

*Eliminating Mortgage Insurance through
Risk-Adjusted Interest Rates
(The Securitization of Mortgage Default Risk)*

Bruce D. Fell, FCAS, MAAA
William S. Ober

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Abstract

Mortgage Insurance (MI) provides protection to mortgage banks and investors of mortgage-backed securities (MBS) from the risk of default by the borrower. This paper will discuss several alternatives that could significantly diminish the need for MI. Some of these alternatives are currently available while others are purely theoretical.

We will begin with a brief overview of basic mortgage concepts, products and the marketplace. This is followed by an overview of the securitization of mortgages into MBSs and the current requirements for MI. We will then discuss alternatives to traditional MI that are currently available in the marketplace. These alternatives (1) incorporate the default risk into the mortgage structure, (2) are less expensive to consumers and (3) provide banks and MBS investors with higher investment risk/return opportunities. With more widespread acceptance of these products, banks and MBS investors could significantly reduce the need for the mortgage insurance industry.

Next, we will discuss additional alternatives that could facilitate the inclusion of default risk through risk-adjusted interest rates that vary with the risk appetite of investors. These products might be developed to further the securitization of these risks.

Finally, we will discuss how other risks, such as homeowners risk, could be included in the mortgage and how these products might be structured.

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About the Authors

Bruce D. Fell is a Fellow of the Casualty Actuarial Society and a Member of the American Academy of Actuaries. Mr. Fell is employed by Arthur Andersen LLP in Philadelphia, Pennsylvania as an Experienced Manager and Consulting Actuary specializing in the reinsurance industry. Prior to joining Arthur Andersen LLP, Mr. Fell was a Vice President with Alexander & Alexander, Inc. and an Assistant Vice President with American Re-Insurance Company. Mr. Fell is currently a member of the American Academy of Actuaries Index Securitization Task Force and has been a presenter at the Casualty Actuaries in Reinsurance (CARE) Seminar.

William S. Ober is employed by Arthur Andersen LLP in Hartford, Connecticut as a Senior Staff Actuary. Prior to joining Arthur Andersen, Mr. Ober was employed by the Hartford Insurance Group and Deloitte & Touche LLP. He is currently pursuing the examinations required for membership in the Casualty Actuarial Society (CAS).

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I. Introduction

Are the financial markets prepared to take on the risks associated with securitized insurance risk? Will the financial markets accept products where principal is placed more at risk? What products will facilitate the most efficient transfer of risk? These are all questions that the insurance industry, investment banks and other financial institutions have begun to investigate, and answer in the past few years. The topic has received significant coverage in the insurance trade press, and many insurers, reinsurers, brokers and investment banks have invested substantially to create capabilities although only a limited number of actual transactions have been completed. Regardless of the technical structure of these transactions, whether through catastrophe bonds issued by special purpose reinsurers, swaps, equity puts, contingent capital or financial futures, they have mostly been related to the risks associated with catastrophes, most commonly earthquakes and windstorms. These transactions are usually structured on an aggregate basis to provide a form of excess of loss reinsurance to the issuing insurer or reinsurer. The risk is either both heterogeneous and not readily comparable to other transactions or based on an index that may or may not correlate to the issuer's actual risk.

The most common analogy to insurance securitization presented in most expositions on the subject is mortgage securitization or the mortgage-backed security (MBS). The MBS is the bundling of many homogeneous and almost indistinguishable individual mortgages each individually exposing the investor to relatively little risk. As a result, the diversification resulting from this bundling provides the investor with benefits similar to those provided by a diversified portfolio of stocks. The investor eliminates the unique (diversifiable) risk and is left exposed only to market risks including interest rate risk, reinvestment risk and prepayment risk.

Insurance risks that fit this model, and that are most similar to mortgages, would appear to be homogeneous consumer-oriented risks such as homeowners insurance or personal automobile insurance. The individual risks from these policies are relatively small, and when bundled, can diversify the unique risks and leave investors exposed only to the results of the aggregate portfolio. In contrast to this logic, the current emphasis in the marketplace is at the opposite end of the spectrum. Rather than bundling small individual and homogeneous risks, the market has created the catastrophe bond, and other similar insurance linked securities, which

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present the investor with a unique security that is difficult to both evaluate and diversify with other insurance linked securities.

Along the lines of the individual homogeneous risk there exists another insurance product that is consumer-oriented and lends itself well to securitization. Mortgage Insurance (MI), or Private Mortgage Insurance (PMI), provides coverage to mortgage investors for credit (default) risk when the borrower does not hold a large enough ownership stake (usually 20%) in the real estate transaction. The need for this coverage is largely due to the underwriting requirements that exist to increase the homogeneity of mortgages and are set forth by the clearinghouses that convert individual mortgages into MBSs.

With more sophisticated clearinghouses, the need for MI, along with this sector of the insurance industry, could be substantially reduced. In addition, due to the favorable tax treatment afforded to mortgage interest, the financial markets can make a larger profit at a lower price to consumers. In economic terms, the current market would seem to be in a state of inefficiency.

