	-144910	-125953	-87376	-41413	9519	66204
	IRR=	12.37%															

Cash Flow Analysis - ENGLISH VERSION

		Total															
Cash Inflow		**329759**	**0**	**0**	**0**	**0**	**4800**	**14688**	**18375**	**12858**	**8873**	**9139**	**21494**	**43738**	**52112**	**57746**	**85936**
1	Sale Proceeds	329759	0	0	0	0	4800	14688	18375	12858	8873	9139	21494	43738	52112	57746	85936
Cash Outflow		**263555**	**114128**	**5547**	**15143**	**9309**	**19162**	**18021**	**19853**	**9868**	**1534**	**1078**	**2536**	**5161**	**6149**	**6814**	**29251**
1	Land Cost	113300	113300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Pre-Construction	2728	273	682	682	546	546	0	0	0	0	0	0	0	0	0	0
3	Construction	77955	0	3898	11693	7796	15591	15591	15591	7796	0	0	0	0	0	0	0
4	Infrastructure	4500	0	0	1800	0	1350	0	1350	0	0	0	0	0	0	0	0
5	Landscape	470	0	0	0	0	141	141	188	0	0	0	0	0	0	0	0
6	Development Fee	546	68	68	68	68	68	68	68	68	0	0	0	0	0	0	0
7	Contingency	2586	287	287	287	287	287	287	287	287	287	0	0	0	0	0	0
8	Management Fee	1800	200	200	200	200	200	200	200	200	200	0	0	0	0	0	0
9	Marketing	11542	0	412	412	412	556	441	551	386	266	274	645	1312	1563	1732	2578
10	Sales Tax	18137	0	0	0	0	264	808	1011	707	488	503	1182	2406	2866	3176	4726
11	Income Tax	29993	0	0	0	0	158	485	606	424	293	302	709	1443	1720	1906	21946
Net Cashflow		66204	**-114128**	**-5547**	**-15143**	**-9309**	**-14362**	**-3333**	**-1478**	**2990**	**7339**	**8061**	**18958**	**38577**	**45963**	**50932**	**56685**
Cummulative Cashflow			-114128	-119676	-134819	-144128	-158489	-161822	-163300	-160310	-152971	-144910	-125953	-87376	-41413	9519	66204
	IRR	**12.37%**															

Exhibit 5-2.

Sales Plan - CHINESE VERSION

序号	项目	合计	2006年			2007年				2008年				2009年			
			2季度	3季度	4季度	1季度	2季度	3季度	4季度	1季度	2季度	3季度	4季度	1季度	2季度	3季度	4季度
1	公寓																
	销售面积	80000					6000	12000	10000	5000	5000	5000	7000	5000	10000	10000	5000
	单价	18563					16000	16480	16974	17484	18008	18548	19500	19890	20288	20694	21107
	签约金额	148501	0	0	0		9600	19776	16974	8742	9004	9274	13650	9945	20288	20694	10554
	回款金额	148501					4800	14688	18375	12858	8873	9139	11462	11798	15116	20491	20900
2	写字楼	0															
	销售面积	33000											6600	6600	6600	6600	6600
	单价	19775											19000	19380	19768	20163	20566
	签约金额	65259											12540	12791	13047	13308	13574
	回款金额	65259											10032	12741	12995	13255	16235
3	酒店	0															
	销售面积	10000															10000
	单价	20000															20000
	签约金额	20000															20000
	回款金额	20000															20000
4	商业	0															
	销售面积	32000												8000	8000	8000	8000
	单价	30000												30000	30000	30000	30000
	签约金额	96000												24000	24000	24000	24000
	回款金额	96000												19200	24000	24000	28800
销售面积合计		155000	0	0	0	0	6000	12000	10000	5000	5000	5000	13600	19600	24600	24600	29600
签约金额合计		329759	0	0	0	0	9600	19776	16974	8742	9004	9274	26190	46736	57334	58001	68127
销售回款合计		329759	0	0	0	0	4800	14688	18375	12858	8873	9139	21494	43738	52112	57746	85936

