THE MORTGAGE-BACKED SECURITIES
IN HONG KONG

by

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MBA PROJECT REPORT
Presented to
The Graduate School

In Partial Fulfillment
of the Requirements for the Degree of
MASTER OF BUSINESS ADMINISTRATION

THREE-YEAR MBA PROGRAMME
THE CHINESE UNIVERSITY OF HONG KONG

May 1995
APPROVAL

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Degree: Master of Business Administration

Title of Project: The Mortgage-backed Securities in Hong Kong

Date Approved: May 3, 1995

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ABSTRACT

While people's dream may be to own a home, the major portion of the funds to purchase one must be borrowed. The market where these funds are borrowed is called the mortgage market. This sector of the debt market is by far the largest in the world with an estimated figure of US$3.5 trillion at the beginning of 1990.

The Mortgage-backed Securities market, born in the U.S. in 1970, has grown in size and complexity faster than other fixed-income instruments in the recent decades. By June 1993, total outstanding of MBS were almost US$1.5 trillion. In 1990s, the MBS extended to other major financial markets including United Kingdom, Japan and Hong Kong.

Over the past twenty years, there is a property market boom in Hong Kong. The price of both residential properties and office properties have grown more than ten times of their original value. Most Hong Kong banks have around 40 percent of their portfolios in mortgages, the stability of the banking system is highly correlated with the property market. To reduce and diversify the risk from the mortgage loans, the Mortgage-backed Securities was introduced in Hong Kong in 1994.

Four bond sales backed by residential mortgage loans totaling HK$3 billion were offered in 1994. They accounts for only 0.1 percent of the whole capital market. The slow-growing introductory phase of MBS may be caused by the following factors: uncertain political environment after 1997, Hong Kong residential property price inflation, limited liquidity, few securities with credit rating, and the risk of MBS itself.
To enhance the development and popularity of MBS in Hong Kong, a number of factors including credit enhancement of securitized products, market infrastructure, and the liquidity of bond markets have to be improved.
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CHAPTER I

INTRODUCTION

As the dream of most Hong Kong people is to own a home, the property market is booming particularly in the last decade. According to the Hong Kong Government’s price indices by class of private domestic residences, the residential price has a triple rise from 1988 to 1993. To cool the territory’s overheated residential property market, the Hong Kong Monetary Authority imposed the 70 per cent ceiling on mortgage loans in November 1991 forcing home buyers to produce 30 per cent of the purchase price for their down payment. However, the house price inflation has not stopped until mid-1994.

In Hong Kong, mortgage is the dominant vehicle for house financing. All real estates virtually have been mortgaged. Mortgage is a pledge of property which refers to some specified real estate, to secure payment of a debt. The debt is the loan given to the buyer of the house by a lender. If the property owner fails to pay the lender, the lender has the right to foreclose the loan and seize the property to ensure that it is paid off. In connection to the property market boom, mortgage market also undergoes a rapid growth. The outstanding mortgage loan grows from $190 billion in December 1992 to $266 billion in December 1994.[HKMA,1995]1 The property market becomes one of the major forces driving up

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the Hong Kong financial market and mortgage loan is the largest debt market in Hong Kong; far exceeding the securities and corporate bond markets.

However, the unforecasted sharp rise in property market intensifies the risks and difficulties encountered by the mortgage originators. In mortgage loan market, the investors are exposed to four main risks: (i) interest-rate risk; (ii) prepayment risk; (iii) credit risk; and (iv) liquidity risk. Since a mortgage is a debt instrument, its price moves in an opposite direction from the market interest rate. Mortgage originators face the risk of loss in the event that general market interest rates change. In addition, borrower has the right to pay off all or part of the mortgage balance at any time. The uncertainty associated with the cash flow as a result of this embedded option is the prepayment risk. On the other hand, the borrower may default to repay the loan. This risk of loss is credit risk. The last but not the least, most mortgage loans are large, indivisible, long term and thus highly illiquid. Mortgage originators would suffer loss when the investment must be sold quickly.

Apart from the above risks, mortgage originators suffer from two serious shortcomings in the presence of high and variable inflation: mismatch problem and tilt problem. Mortgage is a long-term asset financed by depository institutions which obtain funds from short-term deposits. The depository institutions, in fact, are engaged in a highly speculative and risky activity: borrowing short but lending very long. Before October 1994 when all interest rates were regulated, depository institutions were hard to compete deposits for mortgage financing. Most people prefer to deposit funds in large reputable banks and deposit-taking companies. When the
interest rate ceiling for time deposit abolishes, keen competition among depository institutions emerges. To increase the availability of funds for long-term mortgage loan, depository institutions push up the interest rates to attract more funds at whatever duration. A mismatch between the periods of lending and borrowing loans thus occurs. Under the era of high inflation in which the interest rates are high, the rates difference between the lending and borrowing becomes smaller and the mismatch problem is more significant. This heightens the risks of mortgage originators’ risks and lowers their profit.

Furthermore, the small difference between lending and borrowing rates during high inflation will cause the lending institutions to become technically insolvent. It is because the institution’s liabilities are related to the face value of its mortgage assets, but the market value of these assets (which is the present value of the cash flow due by the debtor, discounted at the current high rate) will be below the face value by a factor that is not too far from the ratio of the contractual rate to the current market rate. The mismatch problem lowers the attractiveness of traditional mortgages to investors.

In the presence of inflation-driven high interest rates, mortgage repayments are actually in a "tilt" nature i.e. a high initial but low end. As most young people have little asset accumulation, they are unable to pay a multiple of what they need to pay in the preinflation period. The high initial payment has the effect of foreclosing home ownership to large segments of the population or forcing buyers to scale down their demands. The tilt problem would thus shut off many potential borrowers.
To resolve the above two problems, different types of mortgages are designed. For example, adjustable-rate mortgage (a loan whose contract rate is reset periodically in accordance with some appropriately chosen benchmark index) is developed to address the mismatch problem. Graduated-payment mortgage (with a fixed interest rate and term of the mortgage, the monthly mortgage payments is smaller in the initial years but then becomes larger in the remaining years) is specially designed to deal with the tilt problem. In Hong Kong, about 96 per cent of mortgage loans are arranged on a floating rate basis whilst the rest is on a fixed rate basis [HKMA, 1995]. Nonetheless, no mortgage loans could remedy both shortcomings effectively.

To counter or at least limit the problems, we need to broaden the base of mortgage market to attract other investors besides deposit-taking institutions to provide a large and steady supply of funds to the market. In early 1990s, the focus of innovations is shifted from the design of different modes of mortgage loans to a new financial instrument which involved the pooling of mortgages and the issuance of securities collateralized by these mortgages. Such a lending system is called asset securitization. If the assets collateralizing the securities are mortgage loans, the securities are known as mortgage-backed securities. Mortgage-backed security is first introduced into Hong Kong in 1994. Up till now, four mortgage-back securities totaling HK$3 billion are sold. This financial innovation has various benefits for issuers, borrowers, and investors as well as having far-ranging implications for the whole financial system.

The objectives of the project are: (i) to understand this new-developed financial instrument; (ii) to study the development of mortgage-backed securities in Hong Kong; and (iii) to forecast the future market. The project will be divided into five main parts. The first part, from Chapter 2 to 3, describes the characteristics and advantages of issuing Mortgage-back securities. The second part, Chapter 4, studies methods for valuing the Mortgage-back securities. The third part, Chapter 5 and 6, covers the development of Mortgage-back securities in U.S. and Hong Kong. In the fourth session, Chapter 7, discusses the current development of the security market and the last chapter will give recommendations and forecast the prospect of the Hong Kong Mortgage-backed securities market.
CHAPTER II

INTRODUCTION OF MORTGAGE-BACKED SECURITIES

Mortgage-backed security is a new innovation which becomes popular in the recent decade. Besides the basic mortgage pass-through security, it gives rise to a large number of derivatives to meet the needs of a broader investor group. This chapter will provide an overview of the Mortgage-backed securities: the characteristics and the various types of Mortgage-backed securities products.

What is Securitization

Securitization is the process of restructuring financial assets into securities that can be sold in liquid bond markets i.e. disintermediation. It is a transfer of funds by investors from the low-paying depository institutions toward direct investment in final lending and other intermediaries, in response to higher market rates. Among a number of suitable financial assets which can be collateralized to create securities such as residential loans, automobile loans, credit card receivable and leases receivable etc., residential mortgage loans is found to be the best asset to be securitized. The securitization business began in United States in 1968. In 1990s, it grows rapidly and extends to other major financial markets including United Kingdom, Japan and now Hong Kong.