After presenting the basic concepts of mortgages, mortgage-backed securities and mortgage insurance, this paper will describe, in detail, the inefficiency that exists in the current market and present alternatives that could diminish this inefficiency through both existing and new products. We will also present the implications of the widespread use of these products and conclude by proposing other possible insurance products that could be treated similarly. Those readers familiar with mortgages, mortgage-backed securities and mortgage insurance may choose to skip to Section V.

II. Mortgages

Basic concepts

“A mortgage is a loan secured by the collateral of a specific real estate property”.¹ The lender (or mortgagee) lends money to the borrower (or mortgagor) in return for a series of scheduled payments of interest and principal. Borrowers and lenders come together in the mortgage market, a market where borrowers can find lenders who are willing to lend them money in return for a premium over the risk-free rate. If the borrower fails to make payments on

¹ Fabozzi, Frank J. et al, “The Handbook of Fixed Income Securities”, Fourth Edition. Irvin Professional Publishing; 1995. Page 483

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schedule the lender can foreclose on the property and take control of it. There are two broad categories of mortgages, residential and commercial. This paper will only discuss the single family residential mortgage market.

Current Products

With regard to interest rates, there are primarily three types of single family residential mortgage products. The fixed rate mortgage is perhaps the most popular option with a pre-determined interest rate and level monthly payment over the entire term of the loan. The borrower's repayment is amortized over a fixed period of time, typically 15, 20 or 30 years. The payments are amortized; meaning that with the fixed monthly payment, a portion is the interest owed and the remainder is a payment of principal. The value of the original loan plus accrued interest will be paid at the end of the period.

Another mortgage type is an adjustable rate mortgage (ARM) where the interest rate rises and falls in accordance with a published market interest rate -- usually the London Inter-Bank Offering Rate (LIBOR) or the United States Treasury bill rate.

The third type of mortgage is a combination mortgage that combines a fixed rate and an adjustable rate into one mortgage product. A combination loan offers a fixed rate during an initial period, typically 3, 5 or 7 years, after which the interest rate is adjusted annually or semi-annually. In addition to these products, there is other more complex mortgage products available to consumers, such as balloon mortgages, that are beyond the scope of this paper.

Mortgage Underwriting Requirements

Besides the borrower's credit rating, most lending institutions use two primary underwriting requirements to determine whether a borrower will be approved for the requested loan amount. These two requirements are the loan-to-value (LTV) ratio and the debt ratio.

The ratio of a mortgage loan to the underlying property's appraised value is referred to as the LTV ratio. This is an underwriting requirement used in determining a borrower's ownership stake in the property. If the equity in the property is too low (i.e., LTV ratio is too high), the borrower is more likely to default on the loan since there is little to lose, in particular if property values have declined. As a result, if the LTV ratio is higher than 80 percent, a lending institution will usually require a borrower to purchase mortgage insurance.

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A lender will determine a potential borrower's ability to repay their mortgage by calculating two ratios of debt expense to gross income. The first ratio is calculated as the monthly amount of principal, interest, real estate taxes and homeowners insurance related to the subject property divided by the borrower's gross monthly income. This ratio is usually referred to as a PITI (Principal, Interest, Tax, and Insurance) or Front ratio. If a borrower were required to purchase PMI this would also be included in their PITI ratio. To qualify for a mortgage, a lender will require that a borrower's PITI ratio not exceed 28 percent of their gross income. A further qualifying requirement is that a borrower's total monthly debt load (PITI plus all other monthly loan payments such as, car loans, credit card bills, etc.) not exceed 36 percent of a borrower's gross monthly income. This is usually referred to as the Back ratio. In order to qualify for the mortgage, both the front and back ratios must be satisfied.

In addition to the above ratios, there are restrictions on the loan amount. A conforming mortgage is one with a loan amount of less than \$227,250, a limit that is adjusted annually by the national clearinghouses. A mortgage greater than \$227,250 is referred to as a non-conforming or jumbo loan. Jumbo mortgages cannot be sold to the Federal National Mortgage Association or the Federal Home Loan Mortgage Corporation and, as a result, tend to carry a higher interest rate.

Mortgage Origination and Servicing

The mortgage originator is the lending institution that originally makes the loan. Typically these are commercial banks, thrifts and mortgage bankers. Mortgage originators profit by charging an origination fee either in the form of a fixed fee (often referred to as discount points) or a percentage of the loan value. If a potential borrower qualifies for a loan, the mortgage originator has three options: (1) carry the loan and receive principal and interest payments, (2) sell the mortgage in the secondary market, or (3) issue mortgage-backed securities.²

If the lending institution carries the loan or issues MBSs, the mortgage must be serviced. A mortgage servicer is used to provide payment notices, collect monthly payments, forward proceeds to owners of the loans, and administer escrow accounts. The mortgage servicer usually charges a fee equal to a percentage of the outstanding loan balance.³

² Ibid. Pages 484-5

³ Ibid. Pages 485-6

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There is a prepayment risk to the holder of a mortgage loan, whether it is the mortgage originator or the holder of the MBS. Most mortgage loans have no penalty for early payment of principal, so consequently, holders of MBSs have an uncertain cash flow that is dependent on the payments of the borrower. A borrower could prepay the loan for a number of reasons, including mortgage refinancing or relocation.⁴ Investors are especially at risk of borrower prepayments since prudent borrowers will adversely select against investors; prepaying mortgages when interest rates decline.