Sales Plan - ENGLISH VERSION

No.	Project	TOTAL	2006			2007				2008				2009			
			2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
1	Residential																
	Salable Area	80000					6000	12000	10000	5000	5000	5000	7000	5000	10000	10000	5000
	Unit Price	18563					16000	16480	16974	17484	18008	18548	19500	19890	20288	20694	21107
	Contract Proceeds	148501	0	0	0		9600	19776	16974	8742	9004	9274	13650	9945	20288	20694	10554
	Actual Proceeds	148501					4800	14688	18375	12858	8873	9139	11462	11798	15116	20491	20900
2	Office	0															
	Salable Area	33000											6600	6600	6600	6600	6600
	Unit Price	19775											19000	19380	19768	20163	20566
	Contract Proceeds	65259											12540	12791	13047	13308	13574
	Actual Proceeds	65259											10032	12741	12995	13255	16235
3	Hotel	0															
	Salable Area	10000															10000
	Unit Price	20000															20000
	Contract Proceeds	20000															20000
	Actual Proceeds	20000															20000
4	Commercial	0															
	Salable Area	32000												8000	8000	8000	8000
	Unit Price	30000												30000	30000	30000	30000
	Contract Proceeds	96000												24000	24000	24000	24000
	Actual Proceeds	96000												19200	24000	24000	28800
Total Salable Are		155000	0	0	0	0	6000	12000	10000	5000	5000	5000	13600	19600	24600	24600	29600
Total Contract Proceeds		329759	0	0	0	0	9600	19776	16974	8742	9004	9274	26190	46736	57334	58001	68127
Total Actual Proceeds		329759	0	0	0	0	4800	14688	18375	12858	8873	9139	21494	43738	52112	57746	85936

Exhibit 5-3.

Cost Plan - CHINESE VERSION

成本付现计划

序号	项目	合计	2006年			2007年				2008年				2009年			
			2季度	3季度	4季度	1季度	2季度	3季度	4季度	1季度	2季度	3季度	4季度	1季度	2季度	3季度	4季度
1	土地成本	113300	113300														
2	前期工程费	2728	273	682	682	546	546										
3	建安工程费	77955		3898	11693	7796	15591	15591	15591	7796							
4	基础设施费	4500			1800		1350		1350								
5	园林环境设施费	470					141	141	188								
6	开发间接费	546	68	68	68	68	68	68	68	68							
7	不可预见费	2586	287	287	287	287	287	287	287	287	287						
8	管理费用	1800	200	200	200	200	200	200	200	200	200						
9	营销费用	11542		412	412	412	556	441	551	386	266	274	645	1312	1563	1732	2578
10	财务费用	5310	0	75	315	465	690	780	780	780	645	525	255	0	0	0	0
	成本付现合计	**220736**	**114128**	**5622**	**15458**	**9774**	**19429**	**17508**	**19016**	**9517**	**1399**	**799**	**900**	**1312**	**1563**	**1732**	**2578**

土地成本按照一次付清方式计算

Cost Plan - ENGLISH VERSION

No.	Item	Total	2006			2007				2008				2009			
			2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
1	Land Cost	113300	113300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Pre-Construction	2728	273	682	682	546	546	0	0	0	0	0	0	0	0	0	0
3	Construction	77955	0	3898	11693	7796	15591	15591	15591	7796	0	0	0	0	0	0	0
4	Infrastructure	4500	0	0	1800	0	1350	0	1350	0	0	0	0	0	0	0	0
5	Landscape	470	0	0	0	0	141	141	188	0	0	0	0	0	0	0	0
6	Development Fee	546	68	68	68	68	68	68	68	68	0	0	0	0	0	0	0
7	Contingency	2586	287	287	287	287	287	287	287	287	287	0	0	0	0	0	0
8	Management Fee	1800	200	200	200	200	200	200	200	200	200	0	0	0	0	0	0
9	Marketing	11542	0	412	412	412	556	441	551	386	266	274	645	1312	1563	1732	2578
10	Financing	5310	0	75	315	465	690	780	780	780	645	525	255	0	0	0	0
	Total	**220736**	**114128**	**5622**	**15458**	**9774**	**19429**	**17508**	**19016**	**9517**	**1399**	**799**	**900**	**1312**	**1563**	**1732**	**2578**

Land cost assumed paid in full amount at the beginning.