Upon the introduction of asset securitization, the lending system is radically different from the traditional financial system. More than one institutions such as
property developer may be involved in lending capital. The lending scenario may look as follows: (i) a commercial bank or property developer can originate a mortgage loan; (ii) the commercial bank or property developer can sell its mortgages to an investment banking firm or by itself to create a security backed by the pool of mortgages; (iii) the investment banker can obtain credit risk insurance for the pool of mortgages from a private insurance company; (iv) the investment banker can sell the right to service the loans to another company specializing in serving mortgages; and (iv) the investment banking firm can sell the securities to individuals and institutional investors. The change in financing the mortgage loans is shown in the following diagram:
# DIAGRAM 1

## METHODS OF MORTGAGE FINANCING AFTER INTRODUCTION OF ASSET SECURITIZATION

<table>
<thead>
<tr>
<th>Traditional Mortgages</th>
<th>Marketable Mortgages</th>
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<tbody>
<tr>
<td><strong>Borrowers</strong></td>
<td><strong>Borrowers</strong></td>
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<td><strong>Mortgage Guarantees</strong></td>
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<td>Claims sold to investors</td>
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<td>i.e. Pass through securities, CMOs's</td>
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## Types of Mortgage-backed Securities

The basic mortgage-backed security is the mortgage pass-through security. From this primitive security, derivative mortgage-backed securities are created: collateralized mortgage obligations and stripped mortgage-backed securities.
Pass-through securities are created when one or more holders of mortgages pool their mortgages together and sell undivided shares or participation certificates in the pool. The originator continues to service the mortgages including collection of payments and "passing through" the principal and interest to the security holders after the deduction of the servicing, guarantee and other fees. The security holders receive pro rata shares of the resultant cash flows.

According to the amortization schedules established for each individual mortgage, a portion of the outstanding principal is received each month. Complete return of the principal and the final maturity of the pass-through occurs when the last payment in the pool is completed. However, the principal on individual mortgages in the pool can be prepaid in whole or in part at any time before the maturity of the security without penalty. Thus, there is a considerable uncertainty about what its actual maturity will be. Holding a diversified portfolio of mortgages in the form of a mortgage pass-through security can reduce most unsystematic risk (the risk of an adverse change in the prepayment speed that is not attributable to a change in mortgage interest rates). However, the systematic prepayment risk which is related to the change in mortgage interest rate, is still unavoidable.

Collateralized Mortgage Obligations

Collateralized mortgage obligation (CMO) is a dynamic innovation in the mortgage securities market. CMO generally retains most of the yield and credit quality advantages of pass-through security, while eliminating the uncertainty of the actual
maturity of a mortgage-backed security to meet the needs of a broader investor groups.

CMO is a security backed by a pool of pass-through securities or whole loan mortgages. It is so structured that there are several groups of bondholders with different stated maturities. Each class of bond is known as a tranche. The key difference between traditional pass-through and CMO is the principal payment process. Unlike the pass-through security in which holders receive some return of principal each month and the complete return of principal occurs only when the final mortgage in the pool is paid in full, the principal payments in CMO are made in a sequential basis with all principal going to the shortest maturity tranche first until it is retired. After the shortest maturity bonds are retired, all principal payments received will apply to the next tranche in the schedule. This pattern will be repeated until the final CMO tranche.

CMO is important because it could use cash flows of long maturity monthly pay collateral to create securities with intermediate- and long-maturities having an expected average lives. The availability of shorter average life CMO tranches fulfill the needs of investors requiring lower duration and faster return of principal. It widens the range of investment and fulfills the needs of the universe investors. Since CMO redirects cash flow from a pass-through to different bond classes, it redistributes the prepayment risk so as to offer a greater degree of protection against call and reinvestment risk to the longer CMO classes.
When the sequential-pay CMO becomes mature, numerous innovations in structuring CMO have further been derived. The derivative products include accrual bonds, floating-rate and inverse floating-rate bonds, planned amortization class (PAC) bonds, companions with schedules, targeted amortization class (TAC) bonds and CMO residuals etc. These innovations enable the securities to have: (i) a greater stability of cash flows over a wide range of prepayment speeds; (ii) a better matching of floating-rate liabilities; (iii) a substantial upside potential in a declining interest rate environment, but less downside risk in a rising interest rate environment; or (iv) a greater usefulness for hedging mortgage-related products. Owing to the better credit quality, these CMOs usually get triple-A rating by the major commercial rating agencies.

Stripped Mortgage-backed Securities

Stripped mortgage-backed security (SMBS) is a security which divides principal and interest generated from the underlying pool of mortgage from on a pro rata basis to on an unequal basis. It results that some of the securities created will have a price/yield relationship different from that of the underlying mortgage pool. There are three types of SMBS: (i) synthetic-coupon pass-throughs; (ii) interest-only / principal-only securities; and (iii) CMO strips.

**Synthetic-Coupon Pass-through** is the first generation of stripped mortgage-backed security. The unequal distribution of coupon and principal is in a synthetic coupon rate different from that of the underlying collateral.
**Interest-Only / Principal-Only Strip** is the security where all interest is allocated to one class (the interest-only class) while all the principal to the other class (the principal-only class). The interest-only class receives no principal whilst the principal-only class gets no interest. The principal-only security is purchased at a substantial discount from par value. But the interest-only security is purchased when there is no par value. The yields of the two securities are asymmetric to each other depending on the speed at which prepayments are made. For the principal-only security, the faster the prepayment, the higher the yield the investor will realize. In contrast, an interest-only investor hopes the prepayment to be slow. It is because as prepayments are made, the outstanding principal will decline and less dollar interest will be received. If the prepayments are too fast, the interest-only investor may not receive the amount paid to the security.

**CMO Strips** are tranches within a CMO issue which receive only principal or interest cash flows or have synthetically high coupon rates. A CMO strip may be a PAC or TAC. When a CMO strip is a principal-only class that is neither a PAC nor a TAC, it is called a Super-PO. This relates to its quick paid-off rate if the prepayments increase as interest rates decline.

**SMBS** is highly sensitive to change in prevailing interest and prepayment rates and it can display asymmetric returns. This enables investors to take strong market positions on expected movements in prepayment and interest rates. Principal-only SMBS is a bullish instrument which outperforms in declining interest rate environment whilst interest-only SMBS is a bearish investment that can be used to
hedge against rising interest rate. Apart from acting as a hedge against interest rate and prepayment exposure of other mortgage securities, SMBS can combine with other fixed-income securities to enhance the total return of the portfolio in varying interest rate scenarios and to tailor-make the investment portfolio to meet the duration of liabilities and minimize interest rate risk. Thus, SMBS is a favorable mortgage-backed security in the market.
CHAPTER III

BENEFITS OF SECURITIZATION

Securitization of mortgage loans brings benefits to all parties as well as the financial market. The following is a summary of the major advantages to issuers, investors and borrowers, and its far-reaching implications to the financial market.

Benefits to Issuers

Among the many advantages of securitization to issuers, the most common and important ones are: (i) diversification of funding sources and increased liquidity; (ii) cost effective source of funds; (iii) efficient use of capital; (iv) rapid portfolio growth; (v) better asset/liability management; and (vi) earnings enhancement.

Diversification of Funding Sources and Increased Liquidity

Access to the securitization market offers issuers who ordinarily could not make mortgage loans, an additional source of funding and liquidity. Generally, buyers in the securitization market are not drawn from the existing universe of investors in debt market. It will not reduce but enlarge the market for lender’s traditional debt. It provides more source of capital for both financial and non-financial entities. It increases both the real and perceived liquidity of the issuer’s balance sheet and hence improves the investors’ perception of the corporate strengthen and liquidity of an issuer.
Cost Effective Source of Funds

High quality of assets allows a securitized offering to be achieved at a lower cost than by traditional financing. The cost of funding through securitization depends on its credit rating. The lower the credit rating, the higher the cost of funding. Using mortgage loans as collateral to structure a desirable security, the mortgage-related institution can obtain a higher credit rating and thus a lower cost of funds.

Efficient Use of Capital

As financial institutions have to comply with the capital guideline requirement to hold a certain percentage of capital for each asset category, the sale of assets can free up capital. The retain percentage is supposed to reflect the credit risk associated with the asset. However, for the sake of safety, the capital requirements are often higher than the actual risks. Hong Kong banks can have a maximum of 40 per cent of their loan portfolios in mortgages. The amount of money they must set aside is large. Securitization allows lenders to sell off big chunks of assets, lowering the reserve requirements. In addition, it shifts the credit risk from the originator of the loan to another party reducing the lender's risk. This results a reduction of excess capital requirements.