III. Mortgage-Backed Securities

There are three types of mortgage-backed securities: (1) Mortgage pass-throughs, (2) Collateralized mortgage obligations (CMOs) and (3) Stripped mortgage-backed securities. With a mortgage pass-through, the issuer or servicer of the mortgage “passes through” the principal and interest to investors, hence the name pass-through. The actual cash flow may vary from month to month because borrowers can prepay their loans without penalty, in which case the amount of prepayment would be passed on to the investor. A CMO is a multi-class bond backed by a pool of mortgage pass-throughs. Each class is referred to as a tranche that determines the investor’s priority in receiving principal and interest. Once the mortgage servicer collects payments, the CMO issuer distributes cash flows to the bondholders depending upon their tranche. Stripped mortgage-backed securities split the payment into principal only or interest only payments.^{5,6}

The majority of mortgage-backed securities are issued or guaranteed by one of several agencies of the U.S government that act as national clearinghouses for mortgages. The Government National Mortgage Association (Ginnie Mae) is a government-owned corporation within the Department of Housing and Urban Development. The Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Association (Freddie Mac) are government sponsored agencies but are owned by stockholders. These agencies buy mortgage loans originated by lending institutions that meet their underwriting guidelines.⁷

⁴ Ibid. Page 487

⁵ Ibid. Pages 16-7

⁶ Source: On the internet at <http://www.investinginbonds.com>

⁷ Source: On the internet at <http://www.investinginbonds.com>

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IV. Mortgage Insurance

Borrowers who have less than a 20 percent downpayment when purchasing a home will usually need to purchase mortgage insurance. Mortgage insurance protects the holder of the mortgage in case of default by the borrower. If a borrower defaults on the loan and was required to purchase mortgage insurance, the mortgage insurance company will reimburse the holder of the loan with a predetermined amount of the remaining principal owed by the borrower. Both Ginnie Mae and Freddie Mac have underwriting restrictions stipulating that borrowers with an LTV ratio greater than 80 percent must purchase mortgage insurance.

By requiring a large downpayment, lending institutions encourage borrowers to take a personal stake in their properties so that in the event of a financial downturn, borrowers will be less likely to walk away from their mortgages. If a lender wants to sell a mortgage to Ginnie Mae or Freddie Mac the loan must meet these underwriting criteria.

Mortgage insurance premium is charged annually as a percentage of the outstanding loan balance or charged up front at the time of the loan. Mortgage insurance rates vary according to the LTV ratio and the duration of the loan. The higher the LTV ratio (or equivalently the smaller the downpayment) and the longer the duration of the loan, the higher the mortgage insurance premium. Borrowers can purchase a home with mortgage insurance with as little as a three- percent equity stake. Unlike mortgage interest, mortgage insurance premiums are not tax-deductible to the consumer.

V. Market Inefficiency

With a basic understanding of mortgages and mortgage insurance, we can now discuss in detail the inefficiency that exists in today's marketplace. As a result of the clearinghouses, mortgage originators and lenders have rigid underwriting standards for anyone interested in obtaining a mortgage to purchase real estate. Although different interest rates are available for borrowers with different credit ratings, the loan-to-value (LTV) requirement does not vary. Prior to the securitization of mortgages, each lender developed its own underwriting guidelines reflecting the amount of risk it was willing to take. Some lenders had lower LTV requirements while others allowed higher LTV ratios. This is still true today for lenders who do not sell their

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mortgages. However, if a lender originates a mortgage that it plans to later sell, the mortgage must have an LTV of lower than 80% or require the borrower to purchase MI.

At the same time, lenders are providing home equity loans (second mortgages) to existing homeowners with LTV ratios lower than 80% prior to the issuance of the home equity loan. However, after the issuance of these home equity loans, the aggregate LTV of all debt (first and second mortgages combined) could be as high as 125% of the appraised real estate value. Most often, these second mortgages have shorter terms and higher interest rates than the conforming 30-year mortgage. However, mortgage insurance is not required since the first mortgage remains below the 80% LTV requirement. In these cases, the lender is compensated for the additional risk of a higher LTV through the higher interest rate charged on the second mortgage. The higher interest cost to the consumer is offset by the tax-deductibility of the interest expense for federal (and some state) taxes. However, the federal tax deductibility is limited to interest on loans up to a 100% LTV.

Some astute readers, by now, may realize where this discussion is headed. If a first and second mortgage are issued simultaneously on the real estate at the time of purchase, the lender can charge a higher rate on the second mortgage while still fulfilling the clearinghouse requirement of an 80% LTV on the first mortgage. For the consumer, the additional, but tax-deductible, interest expense replaces the non-tax-deductible mortgage insurance premium. The bank accepts the risk formerly transferred to the mortgage insurer for more interest income, and the mortgage insurer is eliminated from the transaction.