Exhibit 5 - 4.

Cash Flow Analysis - Simulation Model (mostly Normal Distribution)

Sales Forecast (in RMB)

Input Cells
Simulated Input

Project/Land Acquisition Date
Year 2006
Quarter 2

Residential	Starting Unit Price (RMB psm)	Price Growth Rate (per year)	Total Salable Area (sm)	Starting Selling Date Year	Qtr
Resid - 1	16,000	12.0%	80,000	2007	2
Resid - 2	0	0.0%	0		
Resid - 3	0	0.0%	0		
Office	19,000	8.0%	33,000	2008	4
Hotel	20,000	0.0%	10,000	2009	4
Retail	30,000	0.0%	32,000	2009	1

Time		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Year		**2006**	**2006**	**2006**	**2007**	**2007**	**2007**	**2007**	**2008**	**2008**	**2008**	**2008**	**2009**	**2009**	**2009**	**2009**
Quarter		**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Residential																
Residential - 1	Sub-Total															
Sales Progress	100%		0.0%	0.0%	0.0%	7.5%	15.0%	12.5%	6.3%	6.3%	6.3%	8.8%	6.3%	12.5%	12.5%	6.3%
Sales Area	80,000	0	0	0	0	6,000	12,000	10,000	5,000	5,000	5,000	7,000	5,000	10,000	10,000	5,000
Unit Price			0	0	0	16,000	16,480	16,974	17,484	18,008	18,548	19,105	19,678	20,268	20,876	21,503
Contract Proceeds			0	0	0	96,000,000	197,760,000	169,744,000	87,418,160	90,040,705	92,741,926	133,733,857	98,389,909	202,683,213	208,763,709	107,513,310
Actual Proceeds	1,484,788,790		0	0	0	48,000,000	146,880,000	183,752,000	128,581,080	88,729,432	91,391,315	113,237,892	116,061,883	150,536,561	205,723,461	211,895,165
Residential - 2	Sub-Total															
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Sales Area	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit Price			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contract Proceeds			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actual Proceeds	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential - 3	Sub-Total															
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Sales Area	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit Price			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contract Proceeds			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actual Proceeds	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Office	Sub-Total															
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Sales Area	33,000	0	0	0	0	0	0	0	0	0	0	6,600	6,600	6,600	6,600	6,600
Unit Price			0	0	0	0	0	0	0	0	0	19,000	19,380	19,768	20,163	20,566
Contract Proceeds			0	0	0	0	0	0	0	0	0	125,400,000	127,908,000	130,466,160	133,075,483	135,736,993
Actual Proceeds	652,586,636		0	0	0	0	0	0	0	0	0	100,320,000	127,406,400	129,954,528	132,553,619	162,352,090
Hotel	Sub-Total															
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Sales Area	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,000
Unit Price			0	0	0	0	0	0	0	0	0	0	0	0	0	20,000
Contract Proceeds			0	0	0	0	0	0	0	0	0	0	0	0	0	200,000,000
Actual Proceeds	200,000,000		0	0	0	0	0	0	0	0	0	0	0	0	0	200,000,000
Retail	Sub-Total															
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	25.0%	25.0%	25.0%
Sales Area	32,000	0	0	0	0	0	0	0	0	0	0	0	8,000	8,000	8,000	8,000
Unit Price			0	0	0	0	0	0	0	0	0	0	30,000	30,000	30,000	30,000
Contract Proceeds			0	0	0	0	0	0	0	0	0	0	240,000,000	240,000,000	240,000,000	240,000,000
Actual Proceeds	960,000,000		0	0	0	0	0	0	0	0	0	0	192,000,000	240,000,000	240,000,000	288,000,000
Sale Proceeds (Residential Only)			**0**	**0**	**0**	**48,000,000**	**146,880,000**	**183,752,000**	**128,581,080**	**88,729,432**	**91,391,315**	**113,237,892**	**116,061,883**	**150,536,561**	**205,723,461**	**211,895,165**
TOTAL Sale Proceeds	**3,297,375,426**		**0**	**0**	**0**	**48,000,000**	**146,880,000**	**183,752,000**	**128,581,080**	**88,729,432**	**91,391,315**	**213,557,892**	**435,468,283**	**520,491,089**	**578,277,080**	**862,247,255**