Rapid Portfolio Growth

As the business of a financial or non-financial entity grows, its growth potential will be limited by capital constraints. Selling assets through securitization provides a quick means for raising capital while keeping the asset. The removal of
assets from the balance sheet by this method can avoid capital requirements, but improve financial ratios and gives room for additional assets. The risk-based capital guidelines for banks encourage the practice of securitization of assets.

**Better Asset/Liability Management**

Since mortgage and consumer installment loans expose financial institutions to prepayment risk, it is hard to establish a liability structure consistent with the structure of the uncertain cash flow of these assets. Securitization passes the prepayment risk to the investor. It can achieve an exact correspondence between the characteristics of an asset and the funding for that asset. This match can thus be maintained without any active management.

**Earning Enhancement**

Earnings to Business can be enhanced by the fee income through increased origination and servicing fees. Increased fee income with no corresponding increase in assets or equity improves return on assets and return on equity.

**Benefits to Investors**

Securitization converts illiquid loans into securities with greater liquidity and less credit risk which is favorable to investors. The two layers of protection provided are: (i) a diversified pool of loans; and (ii) the credit enhancement or insurance agency which put limits on the amount of the liabilities. Furthermore, securitization improves returns to investors through reduction of the cost of intermediation.
Benefits to Borrowers

Since a financial or non-financial entity can securitize a loan it originates, the illiquid asset held by the lender can be repackaged to turn into a liquid and safe financial instrument. As it can be sold in security market whenever capital is needed, the competition among originators is lesser. Hence the lender could produce loans with a lower lending rate spread than the one in other loan markets for the borrowers.

Implication of Securitization for Financial Market

Securitization has major implications for financial markets as well as the operation of financial institutions such as banks and thrifts. It may eventually replace the conventional indirect financing system.

At present, financial intermediaries, particularly banks and thrifts, play three important roles in the financial market. Firstly, they act as conduits in bringing savers and borrowers together. Banks and thrifts are in a better position to assess credit risk and to diversify the risks over many borrowers. Secondly, they provide maturity intermediation to acquire short-term funds from investors and to grant long-term loans for borrowers. Last but not least, they carry out denomination intermediation to transform many small investments to large-denomination loans for borrowers. Under the current mortgage financing system, banks and thrifts are the major originators and bearers of mortgage loan risks. They will in turn pass these risks to borrowers in form of high interest. Banks and thrifts make considerable profits from residential mortgages.
Securitization short-circuits the traditional intermediaries to provide a direct financing between borrowers and investors. Funds can flow efficiently from investors to borrowers. Pooling of assets reduces credit risk to a more acceptable level for investors. Recasting cash flows such as in CMOs generates securities with different maturities for wide range of investors. Furthermore, the availability of securities with smaller denominations than the underlying loans accomplishes denomination intermediation. As securitization can perform duties of traditional financial institute, the importance of banks and thrifts face a great challenge.

On the other hand, under the new mortgage financing system, most banks and thrifts would take up the role of organizers for coordinating mortgage pool, rather than originators only. They can hold fewer mortgages in their portfolios. Thus, they bear less risks but foregoes their expected returns.
CHAPTER IV

MODELING AND VALUATION OF MORTGAGE-BACKED SECURITIES

Institutional or individual investors who own or contemplate owning Mortgage-backed securities need a method for valuing them. The central issue in all MBS valuation methods is the treatment of prepayment under uncertainty since the mortgage owners' right to prepay their loans introduces a significant degree of uncertainty to the cash flows, and consequently the value, of MBSs.

The relationship between interest rates and prepayment rates directly influences MBS pricing. Moreover, the dependence of prepayment rates on interest rates also affects their interest rate risk. Modified duration, traditional measure of the price sensitivity of fixed income securities, gives the percent change in price caused by the basis point shift in the yield curve as those securities have constant cash flows. However, it is inadequate for MBSs, as prepayment rates, and consequently cash flows, vary as interest rates change.

The inadequacy of traditional fixed income analytical tools for valuing MBSs has led to the development of alternative methods. Multiple approaches for valuing MBSs exist because no single methodology has been shown to explain completely the price performance of these securities. Each method has its strengths and weaknesses.
In this chapter, we are going to review three popular approaches to quantifying MBS return and risk characteristics.

**Static Cash Flow Yield (SCFY) Analysis**

This methodology is the simplest to use, but it offers little insight into the relative value of an MBS. [Fabozzi, 1993] It ignores a number of factors critical to the valuation of MBSs by assuming constant future interest rates.

The SCFY is the discount rate that equates the value of future MBS cash flows with their market price. The future cash flows are projected based on the prepayment rate that is anticipated if interest rates remain stable for the life of the security. The only required assumption of this method is a prepayment projection. After a prepayment has been specified, cash flows can be generated and a yield can be calculated based on the security’s market price. Typically, prepayment projections are made based on the results of a statistical analysis of historical prepayment data, and are generally quoted as conditional prepayment rate (CPR) or percentages of the Public Securities Association (PSA) prepayment model. As it implies a confidence level, which in turn implies a range of possible values for MBS.

From SCFY analysis, you can obtain the following two measures:

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Weighted Average Life (WAL) of a MBS is the average time to receipt of the principle of the security. It is used as a measure of the effective maturity of MBS in the place of stated maturity as most principle is amortized or prepaid well before the stated matured date.

Net present value (NPV) in static cash flow yield is computed by adding the series of projected monthly cash flows to the Weighted Average Maturities (WAMs) and discounting them back to present value, as follows:

$$NPV = \frac{c_{f1}}{(1+r)^d} + \frac{c_{f2}}{(1+r)^{d+1}} + \cdots$$

where

- $c_f =$ cash flow for $i$th period (usually one month)
- $m =$ to maturity
- $r =$ investor-required discount rate (IRR)
- $d =$ interest-free delay expressed as a fraction

Advantages and Limitations

The major attractions of the SCFY methodology are its simplicity and its acceptance by the market as the standard measure of MBS value. The only assumption required is a prepayment projection which may be selected that best reflects the nature of the collateral and the Weighted Average Coupon (WAC) of the underlying mortgages.

The chief limitation of SCFY is its static nature. It assumes constant future interest rates. It does not adjust the prepayment assumption to allow for prepayment volatility. Moreover, it ignores a number of factors critical to the valuation of MBSs,
including the shape of yield curve, the distribution and volatility of future interest rates, and the relationship between interest rates and MBS prepayment rates.

A historical analysis of SCFY spreads is a useful adjunct to the other valuation methodologies discussed later. In particular, SCFY approach is most useful for the high premium and deep discount MBSs having cash flows with little sensitivity to interest rates.

**Total Rate of return Scenario Analysis (SA)**

SA improves on the SCFY methodology by projecting MBS performance in a limited set of interest rate scenarios. The manner in which the future interest rate paths are selected and the specification of the relationship between interest rates and MBS prepayment rates are critical to the SA.

The most rigorous simulation of MBS performance is measuring the total rate of return against a predefined holding period return (HRR), a process referred to as scenario analysis or horizon analysis. Required assumptions for this methodology includes holding period, prepayment rate function, interest rate distribution and volatility, central scenario, horizon pricing model, number of scenarios simulated and reinvestment rate. [Fabozzi, 1992]

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The components of total rate of return consist of coupon income, the scheduled principal plus prepayments and other unscheduled principles (defaults), reinvestment incomes on all P&I cash flows, and market gains or losses recognized upon termination of a predefined holding period (horizon). Total rate of return is expressed as

\[
TR = \frac{(PV_e - PV_b) + PI + R}{PV_b}
\]

where
- \(TR\) = total return
- \(PV_b\) = the price of the investment at the beginning of the holding period
- \(PV_e\) = the price at the end of the period
- \(PI\) = the total PI payments received over the period
- \(R\) = the total reinvestment income received over the holding period

SA is a simple but useful alternative horizon pricing model values the MBSs based on SCFY spreads and projected horizon prepayment rates. The scenario horizon prepayment rate determines MBS WAL at the horizon. A MBS is then priced at a spread to its WAL-matched Treasury issue. Scenario spreads are determined by the SCFY spreads at which the same relative coupon MBS are currently trading.

Advantages and Limitations

The SA approach extends the SCFY methodology by examining the dynamic nature of MBSs. It can be used in conjunction with other MBS pricing models to access their implications for the dynamic performance of MBSs in a holding period return context. SA has the advantage of delineating the available sets of MBS risk/return profiles for specific holding periods. However, SA only works well with
simple and limited number of scenarios. That may not adequately model the effect on value of the complete distribution of future interest rate paths.