Several questions remain including: (1) whether it is less expensive for banks or mortgage insurers to accept this risk; (2) whether banks and institutional investors are willing to accept the additional risk; and (3) if banks can accept this risk more efficiently, why do mortgage insurers still prosper? We will provide answers to the first two questions however; the third will be left for the reader to ponder.

VI. Alternative Product Offerings

As mentioned above, the alternative option would require two mortgages. The first mortgage would be issued for 80% of the purchase price (80% LTV) and structured over a 30 year term with an 8.0% rate (8.30% yield). The second mortgage would be issued for 10% of the purchase

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price and structured over a 10 year term with an 11% rate (11.57% yield). This program is often referred to as an 80/10/10 program (80% first mortgage, 10% second mortgage, and 10% down payment). The first impression of many upon hearing this option would be one of disbelief. Why would one pay more interest? However, as provided below, the 80/10/10 program is, in fact, less expensive to the consumer than a single mortgage with mortgage insurance.

In order to present this cost saving, the cashflow (including federal taxes) required for the traditional 30-year mortgage at 90% LTV with mortgage insurance is compared to the cashflow required for the 80/10/10 program. Exhibit 1 presents a summary of the two options along with the differences between them. Exhibit 2 presents the detailed cashflow analysis for the traditional option while Exhibit 3 presents the detailed cashflow analysis for the 80/10/10 program. As can be seen from Exhibit 1, the before-tax yield is less for the 80/10/10 program by 32.6 basis points.⁸ After reflecting tax deductions this difference increases to 33.9 basis points. As a result, regardless of tax bracket, the 80/10/10 program is less expensive for the consumer than the traditional mortgage with mortgage insurance.

The one drawback to the 80/10/10 program is that a larger monthly payment is initially required. The monthly payment for the 80/10/10 program costs an additional \$23.75 per month growing to \$128.75 per month in the tenth year just before the second mortgage is satisfied. However, on an after-tax basis the additional monthly cost is only \$9.99 growing to \$107.51. As a result, this would seem to be a small cost to pay to save a substantial amount.

From this example, it would appear that banks have a distinctive advantage over mortgage insurers. To determine the extent of this advantage, we calculated the maximum rate on the second mortgage that would result in the same composite after-tax yield as the traditional program. Exhibit 4 presents this scenario which results in an annual rate of 18.737% (20.432% yield). It is clear from this exhibit that banks could increase rates significantly and still have a competitive advantage over mortgage insurers.

In addition to the 80/10/10 program, there are several other options available with the same advantages. The 75/15/10 requires the same downpayment with more debt included in the second mortgage. There are also programs available such as the 70/15/5/5 that add a third

⁸ 100 basis points equal 1.0%

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mortgage with a higher interest rate and a downpayment of only 5%. Many other programs are available and each should be tested to determine the most favorable terms for the consumer. Unfortunately, most mortgage bankers and brokers could not perform the necessary analysis required to determine the least expensive program.

With all these types of programs the lender is allowed to securitize the first mortgage, however it is unable to securitize the secondary and tertiary mortgages and it is therefore required to carry them until the borrower satisfies them. This may explain why these programs have not become widespread. In 1996, 15 different commercial banks, mortgage banks and mortgage brokers were contacted to determine the availability of these types of programs. Several had never heard of them and only two were able to provide them. It would seem that banks would be scrambling to put these programs together, however due to the limited liquidity, many are not interested.

These programs provide a clear example of the efficiency of the capital markets to accept risk at a significantly lower cost than insurers. In addition, the capital markets pass the savings on to consumers who also benefit from the tax-deductibility of the additional interest rather than paying premiums that are not tax deductible.

VII. New Mortgage Product Possibilities

In addition to the programs discussed above, there are numerous other structures that could be developed and tailored to meet the need of borrowers. There is no magical formula that requires the debt to be split into first, second and even third mortgages. One can envision a multi-tiered interest rate structure where the rate varies based on the LTV. Higher LTV ratios would result in higher interest rates but all within one loan. In order to avoid refinancing once the borrower's LTV ratio drops, a multi-tiered step-down approach could be used where the interest rate automatically drops once certain benchmark LTV ratios are reached. When the borrower reaches 80% (or slightly lower to protect the investor in the event of property value declines) the rate is at its lowest. If the initial monthly payment resulting from the higher rate is too high for the borrower, a constant rate structure could be used or the structure could be extended to adjustable rate mortgages.

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In order for these types of programs to develop, the existing mortgage clearinghouses would need to expand their underwriting guidelines to allow these programs. They could then bundle mortgages based on LTV ratios, offering investors of mortgage-backed securities several options with varying degrees of risk and return. There could even be a sort of “junk mortgage bond”.