Exhibit 5 - 4. (Continued)

Project Costs (in RMB)

Input Cells
Simulated Input

		Sub-Total Land															
Land Cost		1,133,092,810	100.0%	0.0%													
			1,133,092,810	0													
Pre-Construction	100%		10.0%	25.0%	25.0%	20.0%	20.0%										
	27,280,000		2,728,000	6,820,000	6,820,000	5,456,000	5,456,000	0	0	0	0	0	0	0	0	0	0
Construction	100%		0.0%	5.0%	15.0%	10.0%	20.0%	20.0%	20.0%	10.0%							
	779,550,000		0	38,977,500	116,932,500	77,955,000	155,910,000	155,910,000	155,910,000	77,955,000	0	0	0	0	0	0	0
Infrastructure	100%		0.0%	0.0%	40.0%	0.0%	30.0%	0.0%	30.0%								
	45,000,000		0	0	18,000,000	0	13,500,000	0	13,500,000	0	0	0	0	0	0	0	0
Landscaping	100%		0.0%	0.0%	0.0%	0.0%	30.0%	30.0%	40.0%								
	4,699,200		0	0	0	0	1,409,760	1,409,760	1,879,680	0	0	0	0	0	0	0	0
Indirect Dev. Cost	100%		12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%							
	5,456,000		682,000	682,000	682,000	682,000	682,000	682,000	682,000	682,000	0	0	0	0	0	0	0
Contingency	100%		11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%						
	25,859,556		2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	0	0	0	0	0	0
Management Fee	100%		11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%						
	18,000,000		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	0	0	0	0	0	0
Marketing																	
	111,286,421		0	4,121,719	4,121,719	4,121,719	1,440,000	4,406,400	5,512,560	3,857,432	2,661,883	2,741,739	6,406,737	13,064,048	15,614,733	17,348,312	25,867,418
Sales Tax 5.5%																	
	181,355,648		0	0	0	0	2,640,000	8,078,400	10,106,360	7,071,959	4,880,119	5,026,522	11,745,684	23,950,756	28,627,010	31,805,239	47,423,599
Income Tax 33.0%																	
	301,189,611		0	0	0	0	1,584,000	4,847,040	6,063,816	4,243,176	2,928,071	3,015,913	7,047,410	14,370,453	17,176,206	19,083,144	220,830,381
Project Costs per Period			**1,141,376,094**	**55,474,503**	**151,429,503**	**93,088,003**	**187,495,044**	**180,206,884**	**198,527,700**	**98,682,851**	**15,343,357**	**10,784,175**	**25,199,831**	**51,385,257**	**61,417,949**	**68,236,695**	**294,121,398**
TOTAL Project Costs	**2,632,769,246**																

Project Cash Flows (in RMB)

Cash Inflow	0	0	0	0	48,000,000	146,880,000	183,752,000	128,581,080	88,729,432	91,391,315	213,557,892	435,468,283	520,491,089	578,277,080	862,247,255
Cash Outflow	(1,141,376,094)	(55,474,503)	(151,429,503)	(93,088,003)	(187,495,044)	(180,206,884)	(198,527,700)	(98,682,851)	(15,343,357)	(10,784,175)	(25,199,831)	(51,385,257)	(61,417,949)	(68,236,695)	(294,121,398)
Project Net Cash Flow	(1,141,376,094)	(55,474,503)	(151,429,503)	(93,088,003)	(139,495,044)	(33,326,884)	(14,775,700)	29,898,229	73,386,075	80,607,140	188,358,060	384,083,026	459,073,141	510,040,384	568,125,856

Project IRR 12.42%

Exhibit 5-5.