Option Adjusted Spreads (OAS)

What is option-adjusted spread? The OAS measures relative value. It calculates expected yield spread of the MBS over the entire Treasury curve adjusted for the value of the prepayment call options embedded in the MBS. The value of the option is a function of the homeowners' economic incentive to refinance. [Bartlett, 1994]

OAS models extend SA by simulating MBS performance over numerous interest rate paths. The OAS simulation approach generates numerous interest rate paths that then determine future MBS cash flows. These cash flows are discounted by the simulated interest rates plus the option-adjusted spread. The simulation approach provides a method for estimating MBS yields and spreads to the Treasury yield curve that are adjusted for the embedded options in these securities. In addition, these models can provide estimates of MBS option cost and effective MBS duration and convexity.

One of the two critical assumptions in the OAS simulation methodology is the link between interest rates and prepayment rates. If the relationship is misspecified, the calculated value and risk measures will be biased. The second critical assumption is the specification of the interest rate diffusion process. Most models diffuse a single short-term rate. That is, the current MBS coupon, is assumed to shift deterministically.

based on the change in the short-term rate. Other models seek to introduce a greater amount of realism into the interest rate process by diffusing both a short- and long-term rate. The long-term rate is used to drive the prepayment function, while MBS cash flows are discounted backed along the short-term rate paths.

In addition to the above two critical assumptions, an assumption about interest rate volatility has to be made. Since MBSs are actually a long position of bonds and a short position in a call option, increasing interest rate volatility will increase calculated option cost and decrease option-adjusted spread. OAS values are also sensitive to the method used to aggregate the information from the individual interest rate paths. Therefore, averaging methodology is also important to OAS models.

An OAS model is constructed upon a series of building blocks. In sequential order these are:

- An interest rate model is used to generate a series of future interest rate paths, or yield curves.

- A prepayment model is used to forecast the changes in pool cash flow according to the interest rate paths generated and the specific collateral characteristics selected. The prepayment projection is dependent upon projected interest rate paths and demographic influences on mortgage pool life.

- A cash flow model is used to calculate the monthly distributions of P&I according to the projections of the prepayment model.
Two values measures are produced by OAS models: option-adjusted spread and option cost. Most of the OAS models define OAS as the spread that equates the average simulated price to the market price. The option cost measures the prepayment risk embedded in the security and equates to the difference of the static cash flow spread and the OAS.

Advantages and Limitations

The OAS methodology has a number of advantages over both the SCFY and SA approaches. Firstly, OAS models simulate a large number of future interest rate paths which may better model the complete distribution of future rate paths, and improve the statistical significance of the risk and return measures. Secondly, the risk measures account for the dependence of MBS prepayments on interest rates. The major drawback to the OAS approach is its complexity. The prepayment functions and term structure models embedded in OAS models are generally proprietary. It is difficult to evaluate them. Also, values are difficult to compare on an absolute basis between models.
CHAPTER V

THE MORTGAGE-BACKED SECURITIES MARKET IN US

U.S. has the most highly developed capital market. It provides the most different kinds of capital market instruments in the world. Mortgage-backed securities was also innovated in U.S. and now becomes the predominant capital market instrument traded in US. A thorough understanding of the largest Mortgage-backed securities market can shed light on how to develop a Mortgage-backed securities market in Hong Kong. This chapter gives a brief picture of Mortgage-backed securities market in US.

U.S. Capital Market

Stocks, bonds and mortgages are the three principal instruments traded on the U.S. Capital market. There are about US$ 5 trillion of bonds (treasury, municipal, corporate and agency securities) outstanding while the total capitalization of the stock market is about US$ 4 trillion. The entire U.S. mortgages account for over US$ 4 trillion. Among these mortgages, one-third of them which is equivalent to 12 percent of the U.S. Bond Market, have been securitized.
Market Structure of Mortgage-backed Securities in US

Mortgage Originators

The principal originators of residential mortgage loans in U.S. are thrifts, commercial banks and mortgage banks. Other private mortgage originators are life insurance companies and pension funds. In 1990, the three major mortgage originators have made US$ 475 billion i.e. about 98 percent, of the US$ 485 billion residential mortgages loans. As of December 1993, the outstanding mortgages have been up to over US$ 4 trillion. Prior to 1990, thrifts were the main originators followed by the commercial bank. Starting from 1990, mortgage bankers’ share of origination became the largest.

Mortgage originators will: (i) hold the mortgage in their portfolio; (ii) sell the mortgage to an investor who wishes to hold the mortgage or who will place the mortgage in a pool of mortgages to be used as collateral for the issuance of a security; or (iii) use the mortgage themselves as collateral for the issuance of a security.

Since investing in mortgages exposes the investors to credit risk, interest-rate risk, liquidity risk and prepayment risk, more and more mortgage originators open their doors to disintermediation for a steady and secured supply of funds for the mortgage market. Apart from the mortgage originators themselves, they can sell the mortgages to conduits which are federally sponsored credit agencies or private companies, to pool the mortgages to issue securities.
Mortgage-backed Securities Issuers

In US, Mortgage-backed securities can be issued by mortgage banks, commercial banks, thrifts, conduits and agencies. However, nearly 98 percent of all pass-through securities are created by three major agencies. They are: Government National Mortgage Association (GNMA or "Ginnie Mae"), Federal Home Loan Mortgage Corporation (FHLMC or "Freddie Mac") and Federal National Mortgage Association (FNMA or "Fannie Mae"). The securities associated with these three entities are called agency pass-through securities. The rest are privately issued which are known as non-agency / conventional mortgage pass-through securities. The difference in issuance of agency versus non-agency mortgage-backed securities from 1981 to 1993 is shown in Chart 1.
CHART 1

ISSUANCE OF AGENCY / NON-AGENCY MORTGAGE-BACKED SECURITIES

Among the three agency mortgage pass-throughs, Ginnie Mae is a risk-free pass-through like Treasury securities. Ginnie Mae is a federally related institution, part of the Department of Housing and Urban Development. Its pass-throughs are guaranteed by the full faith and credit of the U.S. Government. In contrast, Fannie Mae and Freddie Mae are corporate instrumentalities of the U.S. Government. They do not receive a government subsidy or appropriation, and are taxed like other corporation. Their stocks are traded on the New York Stock Exchange. Therefore, they are more appropriately referred to as federally sponsored agencies or government sponsored entities. Nonetheless, these three agencies purchase only conforming mortgages. A conforming mortgage is one that meets the underwriting standards established by themselves for being in a pool of mortgages underlying a security that they guarantee.

Thrifts, commercial banks and other private conduits which would purchase nonconforming mortgages, collateralized these nonconforming mortgages in the underlying pool to issue non-agency securities in 1977. The first non-agency pass-through securities was publicly introduced by Bank of America. Unlike agency pass-throughs, the non-agency mortgage pass-throughs must be registered with the Securities and Exchange Commission and are rated by commercial rating agencies such as Moody's and Standard & Poor's. However, the development of private credit enhancement becomes the key success of this market. Although the amount of non-agency pass-through securities is small (less than 25 percent) to agency pass-through securities, it is expected that this market will grow significantly in the coming years.
Derivatives of Mortgage-backed Securities

The first Mortgage-backed security is mortgage pass-through security which was created in February 1970. As the investor in a pass-through security is exposed to the total prepayment risk associated with the underlying pool of mortgage loans, a new security structure was introduced by Freddie Mac in 1983. This was collateralized mortgage obligation (CMO). In this structure, backed by mortgage pass-through securities and whole loans, the total prepayment risk is divided among classes of bonds. Following the sequential pay or plain vanilla CMOs, planned amortization class bonds (PACs), targeted amortization class (TAC) and reverse TAC are sequentially created for institutional investors who require different protection against risks of the Mortgage-backed securities.

In July 1986, another type of derivative Mortgage-backed security was introduced by Fannie Mae, the stripped Mortgage-backed security (SMBS). As the principal and interest are divided unequally between the two classes of bonds in the stripped Mortgage-backed securities, the two bond classes have different synthetic coupon rates and perform differently from the underlying collateral when interest rates changed. In the second generation of SMBS, all interest is distributed to one bond class while all principal is distributed to another class. This investment features allow institutional investors to create synthetic securities with risk/return characteristics and to hedge a portfolio of pass-through securities.
Secondary Mortgage-backed Securities Market

Mortgage pass-through securities are traded and quoted in the same manner as U.S. Treasury coupon securities. The secondary exchange markets for Mortgage-backed securities are New York Stock Exchange and the American Stock Exchange.