An alternative to making changes at the clearinghouse level would be the establishment of captive mortgage insurance companies. Currently, some lenders have captive insurers in order to share in the profits of the mortgage insurers, often through quota share reinsurance programs. However, the lenders could also issue mortgage insurance through the captive on a bundled mortgage basis and eliminate the mortgage insurers completely. They could even be structured as an aggregate excess of loss cover wherein the bundled mortgages are protected only from significant losses. This option may be impacted by possible financial services legislation currently under consideration by Congress that could reduce the current limitations on banks owning insurers and vice versa.

VIII. Implications of New Mortgage Product Possibilities

The implications of these new mortgage structures could be significant. In particular, if the clearinghouses expanded their underwriting, mortgage insurers could be in for a major uphill battle. We are not advocates for the elimination of the insurance industry. However, it would seem possible that, over time, the mortgage insurers could be headed for extinction. This could be a precursor to the advent of securitization that could have a similar impact on other segments of the insurance industry.

The major service that mortgage insurers could still provide in the future would be underwriting. Currently, mortgage insurers evaluate individuals to determine the credit risk that they are accepting through the mortgage insurance. In the future this risk will remain with investors, and the investors will need to determine the risk associated with various securities. Mortgage insurers could continue to provide the underwriting function for lenders on a contract services basis.

It would also seem reasonable to assume that the new higher risk/higher reward securities would require ratings just as corporate bonds are currently rated by Standard & Poor's or

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Moody's. The rating service could be a natural extension of the underwriting service that mortgage insurers would provide.

Finally, it would seem that widespread acceptance of these programs would make homeownership available to a whole class of people that previously were unable to obtain a mortgage as a result of the inability to save a larger downpayment. Although the Federal Housing Authority (FHA) and the Veterans Administration (VA) currently provide opportunities for low downpayment mortgages, the alternative programs discussed here would provide additional alternatives.

IX. Inclusion of Other Insurance Exposures (Future Research)

In addition to the inclusion of credit risk associated with the mortgage, there are other risks that could be included within the mortgage to provide even more investment options. Another cost associated with homeownership is the cost of homeowners insurance. All lenders require that the real estate be insured so that they are protected in the event that the house is damaged or destroyed. It would seem plausible that a portion of the property component of the homeowners policy could be incorporated into the mortgage itself. Obviously, the homeowner would be inclined to purchase insurance for his equity ownership and for any liability that might result from that ownership. However, why not transfer the risk of catastrophic destruction to the lender? If the building is destroyed, the homeowner could collect his equity stake from his insurer and default on the loan, thereby transferring the risk to the lender (This default would need to be an allowable default that does not blemish the homeowner's credit rating). If the homeowner were interested in rebuilding the structure, he would be free to obtain new financing for the construction of the home through a brand new mortgage.

A variation on this theme could also be applied to automobile physical damage insurance. If a car loan is provided upon purchase, the lenders proportionate share of the car's value could be included in the loan rate. The purchaser of the vehicle would then only need to purchase coverage if desired for his proportionate share.

This type of program may be subject to inherent flaws, adverse selection and additional administrative burden. In particular, coinsurance requirements in property insurance strive to protect the insurer from a policyholder underinsuring the property and having most of the

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losses covered. A similar problem might exist with the insurance risk split between the lender and the borrower. This program may not present the most efficient transfer of risk although it would appear to be more efficient from a tax and transaction perspective. Regardless of these issues, it would seem that this idea would warrant further investigation and discussion.

X. Conclusion

As presented above, there is an inherent inefficiency in the current mortgage insurance industry. This inefficiency is brought about by the underwriting requirements of mortgage clearinghouses that bundle mortgages into mortgage-backed securities. These requirements limit the ability of mortgage lenders to securitize mortgages with loan-to-value ratios higher than 80%. As a result, borrowers are forced to purchase mortgage insurance in order to meet the underwriting requirements of lenders. However, alternatives to mortgage insurance currently exist that provide borrowers with a less costly means of financing homeownership. These alternatives also provide additional investment opportunities for lenders seeking alternative risk/reward opportunities. In addition, new product offerings are possible that could provide additional alternatives to borrowers if certain marketplace changes could be implemented. These changes could have significant ramifications on the mortgage insurance industry as it exists today and could reshape the role it plays in the future. Finally, additional risks like the property component of homeowners insurance risk could be included in the mortgage product.