Cash Flow Analysis - Simulation Model (Various PDF's)

Sales Forecast (in RMB)

Input Cells
Simulated Input

Project/Land Acquisition Date
Year 2006
Quarter 2

Residential	Starting Unit Price (RMB psm)	Price Growth Rate (per year)	Total Salable Area (sm)	Starting Selling Date Year	Qtr
Resid - 1	15,500	11.5%	80,000	2007	2
Resid - 2	0	0.0%	0		
Resid - 3	0	0.0%	0		
Office	18,500	7.5%	33,000	2008	4
Hotel	19,500	0.0%	10,000	2009	4
Retail	29,500	0.0%	32,000	2009	1

Time		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Year		**2006**	**2006**	**2006**	**2007**	**2007**	**2007**	**2007**	**2008**	**2008**	**2008**	**2008**	**2009**	**2009**	**2009**	**2009**	
Quarter		**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
Residential																	
Residential - 1	Sub-Total																
Sales Progress	100%		0.0%	0.0%	0.0%	7.5%	15.0%	12.5%	6.3%	6.3%	6.3%	8.8%	6.3%	12.5%	12.5%	6.3%	
Sales Area	80,000	0	0	0	0	6,000	12,000	10,000	5,000	5,000	5,000	7,000	5,000	10,000	10,000	5,000	
Unit Price			0	0	0	15,500	15,946	16,404	16,876	17,361	17,860	18,373	18,902	19,445	20,004	20,579	
Contract Proceeds			0	0	0	93,000,000	191,347,500	164,040,617	84,378,392	86,804,271	89,299,894	128,614,172	94,508,450	194,451,136	200,041,606	102,896,401	
Actual Proceeds	1,429,382,440		0	0	0	46,500,000	142,173,750	177,694,059	124,209,505	85,591,332	88,052,083	108,957,033	111,561,311	144,479,793	197,246,371	202,917,204	
Residential - 2	Sub-Total																
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
Sales Area	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Unit Price			0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Contract Proceeds			0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Actual Proceeds	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Residential - 3	Sub-Total																
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
Sales Area	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Unit Price			0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Contract Proceeds			0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Actual Proceeds	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Office	Sub-Total																
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	20.0%	20.0%	20.0%	
Sales Area	33,000	0	0	0	0	0	0	0	0	0	0	6,600	6,600	6,600	6,600	6,600	
Unit Price			0	0	0	0	0	0	0	0	0	18,500	18,847	19,200	19,560	19,927	
Contract Proceeds			0	0	0	0	0	0	0	0	0	122,100,000	124,389,375	126,721,676	129,097,707	131,518,289	
Actual Proceeds	633,827,047		0	0	0	0	0	0	0	0	0	97,680,000	123,931,500	126,255,216	128,622,501	157,337,831	
Hotel	Sub-Total																
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
Sales Area	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,000	
Unit Price			0	0	0	0	0	0	0	0	0	0	0	0	0	19,500	
Contract Proceeds			0	0	0	0	0	0	0	0	0	0	0	0	0	195,000,000	
Actual Proceeds	195,000,000		0	0	0	0	0	0	0	0	0	0	0	0	0	195,000,000	
Retail	Sub-Total																
Sales Progress	100%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	25.0%	25.0%	25.0%	
Sales Area	32,000	0	0	0	0	0	0	0	0	0	0	0	8,000	8,000	8,000	8,000	
Unit Price			0	0	0	0	0	0	0	0	0	0	29,500	29,500	29,500	29,500	
Contract Proceeds			0	0	0	0	0	0	0	0	0	0	236,000,000	236,000,000	236,000,000	236,000,000	
Actual Proceeds	944,000,000		0	0	0	0	0	0	0	0	0	0	188,800,000	236,000,000	236,000,000	283,200,000	
Sale Proceeds (Residential Only)			**0**	**0**	**0**	**46,500,000**	**142,173,750**	**177,694,059**	**124,209,505**	**85,591,332**	**88,052,083**	**108,957,033**	**111,561,311**	**144,479,793**	**197,246,371**	**202,917,204**	
TOTAL Sale Proceeds	**3,202,209,487**		**0**	**0**	**0**	**46,500,000**	**142,173,750**	**177,694,059**	**124,209,505**	**85,591,332**	**88,052,083**	**206,637,033**	**424,292,811**	**506,735,008**	**561,868,872**	**838,455,035**	

Exhibit 5-5 (Continued).