Mortgage pass-through securities traded on the market can be specified or unspecified in which the underlying pools are still unspecified. The unspecified trade is known as a "TBS" (to be announced) trade which gives an advantage to the seller. According to the guidelines for standards of delivery and settlement of mortgage-backed securities established by the Public Securities Association, an under- or overdelivery tolerance of 2.5 percent per million traded is allowed. This means that if US$ 1 million of par value is sold at par, the seller may deliver pass-throughs with a par value between US$ 975,000 and US$ 1,025,000. This delivery option is valuable. If the interest rates decline between the trade date and the settlement date, the value of pass-through will rise and thus the seller can deliver a less than US$ 1 million pool and vice versa. Thus most trades occurred is unspecified.

The availability of a wide variety of Mortgage-backed securities, an active secondary market which improves the liquidity of the instruments and the presence of a risk-free securities for investors enable the establishment of a mature Mortgage-backed securities in US. The development of U.S. Mortgage-backed securities market is summarized in Table 1.
# Table 1
## Development of the U.S. MBS Market

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</thead>
<tbody>
<tr>
<td>- Creation of FNMA (1938)</td>
<td>- FNMA privatized (1968)</td>
<td>- First GNMA pass-through (1970)</td>
<td>- First non-agency transaction (1977)</td>
<td>- Market dominated by non-agency issues</td>
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<tbody>
<tr>
<td>- Introduction of conduits</td>
<td>- REMIC status for CMO’s</td>
<td>- First ARM securitization</td>
<td>- Privatization of FHLMC</td>
<td>- Creation of RTC</td>
</tr>
<tr>
<td>- $20 billion of issuance</td>
<td>- First senior/sub structure</td>
<td>- Initiation of FNMA REMIC program</td>
<td>- First UK mortgage securitization</td>
<td>- Moody’s begins unsolicited ratings</td>
</tr>
<tr>
<td>- First Australian mortgage securitization</td>
<td>- $50 billion of issuance</td>
<td>- Initiation of FHLMC REMIC program</td>
<td>- Introduction of risk based capital</td>
<td>- First Swedish CMO</td>
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</thead>
<tbody>
<tr>
<td>- Trading of subordinate pieces begins</td>
<td>- First Spanish mortgage securitization</td>
<td>- Total MBS issuance surpasses $1 trillion</td>
<td>- Dramatic expansion of subordinate piece market</td>
<td>- First public Canadian mortgage securitization</td>
</tr>
<tr>
<td>- First Swedish mortgage securitization</td>
<td>- $250 billion of issuance</td>
<td>-</td>
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</table>

CHAPTER VI

THE HONG KONG MORTGAGE-BACKED SECURITIES MARKET

Hong Kong has a well developed stock market. It has one of the biggest stock exchanges in the world. But, Hong Kong’s debt capital market is still under developing and has a long way to catch up with the United States. Hong Kong’s first Mortgage-backed bonds sale came out until 1994 whereas Mortgage-backed securities now is the predominant capital market instrument traded in the United States. In this chapter, we will give a brief picture of Hong Kong Mortgage-backed securities market.

Mortgage Pool

Hong Kong Monetary Authority conducted a survey on residential mortgage loans in Hong Kong in October 1994.[HKMA, 1994] 1 A total of 33 authorized institutions (AIs) which accounted for over 90% of total residential mortgage loans in Hong Kong were involved in this survey.

Characteristics of residential mortgage loans in Hong Kong

In the report, we found the following characteristics of residential mortgage loans in Hong Kong:

---

• the total outstanding amount of residential mortgage loans were HK$266 billion which was made up by a total of 338,249 residential mortgage loans. The average outstanding amount per loan was HK$787,000.

• The outstanding loan-to-valuation ratio which measures the ratio of the outstanding loan amount to the appraised value of the property at origination or refinancing was at 53.5%.

• A major proportion of residential mortgage loans (68.2%) involved fairly new property, of less than 10 years old. Those between 10 and 20 years old accounted for 22.8%, while property over 20 years old accounted for only 9%. The average contractual life of the outstanding mortgage loans, was about 183 months. The loans were on average seasoned for about 22.6 months, and hence the remaining contractual life averaged 160.2 months.

• 96.5% involved property were owner-occupied. Loans involving non-occupied property accounted for only 3.5%.

• Broken by loan purpose, 94.5% of total outstanding loans were for financing the purchase of flats. Refinancing loans accounted for 5.5%.

• Around 96% of mortgage loans were arranged on floating rate basis and only 4% on fixed rate basis. For loans on floating rate terms, around 63% involved a repayment scheme under which interest rate adjustment was made to the monthly installment amount. That is, the amount of monthly installment would be varied according to any mortgage rate adjustment, leaving the length of contractual maturity unchanged.
• Except for 0.2% of the floating rate loans whose set with reference to HIBOR or deposit rates, the mortgage rate of the remaining 99.8% of floating rate loans were based upon the Best Lending Rate (BLR).

• Charge would be imposed on complete prepayment within the first year from loan origination. The penalties ranged from 2 to 5 months' interests or 3% of original loan amount.

Lending policy of authorized institutions since 1989

The lending policy has been changed all the time. Listed below is the most significant changes on the lending policy for the past few years:

• The maximum loan to valuation ratio showed a notable decline since 1990 which reflected the prudent lending policy of AIs in the face of the property market boom. For small to medium flats, the ratio dropped from 88.5% in 1990 to 69.5% in September 1994. For luxurious flats, the ratio fell from 87.1% to 54.8%. The maximum repayment periods still remained at around 20 years.

• The premium which the mortgage rate fetched over the BLR increased in the past few years. For small to medium flats, it was from 0.9% - 1.5% in 1989, but increased to 1.3% - 2.1% in September 1994. For luxurious flats, the spread increased from 0.9% - 1.5% in 1989 to 1.5% - 2.4% in September 1994. The rise was partly to discourage speculative activities in the property market, and partly reflecting an increased risk in property lending with the rapid rises in property prices.

Table 2 summarizes the lending policy of reporting AIs since 1989.
<table>
<thead>
<tr>
<th>Lending Policy</th>
<th>89</th>
<th>90</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>Sept. 94</th>
</tr>
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<tbody>
<tr>
<td>Maximum loan to valuation (%)</td>
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<tr>
<td>• small to medium flats</td>
<td>88.3</td>
<td>88.5</td>
<td>75.9</td>
<td>72.2</td>
<td>70.8</td>
<td>69.5</td>
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<tr>
<td>• luxurious flats</td>
<td>86.8</td>
<td>87.1</td>
<td>72.9</td>
<td>69.5</td>
<td>64.6</td>
<td>54.8</td>
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<tr>
<td>Maximum repayment period (no. of years)</td>
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<tr>
<td>• small to medium flats</td>
<td>21.0</td>
<td>21.2</td>
<td>21.2</td>
<td>21.2</td>
<td>20.9</td>
<td>20.8</td>
</tr>
<tr>
<td>• luxurious flats</td>
<td>20.1</td>
<td>20.2</td>
<td>20.2</td>
<td>20.2</td>
<td>20.0</td>
<td>19.9</td>
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<tr>
<td>Spread over BLR (%)</td>
<td></td>
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<tr>
<td>• small to medium flats</td>
<td>0.9-1.5</td>
<td>1.0-1.5</td>
<td>1.1-2.0</td>
<td>1.2-2.2</td>
<td>1.2-2.0</td>
<td>1.3-2.1</td>
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<tr>
<td>• luxurious flats</td>
<td>0.9-1.5</td>
<td>1.0-1.5</td>
<td>1.1-2.0</td>
<td>1.2-2.2</td>
<td>1.2-2.0</td>
<td>1.5-2.4</td>
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<tr>
<td>% of reporting AIs accepting equitable charge</td>
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<tr>
<td>• small to medium flats</td>
<td>90.9</td>
<td>90.9</td>
<td>90.9</td>
<td>81.8</td>
<td>78.8</td>
<td>78.8</td>
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<tr>
<td>• luxurious flats</td>
<td>84.8</td>
<td>84.8</td>
<td>84.8</td>
<td>78.8</td>
<td>75.8</td>
<td>75.8</td>
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<tr>
<td>Maximum ratio of installment to income of borrowers (%)</td>
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<tr>
<td>• small to medium flats</td>
<td>50.2</td>
<td>50.2</td>
<td>50.6</td>
<td>49.9</td>
<td>48.9</td>
<td>48.7</td>
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<tr>
<td>• luxurious flats</td>
<td>50.2</td>
<td>50.2</td>
<td>50.5</td>
<td>49.9</td>
<td>48.9</td>
<td>48.7</td>
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<td>% of reporting AIs requiring income verification</td>
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<tr>
<td>• small to medium flats</td>
<td>93.9</td>
<td>93.9</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>• luxurious flats</td>
<td>93.9</td>
<td>93.9</td>
<td>97.0</td>
<td>97.0</td>
<td>97.0</td>
<td>97.0</td>
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<tr>
<td>% of reported AIs requiring employment verification</td>
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<tr>
<td>• small to medium flats</td>
<td>75.8</td>
<td>75.8</td>
<td>75.8</td>
<td>78.8</td>
<td>78.8</td>
<td>78.8</td>
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<tr>
<td>• luxurious flats</td>
<td>72.7</td>
<td>72.7</td>
<td>72.7</td>
<td>75.8</td>
<td>75.8</td>
<td>75.8</td>
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<tr>
<td>% of reporting AIs which conduct credit test</td>
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<tr>
<td>• small to medium flats</td>
<td>39.4</td>
<td>39.4</td>
<td>39.4</td>
<td>45.5</td>
<td>45.5</td>
<td>45.5</td>
</tr>
<tr>
<td>• luxurious flats</td>
<td>78.8</td>
<td>78.8</td>
<td>81.8</td>
<td>81.8</td>
<td>81.8</td>
<td>81.8</td>
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<tr>
<td>% of reporting AIs which value the property by independent valuation agents</td>
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</tr>
<tr>
<td>• small to medium flats</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>6.1</td>
</tr>
<tr>
<td>• luxurious flats</td>
<td>97.0</td>
<td>97.0</td>
<td>97.0</td>
<td>97.0</td>
<td>97.0</td>
<td>97.0</td>
</tr>
</tbody>
</table>
% of reporting AIs requiring standard documentation
- application form 87.9 90.9 90.9 93.9 93.9 93.9
- offering letter or loan agreement duly accepted by customer 87.9 87.9 87.9 87.9 87.9 87.9
- other standard documents 69.7 69.7 69.7 69.7 69.7 69.7