Summary of Mortgage Options

	Traditional Mortgage	80/10/10 Option			Savings/ (Cost)	80/10/10 Option - Maximum 2nd Rate			
		First Mortgage	Second Mortgage	Composite		First Mortgage	Second Mortgage	Composite	Savings/ (Cost)
Property Value	200,000.00			200,000.00	0.00			200,000.00	0.00
Loan Amount	180,000.00	160,000.00	20,000.00	180,000.00	0.00	160,000.00	20,000.00	180,000.00	0.00
Marginal Federal Income Tax Rate	28.0%			28.0%				28.0%	
Before Tax Interest Rate (Compounded Monthly)	8.000%	8.000%	11.000%	8.169%	-0.169%	8.000%	18.737%	8.666%	-0.666%
Term to Maturity (Months)	360	360	120	N/A		360	120	N/A	
Monthly Payment (1st 10 years)	1,320.78	1,174.02	275.50	1,449.52	(128.75)	1,174.02	369.91	1,543.93	(223.16)
Monthly Payment (After 10 years)	1,320.78	1,174.02	0.00	1,174.02	146.75	1,174.02	0.00	1,174.02	146.75
PMI Rate	0.700%	N/A	N/A	N/A		N/A	N/A	N/A	
Nominal Cost of Mortgage Payments	475,479.44	422,648.39	33,060.00	455,708.40	19,771.05	422,648.39	44,389.11	467,037.50	8,441.94
Nominal Costs of PMI	11,192.40	0.00		0.00	11,192.40	0.00		0.00	11,192.40
Total Before Tax Nominal Costs	486,671.84	422,648.39	33,060.00	455,708.40	30,963.44	422,648.39	44,389.11	467,037.50	19,634.34
Effective Before-Tax Yield of Payments	8.808%	8.300%	11.572%	8.482%	0.326%	8.300%	20.432%	9.019%	-0.211%
Tax Savings from Interest Deduction	(82,734.24)			(77,198.35)	(5,535.89)			(80,370.50)	(2,363.74)
Total After-Tax Nominal Costs	403,937.60			378,510.05	25,427.55			386,667.00	17,270.60
Annual Effective After-Tax Yield of Payments	6.369%			6.030%	0.339%			6.369%	0.000%
After-Tax Monthly Yield	0.516%			0.489%	0.027%			0.516%	0.000%

30 Year Fixed Rate Mortgage
90% Loan-To-Value with Mortgage Insurance

Mortgage Assumptions	
Annual Interest Rate =	8.000%
Monthly Yield =	0.667%
Term =	360
Loan Amount =	180,000.00
Monthly Payment =	1,320.78
Total Property Value =	200,000.00
Loan-to-Value Ratio =	90.0%
Mortgage Ins Prem Rate =	0.700%
Marginal Fed Tax Rate =	28.0%

Output	
After-Tax Monthly Yield =	0.516%
After-Tax Annual Interest Rate =	6.369%
Before-Tax Annual Interest Rate =	8.846%
Present Value of After-Tax Costs =	180,000.00
Nominal Value of After-Tax Costs =	403,937.60
Modified Duration of After-Tax Costs =	4.81

30 Year Fixed Rate Mortgage
90% Loan-To-Value with Mortgage Insurance

Time	First Mortgage				Mortgage Insurance Premium	Tax Savings	Total After-Tax Costs	Present Value After-Tax Costs
	Outstanding Principal Balance	Interest Expense	Principle Repayment	Total P&I Payment				
1	180,000.00	1,200.00	120.78	1,320.78	105.00	(336.00)	1,089.78	1,084.18
2	179,879.22	1,199.19	121.58	1,320.78	104.93	(335.77)	1,089.93	1,078.77
3	179,757.64	1,198.38	122.39	1,320.78	104.86	(335.55)	1,090.09	1,073.39
4	179,635.25	1,197.57	123.21	1,320.78	104.79	(335.32)	1,090.24	1,068.03
5	179,512.04	1,196.75	124.03	1,320.78	104.72	(335.09)	1,090.40	1,062.71
6	179,388.01	1,195.92	124.86	1,320.78	104.64	(334.86)	1,090.56	1,057.41
7	179,263.16	1,195.09	125.69	1,320.78	104.57	(334.62)	1,090.72	1,052.14
8	179,137.47	1,194.25	126.53	1,320.78	104.50	(334.39)	1,090.88	1,046.89
9	179,010.94	1,193.41	127.37	1,320.78	104.42	(334.15)	1,091.05	1,041.67
10	178,883.57	1,192.56	128.22	1,320.78	104.35	(333.92)	1,091.21	1,036.48
11	178,755.35	1,191.70	129.07	1,320.78	104.27	(333.68)	1,091.37	1,031.32
12	178,626.28	1,190.84	129.93	1,320.78	104.20	(333.44)	1,091.54	1,026.18
13	178,496.34	1,189.98	130.80	1,320.78	104.12	(333.19)	1,091.71	1,021.07
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348	16,394.83	109.30	1,211.48	1,320.78	-	(30.60)	1,290.17	215.28
349	15,183.36	101.22	1,219.55	1,320.78	-	(28.34)	1,292.43	214.55
350	13,963.80	93.09	1,227.68	1,320.78	-	(26.07)	1,294.71	213.82
351	12,736.12	84.91	1,235.87	1,320.78	-	(23.77)	1,297.00	213.10
352	11,500.25	76.67	1,244.11	1,320.78	-	(21.47)	1,299.31	212.38
353	10,256.14	68.37	1,252.40	1,320.78	-	(19.14)	1,301.63	211.67
354	9,003.74	60.02	1,260.75	1,320.78	-	(16.81)	1,303.97	210.96
355	7,742.99	51.62	1,269.16	1,320.78	-	(14.45)	1,306.32	210.26
356	6,473.83	43.16	1,277.62	1,320.78	-	(12.08)	1,308.69	209.56
357	5,196.21	34.64	1,286.13	1,320.78	-	(9.70)	1,311.08	208.86
358	3,910.08	26.07	1,294.71	1,320.78	-	(7.30)	1,313.48	208.17
359	2,615.37	17.44	1,303.34	1,320.78	-	(4.88)	1,315.89	207.48
360	1,312.03	8.75	1,312.03	1,320.78	-	(2.45)	1,318.33	206.80
		295,479.44	180,000.00	475,479.44	11,192.40	(82,734.24)	403,937.60	180,000.00