Proiect Costs (in RMB)

Input Cells
Simulated Input

Land Cost	Sub-Total Land	100.0%	0.0%													
	1,300,000,000	1,300,000,000	0													
Pre-Construction	100%	10.0%	25.0%	25.0%	20.0%	20.0%										
	27,280,000	2,728,000	6,820,000	6,820,000	5,456,000	5,456,000	0	0	0	0	0	0	0	0	0	0
Construction	100%	0.0%	5.0%	15.0%	10.0%	20.0%	20.0%	20.0%	10.0%							
	779,550,000	0	38,977,500	116,932,500	77,955,000	155,910,000	155,910,000	155,910,000	77,955,000	0	0	0	0	0	0	0
Infrastructure	100%	0.0%	0.0%	40.0%	0.0%	30.0%	0.0%	30.0%								
	45,000,000	0	0	18,000,000	0	13,500,000	0	13,500,000	0	0	0	0	0	0	0	0
Landscaping	100%	0.0%	0.0%	0.0%	0.0%	30.0%	30.0%	40.0%								
	4,699,200	0	0	0	0	1,409,760	1,409,760	1,879,680	0	0	0	0	0	0	0	0
Indirect Dev. Cost	100%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%							
	5,456,000	682,000	682,000	682,000	682,000	682,000	682,000	682,000	682,000	0	0	0	0	0	0	0
Contingency	100%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%						
	25,859,556	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	2,873,284	0	0	0	0	0	0
Management Fee	100%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%						
	18,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	0	0	0	0	0	0
Marketing																
	108,074,570	0	4,002,762	4,002,762	4,002,762	1,395,000	4,265,213	5,330,822	3,726,285	2,567,740	2,641,562	6,199,111	12,728,784	15,202,050	16,856,066	25,153,651
Sales Tax 5.5%																
	176,121,522	0	0	0	0	2,557,500	7,819,556	9,773,173	6,831,523	4,707,523	4,842,865	11,365,037	23,336,105	27,870,425	30,902,788	46,115,027
Income Tax 33.0%																
	217,492,651	0	0	0	0	1,534,500	4,691,734	5,863,904	4,098,914	2,824,514	2,905,719	6,819,022	14,001,663	16,722,255	18,541,673	139,488,754
Project Costs per Period		**1,308,283,284**	**55,355,546**	**151,310,546**	**92,969,046**	**187,318,044**	**179,651,547**	**197,812,863**	**98,167,006**	**14,973,061**	**10,390,146**	**24,383,170**	**50,066,552**	**59,794,731**	**66,300,527**	**210,757,432**
TOTAL Project Costs	**2,707,533,499**															

Proiect Cash Flows (in RMB)

Cash Inflow	0	0	0	0	46,500,000	142,173,750	177,694,059	124,209,505	85,591,332	88,052,083	206,637,033	424,292,811	506,735,008	561,868,872	838,455,035
Cash Outflow	(1,308,283,284)	(55,355,546)	(151,310,546)	(92,969,046)	(187,318,044)	(179,651,547)	(197,812,863)	(98,167,006)	(14,973,061)	(10,390,146)	(24,383,170)	(50,066,552)	(59,794,731)	(66,300,527)	(210,757,432)
Project Net Cash Flow	(1,308,283,284)	(55,355,546)	(151,310,546)	(92,969,046)	(140,818,044)	(37,477,797)	(20,118,804)	26,042,499	70,618,271	77,661,937	182,253,863	374,226,259	446,940,277	495,568,345	627,697,603

Project IRR 8.65%