% of reporting AIs which imposed penalties/restrictions on complete prepayment
- application form 90.9 90.9 100 100 100 100
- offering letter or loan agreement duly accepted by customer 75.8 72.7 72.7 72.7 75.8 75.8
- other standard documents 45.5 45.5 48.5 48.5 51.5 57.6

value above which property is classified as luxurious flats ($mn)
- gross floor above which property is classified as luxurious flats (sq. ft) 2.2 2.5 3.8 3.9 4.9 5.5

Source: Survey on Residential Mortgages in Hong Kong, Hong Kong Monetary Authority, October 1994.

Development Of MBS

International bank regulators require banks to reserve capital against a percentage of their total assets. As Hong Kong banks can have up to 40 per cent of their loan portfolios in mortgages, the amount of money they must set aside is large. Securitization allows lenders to sell off big chunks of assets, lowering the reserve requirements.

The Mortgage-backed bond market in Hong Kong got underway in 1994. Four bond sales backed by residential mortgage loans totaling HK$3 billion were
offered in 1994.[SCMP, 1/16/95] Each of the financing was divided into a series of tranches of floating rate securities with maturities ranging from one year to 7 1/2 years. Interest rates on these securities were 75-500 basis points more that the one-month Hong Kong inter-bank offered rate (HIBOR).

Four Mortgage-backed Bond Sales

Three out of these four Mortgage-backed bond sales were originated by international commercial banks via their Hong Kong branches. They are Bank Of America (Asia), Citibank and Standard Chartered Bank. Li Ka-Shing’s Cheung Kong Holdings, Hong Kong’s premier property developer, so far is the only one property developer who originated Mortgage-backed securities in Hong Kong.

Bank Of America (Asia) - May, 1994

This MBS transaction placed by Salomon Brothers was completed in May, 1994. It was structured as a simple pass-through with the idea that it would be easier for first-time MBS buyers to understand.

Both the senior and subordinated classes were paid down on pro-rata basis and had a weighted average life of 3.6 years based on an estimated 20% pre-payment rate. Class A totaled HK$325 million and was placed with investors at one-month HIBOR plus 137.5 basis point. The subordinated Class B added up to HK$24.5 million and paid one-month HIBOR plus 350 basis point. A cash reserve account

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totaling HK$1.75 million provided by BA Asia acted as credit enhancement. The deal was not rated as the rating agencies were not ready to rate the deal. Salomon Brothers hoped their next deal would be rated as a rating would be a significant development for MBS transactions. It would improve both the liquidity and depth of investors who were interests in this type of paper. Moody's Investors Service started developing a rating criteria for MBS in Hong Kong.

The deal was placed with investors in Hong Kong and Japan as well as non-Asian investors. According to Salomon Brothers, the most interest they received were from yield-driven investors. People were not going to trade out of this, they bought it for the yield.

Citibank's Homes-1 - July, 1994

This multi-class mortgage backed floating rate securities totaled HK$1 billion was originated by Citibank Hong Kong. This was the region's first public deal. Goldman Sachs (Asia) Limited and Citicorp International Limited acted as joint-lead managers placed this transaction in July, 1994.

Class A1 totaled HK$620 million and was sold at 90 basis point over HIBOR for a 1.2-year average life. The HK$280 million Class A2 had a 4.1-year average life and was paid at 175 basis point over HIBOR. The subordinated class B totaled HK$100 million had a 8.4-year average life and was paid at 500 basis point
over HIBOR. All the over expected weighted average life was estimated based on a 25% assumed prepayment speed.

The deal was backed by 1,729 owner-occupied mortgages from Citibank's portfolio. Average seasoning of the pool was three years and average loan size was HK$600,000. The current loan-to-value ratio was 58%. The average debt to income ratio of the mortgage holders is 45% - higher than U.S. Standard but relatively low in Hong Kong as some developers allowed a 60% to 70% debt-to-income ratio.

Compared to BA’s deal, the Citi transaction’s sequential-pay structure might attract wider range of investors. Here, the A1 class was paid first which accounted for the shorter 1.2-year average life. The short class appealed both to investors who were nervous about Hong Kong’s fate after 1997 and typical CD-buyers who were in search of some extra yield. The class A2’s average life was five months longer than BA’s deal, but investors were compensated with the higher spread - 175 basis point. The subordinated class met the investors who demanded a high yield.

The deal was not rated due to the same reason as BA’s deal. According to Tim Kelley, Citibank’s senior vice president, the bank might issues another MBS transaction in the future. In further issues, the bank would attempt to broaden the marketability of the securities to investors outside Hong Kong. Obtaining a rating will be a must.

Cheung Kong Holdings - September, 1994
Li Ka Shing’s Cheung Kong Holdings, Hong Kong’s premier property developer, sold HK$686 million of bonds backed by loans from its biggest residential project, Kingswood Villas in Yuen Long. U.S. investment bank Merrill Lynch underwrote the bond sale.

The financing included two U.S.dollar-denominated tranches, which totaled US$49.6 million. The other two were denominated in Hong Kong dollars and totaled HK$303.4 million. The price of U.S.dollar tranches was pegged to the one-month London inter-bank offered rate (LIBOR). The Hong Kong dollar bonds were priced against the Hong Kong prime lending rate. The largest U.S.dollar tranche, Class A1 was worth US$32 million and had an average life of 1.3-year. It was paid at 90 basis point over LIBOR. The Class A2 U.S.dollar tranche totaled US$17.6 million, had a 3.9-year average life with an interest at 135 basis point over LIBOR. Class A3 Hong Kong dollar bonds totaled 131.7 million, had a 6.5-year average life was paid at 50 basis point over prime lending rate. Class B, totaled HK$68.7 million, had a 9.3-year average life with an interest of 125 basis point over prime lending rate. The CPR (constant prepayment rate) assumption for the loans backing the Cheung Kong bonds was 12%.

It was the first rated Mortgage-backed securities issue in Hong Kong. The financing comprised four floating rate tranches, three of which were rated by Moody’s Investors Service and Standard & Poor’s. The ratings agencies assigned A3/A ratings to each tranche.
This was the first MBS transaction originated by a property developer. Other property development companies which had made loans to help selling apartments were expected to follow Cheung Kong's lead and securitize their mortgages as this would raise fresh funds and relieve the company of the burden of administering a portfolio of mortgages.