30 Year First Mortgage - 10 Year Second Mortgage
 80%/10% Loan-To-Value without Mortgage Insurance

First Mortgage Assumptions	
Annual Interest Rate =	8.000%
Monthly Yield =	0.667%
Term =	360
Loan Amount =	160,000.00
Monthly Payment =	1,174.02
Total Property Value =	200,000.00
Loan-to-Value Ratio =	80.0%
Mortgage Ins Prem Rate =	0.700%
Marginal Fed Tax Rate =	28.0%

Second Mortgage Assumptions	
Annual Interest Rate =	11.000%
Monthly Yield =	0.917%
Term =	120
Loan Amount =	20,000.00
Monthly Payment =	275.50
Total Property Value =	200,000.00
Loan-to-Value Ratio =	10.0%

Output	
After-Tax Monthly Yield =	0.489%
After-Tax Annual Interest Rate =	6.030%
Before-Tax Annual Interest Rate =	8.375%
Present Value of After-Tax Costs =	180,000.00
Nominal Value of After-Tax Costs	378,510.05
Modified Duration of After-Tax C	5.01

30 Year First Mortgage - 10 Year Second Mortgage
 80%/10% Loan-To-Value without Mortgage Insurance

Time	First Mortgage				Second Mortgage				Mortgage Insurance Premium	Tax Savings	Total After-Tax Costs	Present Value After-Tax Costs
	Outstanding Principal Balance	Interest Expense	Principle Repayment	Total P&I Payment	Outstanding Principal Balance	Interest Expense	Principle Repayment	Total P&I Payment				
1	160,000.00	1,066.67	107.36	1,174.02	20,000.00	183.33	92.17	275.50	-	(350.00)	1,099.52	1,094.17
2	159,892.64	1,065.95	108.07	1,174.02	19,907.83	182.49	93.01	275.50	-	(349.56)	1,099.96	1,089.28
3	159,784.57	1,065.23	108.79	1,174.02	19,814.82	181.64	93.86	275.50	-	(349.12)	1,100.40	1,084.41
4	159,675.78	1,064.51	109.52	1,174.02	19,720.96	180.78	94.72	275.50	-	(348.68)	1,100.84	1,079.57
5	159,566.26	1,063.78	110.25	1,174.02	19,626.23	179.91	95.59	275.50	-	(348.23)	1,101.29	1,074.75
6	159,456.01	1,063.04	110.98	1,174.02	19,530.64	179.03	96.47	275.50	-	(347.78)	1,101.74	1,069.96
7	159,345.03	1,062.30	111.72	1,174.02	19,434.17	178.15	97.35	275.50	-	(347.33)	1,102.20	1,065.19
8	159,233.31	1,061.56	112.47	1,174.02	19,336.82	177.25	98.25	275.50	-	(346.87)	1,102.66	1,060.44
9	159,120.84	1,060.81	113.22	1,174.02	19,238.57	176.35	99.15	275.50	-	(346.40)	1,103.12	1,055.72
10	159,007.62	1,060.05	113.97	1,174.02	19,139.43	175.44	100.06	275.50	-	(345.94)	1,103.58	1,051.03
11	158,893.65	1,059.29	114.73	1,174.02	19,039.37	174.53	100.97	275.50	-	(345.47)	1,104.05	1,046.36
12	158,778.91	1,058.53	115.50	1,174.02	18,938.40	173.60	101.90	275.50	-	(345.00)	1,104.53	1,041.71
13	158,663.42	1,057.76	116.27	1,174.02	18,836.50	172.67	102.83	275.50	-	(344.52)	1,105.00	1,037.09
348	14,573.18	97.15	1,076.87	1,174.02	0.00	0.00	0.00	0.00	-	(27.20)	1,146.82	209.92
349	13,496.32	89.98	1,084.05	1,174.02	0.00	0.00	0.00	0.00	-	(25.19)	1,148.83	209.27
350	12,412.27	82.75	1,091.27	1,174.02	0.00	0.00	0.00	0.00	-	(23.17)	1,150.85	208.62
351	11,320.99	75.47	1,098.55	1,174.02	0.00	0.00	0.00	0.00	-	(21.13)	1,152.89	207.97
352	10,222.44	68.15	1,105.87	1,174.02	0.00	0.00	0.00	0.00	-	(19.08)	1,154.94	207.32
353	9,116.57	60.78	1,113.25	1,174.02	0.00	0.00	0.00	0.00	-	(17.02)	1,157.01	206.68
354	8,003.32	53.36	1,120.67	1,174.02	0.00	0.00	0.00	0.00	-	(14.94)	1,159.08	206.05
355	6,882.66	45.88	1,128.14	1,174.02	0.00	0.00	0.00	0.00	-	(12.85)	1,161.18	205.41
356	5,754.52	38.36	1,135.66	1,174.02	0.00	0.00	0.00	0.00	-	(10.74)	1,163.28	204.78
357	4,618.86	30.79	1,143.23	1,174.02	0.00	0.00	0.00	0.00	-	(8.62)	1,165.40	204.16
358	3,475.63	23.17	1,150.85	1,174.02	0.00	0.00	0.00	0.00	-	(6.49)	1,167.54	203.54
359	2,324.77	15.50	1,158.52	1,174.02	0.00	0.00	0.00	0.00	-	(4.34)	1,169.68	202.92
360	1,166.25	7.77	1,166.25	1,174.02	0.00	0.00	0.00	0.00	-	(2.18)	1,171.85	202.31
	262,648.39	160,000.00	422,648.39		13,060.00	20,000.00	33,060.00		0.00	(77,198.35)	378,510.05	180,000.00