Standard Chartered Bank’s MARS - December, 1994

With underwriters Goldman Sachs and Standard Chartered Asia, the Hong Kong branch of Standard Chartered Bank sold HK$1 billion of mortgage backed bonds in December, 1994. This was the fourth Mortgage-backed bond sales in Hong Kong in 1994.

The financing comprised two senior tranches and one subordinated tranche, the structure and pricing were very similar to the Citibank's Homes-1 deal which was also arranged by Goldman Sachs. The largest tranche, of HK$500 million, was named Class A1 Mortgage Backed Floating Rate Notes had an average life of 1.2 years and paid interest at 90 basis point over HIBOR. Another tranche, of HK$400 million, was called Class A2 Mortgage Backed Floating Rate Notes which could be offered as a non-callable bond or a callable security. Without the call option, it had a 5.3-year average life, with the option, it had a 5.0-year average life. The interest rate for this tranche was at 175 basis point over HIBOR. Class A1 and A2 had an 'A1' rating from Moody's Investors Service and 'A' from Standard & Poor's. The average life of the third tranche, of HK$100 million, Class B Mortgage Backed Floating Rate Notes was
7.3 years if the tranche did not include a call option. With the option, it was 6.2 years. This tranche was paid at 500 basis point over HIBOR. The CPR (constant prepayment rate) assumption for the pool of loans backing the Standard Chartered was 20% a year. The deal was backed by 1,775 owner-occupied residential mortgages from Standard Chartered Bank's portfolio. The interest margin had a weighted average of 120 basis point over the prime lending rate. Average seasoning of the pool was 43 months and the average remaining term to maturity was 174 months. The current loan-to-value ratio was 71%.
CHAPTER VII

DISCUSSION ON HONG KONG
MORTGAGED-BACKED SECURITIES MARKET

The present Mortgage-backed securities market in Hong Kong is very small. It accounts for only 0.1 percent of the whole capital market. As compare with the mature, well-developed U.S. Capital market, Hong Kong Mortgage-backed securities market is much under-developed. In the following, we shall examine the reasons for the slow growth of market in Hong Kong.

Why is the Mortgage-backed Securities Market Less Important in Hong Kong

In Hong Kong capital market, the total common stock and corporate bonds outstanding are about HK$ 3 trillion and HK$ 50 billion respectively versus there is only a total of four Mortgage-backed securities for a sum of HK$ 3 billion in the market. Apart from the fact that the emerging Mortgage-backed securities market is just situated in the slow-growing introductory stage of the product life cycle, the following factors may hinder its rapid growth.

Uncertain Political Environment of Hong Kong

Hong Kong is now under the administration of the United Kingdom Government with a Governor appointed by The Queen. With effect from 1 July 1997, sovereignty over Hong Kong will be transferred from the United Kingdom Government to the Government of the People’s Republic of China to become a Special
Administrative Region (SAR) of China. An agreement between the Governments of the United Kingdom and China regarding this transfer is made and embodied in the Sino-British Joint Declaration on the Question of Hong Kong. The Joint Declaration provides that the Hong Kong SAR shall be directly under the authority of the China Government and shall enjoy a high degree of autonomy. The Basic Law further states that the HK Dollars will be freely convertible and circulate as the legal tender in the Hong Kong SAR after 1997. No exchange control policies will be applied in the Hong Kong SAR.

Regarding the lands in Hong Kong, almost all lands in Hong Kong is held under fixed term leases from the Government. Most leases of property in the New Territories have been extended to 2047. For those in Kowloon and Hong Kong Island, some leases have an automatic right of renewal while some leases are not automatically renewable or the right to renew have already been exercised. The granting of, and the terms of any renewal of these expired leases after 1997 will be at the discretion of the Government of the Hong Kong SAR. Thus, it should be noted that no mortgage loan has a term longer than the unexpired term of lease of the related property.

Although the Joint Declaration and Basic Law state that the current social and economic system in Hong Kong shall remain unchanged for a period of fifty years after 1997, the future of Hong Kong, in fact, depends on the relationship between British and China Government. It is uncertain whether Hong Kong shall retain the status of an international financial center after the transfer of sovereignty in 1997. The prosperity of property market and the future performance of mortgage loans in Hong
Kong is unclear. The blur of the future is a major obstacle to the development of Mortgage-backed securities market in Hong Kong.

Hong Kong Residential Property Price Inflation

In Hong Kong, the price of residential properties rose substantially during the period from 1990 to the first quarter of 1994. As the price rose in an uncontrollable manner, the Hong Kong Government expressed concern to this trend and set up a task force, the Task Force on Land Supply and Property Prices, to evaluate alternatives to slow the growth in property prices. In June 1994, the Task Force recommended a number of measures to eradicate the false pressure on prices. It includes reducing the developers' quota for private sales from 50 percent of uncompleted flats to 10 percent, restricting the period of forward sales to nine months, increasing the initial deposit to 10 percent of the purchase price in which half of it will be non-refundable, and redefining the date for completion of construction as the date of compliance with the lease conditions or the consent to assign etc.

Upon the introduction of new measures, the property price declines drastically over 10 percent within six months. A decline in the price of residential properties obviously affects the performance of borrowers in making payments of interest and principal i.e. increases the default and delinquency risk of the mortgage loans. This probably would have an adverse effect on the ability of issuers to pay interest and principal to security-holders. To introduce Mortgage-backed securities in this tough year, 1994, most investors will prefer delay or even retrieve their investment until a steady and clear picture of the Hong Kong property market could be observed.
Limited Liquidity

Currently, there is no secondary market for Mortgage-backed securities. That means there is no trading of the securities, no price fluctuations, and no way for investors to gauge a fair price on a mortgage bond. Securities-holders could not sell their securities in market when capital is needed. The illiquidity of securities restricts the hedging opportunities and will cause the funding of securities very expensive. Nonetheless, it is uncertain whether such market will be developed in future. In addition, it is unsure if such market will affect the sale of the securities or the securities may be sold at a discount to the initial issue price.

Few Securities with Credit Ratings

Mortgage-backed securities are complicated as they do not have a uniform structure. Most of the public do not understand how a Mortgage-backed securities financing works. As it is difficult for the public to acquire information on the security, to assess the riskiness of the issuing organizations and the collateral of securities, it implicitly imposes a significant transaction cost for the investors on the security. Credit rating is one of the easiest and important reference for the public to get a brief picture on the security. However, not all issuing securities carry published credit ratings by major international rating agencies. Thus, the lack of knowledge on the security, the collateral in the securities and the issuing organizations lowers the attractiveness of Mortgage-backed securities to the public.

Risks of Mortgage-backed Securities

Holding the securities is not free of risks. Although there are various structural protections to lessen the risks, the measures cannot eliminate all generic
risks. As a result, there is no assurance that payment of interest and principal on the securities could be made on a timely basis. The following is a summary of major generic risks of Mortgage-backed securities.

Basis Risk

The interest rates of the mortgage loans are subject to fluctuation at the discretion of the mortgagee. It is the general practice that mortgage rates are determined by reference to a margin over Hong Kong Prime. Hong Kong Prime is an administrated rate which is set from time to time at the discretion of the Hong Kong Association of Banks. The income payments on the securities are based on Hong Kong Interbank Offered Rate (HIBOR) which is a market driven rate. The history of the Prime spread and HIBOR over the past ten years are shown as Chart 2:
CHART 2

PRIME SPREAD TO HIBOR

As shown in the above diagram, the difference between the two rates is not constant. Owing to a rise in HIBOR or a reduction in Hong Kong Prime, it may be possible that there will be insufficient funds for issuers to make scheduled payments of interest and principal to the security-holders even though all amounts due in respect of the mortgage loans are being paid in full and on time. Furthermore, as there is a priority of payments to different classes of securities-holders, the Class B security-holders may result not only a reduction in the pre-tax yield to maturity, but also a principal loss on their investment.

Mortgage Loan Prepayment

The mortgage loans may be repaid in full or in part at any time. A variety of political, economic, social and demographic factors including homeowner mobility, economic conditions, property prices, mortgage interest rates and the availability of mortgage funds, may affect the prepayment experience of the mortgage loans.

If a borrower prepays his mortgage loan in whole or in part, he owes interest on the principal prepaid only up to the date of prepayment. Accordingly, if he makes an unscheduled prepayment of principal in a collection period prior to the usual scheduled payment date, the issuer will not earn any interest on that unscheduled prepayment of principal from the date of prepayment to the immediately succeeding mortgage payment date. As a result, there will be a reduction in the anticipated interest receipts available to the issuer for such period.

For the first nine months of 1994, the complete and partial prepayment recorded are HK$ 27.3 billion and HK$ 2.8 billion, corresponding to 1.0 percent and
10.3 percent of the total outstanding loans respectively.[HKMA, 1995] Although the prepayment risk is not serious in Hong Kong and the originators have made reference to the historical trend, no assurance can be given that prepayments on the mortgage loans will conform to any historical experience of the originator and no prediction can be made as to the actual prepayment rates which will be experienced on the mortgage loans. Thus, the anticipated interest is actually uncertain.

Delinquent and Default Risk

The issuer's obligation to pay interest on and to repay the securities in full is limited by receipts from the outstanding mortgage loans. Security-holders must rely on payments being made under the mortgages. If mortgagors fail to make their monthly mortgage payments when due, it is probably that the issuer may have insufficient funds to make full and timely payments of current interest and eventual payment of principal to the holders. If mortgagor defaults on payment and the servicer seeks to enforce the mortgage and take possession of the property, the time required to sell the property and to realize the proceeds of sale is uncertain. Any delay and loss incurred under such circumstances may affect the ability of issuer to make payments to security-holders.

The performance of borrowers in making payments of interest and principal under the mortgage loans is affected by many factors, particularly the property price. The number and amount of delinquency/default is adversely related to the property

1 Hong Kong Monetary Authority, "Report on the Survey of Residential Mortgages in Hong Kong," Hong Kong Monetary Authority, 24 January, 1995, p.4-p.11.
price. Table 3 shows the number and amount of delinquent/default loans from 1983 to 1994 by 3 major authorized institutions.

**TABLE 3**

<table>
<thead>
<tr>
<th>Number and Amount of Delinquent/Default Loans Reported by 3 Major Authorized Institutions During 1983-1994</th>
</tr>
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<tbody>
<tr>
<td>No. of days from payment due date</td>
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<tr>
<td>----------------------------------</td>
</tr>
<tr>
<td>61-90 days No.</td>
</tr>
<tr>
<td>Amount (HK$mn)</td>
</tr>
<tr>
<td>91-120 days No.</td>
</tr>
<tr>
<td>Amount (HK$mn)</td>
</tr>
<tr>
<td>Over 121 days No.</td>
</tr>
<tr>
<td>Amount (HK$mn)</td>
</tr>
<tr>
<td>Total No.</td>
</tr>
<tr>
<td>Amount (HK$mn)</td>
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</tbody>
</table>


There is no assurance that delinquent and default experience on mortgages will conform to any historical experience, and thus no prediction can be made as to the actual delinquent and default rates which will be experienced on mortgages. Security-holders will bear the investment risk resulting from the delinquent and default experience of the mortgages.

**Deductions**

Any withholding or deduction for interest payment or income distributions of the securities such as withholding taxes and stamp duties, is not obliged to the issuers. The issuers are not responsible for any additional payment for security-holders in any circumstances. Hence the income to security-holders are uncertain in many aspects.
CHAPTER VIII

RECOMMENDATIONS AND FUTURE OF HONG KONG MORTGAGE-BACKED SECURITIES MARKET

Having an understanding of factors which may affect the growth of Mortgage-backed securities market in short term, a number of recommendations are proposed in this chapter to facilitate the market development. Furthermore, we shall forecast the prospect of Mortgage-backed securities market in Hong Kong.

Recommendations for Hong Kong Mortgage-backed Securities Market

To enhance the development and popularity of Mortgage-backed securities in Hong Kong, a number of factors have to be improved. They include credit enhancement of securitized products, better market infrastructure and liquid bond markets.

Credit Enhancement of Securitized Products

To gain confidence of the public on Mortgage-backed securities, it needs to help the public understand and acquire knowledge on the product at a low cost. Firstly, issuers should develop a uniform structure for these financings and to address the risks unique for this security. Secondly, issuers should obtain published credit ratings by major international rating agencies on their securities to help the public access the securitized products and the issuing organizations. In fact, some securities have already carried credit rating when issued. Last but not least, issuers should
enhance the credit ratings on the collateral in the securities to increase its attractiveness to the investors.

Securitized products often obtain a higher rating than the rating of the seller of the assets. However, this is only possible by separating the credit of assets from the credit of seller. Rating agencies require the transfer of assets to be regarded as a "true sale" of the assets under applicable law and accounting standards rather than a pledge or hypothecation of the assets to achieve the necessary separation. In addition to the separation of credit quality of assets from the credit of seller, several forms of credit enhancement can be used to achieve a better rating. They include:

- overcollateralization or "subordination" by provision of two or more classes of securities with different privileges
- reserve or "spread" accounts which are funded by an initial deposit by the seller and/or by excess cash flow received from the assets over time
- financial guaranty insurance on the securities from a monoline insurance company
- pool insurance on the pool of assets from a pool insurance company
- bank letters of credit
- seller or other corporate guarantees

Better Market Infrastructure

A set of good institutional infrastructure are essential for the development of a securitization market. A clearly understood legal system governing the financial assets, the related securities and the financial agencies can ensure a fair trade of financial instrument. A sophisticated asset monitoring systems can protect the
security-holders to lessen their risks. A constructive regulatory environment and
documentary precedent can assist issuers and borrowers to follow the rules of games
to facilitate growth of market. Of course, positive government attitude towards the
debt instrument such as streamlining the application process of listing debt securities in
market, a higher acceptance to debt instrument by the public, advanced communication
system and good supportive systems are also crucial for the success of market. Thus,
in order to boost up the Mortgage-backed securities market in Hong Kong, a number
of proper institutional infrastructure has to be established.

Liquid Bond Markets

Similar to bonds, Mortgage-backed security is a debt instrument. The
Mortgage-backed securities market grows side by side with the local bond market.
The lack of a secondary market for long-term bonds and Mortgage-backed securities
affects the liquidity of investment and limits the hedging opportunities leading to the
under-development of debt instrument in Hong Kong. Fortunately, with the
introduction of Exchange Fund Bills and Notes in November 1991, the situation has
been improved as it could be sold short. Together with a sharp increase in the number
and size of infrastructure projects in the region such as Hong Kong's new airport, a
great demand for long-term debt funding will substantially boost up the secondary
market for bonds. With the development of secondary bond market underpinning a
secondary Mortgage-backed securities market, active trading of Mortgage-backed
securities will become available. More potential issuers and investors of Mortgage-
backed securities will have incentives to join the market. The popularity of Mortgage-
backed securities will be enhanced. Thus, improving the liquidity of Mortgage-backed securities can make the security quick sellers.

The Future Mortgage-backed Securities Market in Hong Kong

The Hong Kong Mortgage-backed securities market gets a tough year in 1994. At present, a number of factors including the lack of uniformity in structuring, complicated prospectuses and illiquidity, are likely to hinder the growth of Mortgage-backed securities market in Hong Kong in the short term. Furthermore, the growth of market highly depends on how people feel about the future property price. The wobbliness in the property market in 1994 increases the uncertainty of defaults which affects the development of an embryonic market.[SCMP, 1/16/1995]¹ Hence the nascent development of the Mortgage-backed securities market may be slow and tedious. However, a number of other factors suggest that the prospects for the market are good.

The rapid development of Hong Kong Stock Market and Banking Sector, along with the growth of the economy, indicates that financial resources are abundant in Hong Kong. If the debt financing instruments are appropriately structured and an active secondary market is established for trading of the securities, a fertile source of capital are available for debt financing. The favorable response to the Dragon Bond and Hong Kong dollar debt issues by supranational reflects the considerable wealth which has been amassed in the past decades of hypergrowth.[HKB, 1994]² Since Mortgage-backed securities possess a more favorable feature than the standard

corporate bonds such as a substantially higher interest rate and a more stable and predictable return, it is believed that Mortgage-backed securities should be more attractive than bonds to mobilize the large pool of savings.

Despite the lots of hurdles that issuers have to jump over in developing the Mortgage-backed securities market in Hong Kong, many issuers are still very positive about the future of the market. Chase Manhattan is planning a mortgage bond sale in this year while Bank of America (Asia) is studying the second issue of Mortgage-backed securities in Hong Kong. In fact, besides Mortgage-backed securities, many financial issuers start to examine the feasibility of other asset-backed securities to broaden the investor base. Citicorp Commercial Finance (HK) Ltd., a special company of the Hong Kong branch of Citibank, plans to issue a HK$ 500 million automobile-loan backed bonds in 1995 and an asset-backed transaction securitized with credit card receivable is being studied and plans to be issued in late 1995. In sum, the future of the Mortgage-backed securities market is very bright.
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