30 Year First Mortgage - 10 Year Second Mortgage - Maximum 2nd Mortgage Rate
 80%/10% Loan-To-Value without Mortgage Insurance

First Mortgage Assumptions	
Annual Interest Rate =	8.000%
Monthly Yield =	0.667%
Term =	360
Loan Amount =	160,000.00
Monthly Payment =	1,174.02
Total Property Value =	200,000.00
Loan-to-Value Ratio =	80.0%
Mortgage Ins Prem Rate =	0.700%
Marginal Fed Tax Rate =	28.0%

Second Mortgage Assumptions	
Annual Interest Rate =	18.737%
Monthly Yield =	1.561%
Term =	120
Loan Amount =	20,000.00
Monthly Payment =	369.91
Total Property Value =	200,000.00
Loan-to-Value Ratio =	10.0%

Output	
After-Tax Monthly Yield =	0.516%
After-Tax Annual Interest Rate =	6.369%
Before-Tax Annual Interest Rate =	8.846%
Present Value of After-Tax Costs =	180,000.00
Nominal Value of After-Tax Costs =	386,667.00
Modified Duration of After-Tax Costs	4.73

30 Year First Mortgage - 10 Year Second Mortgage - Maximum 2nd Mortgage Rate
80%/10% Loan-To-Value without Mortgage Insurance

Time	First Mortgage				Second Mortgage				Mortgage Insurance Premium	Tax Savings	Total After-Tax Costs	Present Value After-Tax Costs
	Outstanding Principal Balance	Interest Expense	Principle Repayment	Total P&I Payment	Outstanding Principal Balance	Interest Expense	Principle Repayment	Total P&I Payment				
1	160,000.00	1,066.67	107.36	1,174.02	20,000.00	312.28	57.63	369.91	-	(386.10)	1,157.83	1,151.89
2	159,892.64	1,065.95	108.07	1,174.02	19,942.37	311.38	58.53	369.91	-	(385.65)	1,158.28	1,146.42
3	159,784.57	1,065.23	108.79	1,174.02	19,883.84	310.46	59.45	369.91	-	(385.19)	1,158.74	1,140.99
4	159,675.78	1,064.51	109.52	1,174.02	19,824.39	309.54	60.37	369.91	-	(384.73)	1,159.20	1,135.59
5	159,566.26	1,063.78	110.25	1,174.02	19,764.02	308.59	61.32	369.91	-	(384.26)	1,159.67	1,130.21
6	159,456.01	1,063.04	110.98	1,174.02	19,702.70	307.64	62.27	369.91	-	(383.79)	1,160.14	1,124.87
7	159,345.03	1,062.30	111.72	1,174.02	19,640.43	306.66	63.25	369.91	-	(383.31)	1,160.62	1,119.56
8	159,233.31	1,061.56	112.47	1,174.02	19,577.18	305.68	64.23	369.91	-	(382.82)	1,161.11	1,114.28
9	159,120.84	1,060.81	113.22	1,174.02	19,512.95	304.67	65.24	369.91	-	(382.33)	1,161.60	1,109.03
10	159,007.62	1,060.05	113.97	1,174.02	19,447.71	303.65	66.25	369.91	-	(381.84)	1,162.10	1,103.81
11	158,893.65	1,059.29	114.73	1,174.02	19,381.46	302.62	67.29	369.91	-	(381.34)	1,162.60	1,098.62
12	158,778.91	1,058.53	115.50	1,174.02	19,314.17	301.57	68.34	369.91	-	(380.83)	1,163.11	1,093.46
13	158,663.42	1,057.76	116.27	1,174.02	19,245.83	300.50	69.41	369.91	-	(380.31)	1,163.62	1,088.33
348	14,573.18	97.15	1,076.87	1,174.02	0.00	0.00	0.00	0.00	-	(27.20)	1,146.82	191.36
349	13,496.32	89.98	1,084.05	1,174.02	0.00	0.00	0.00	0.00	-	(25.19)	1,148.83	190.71
350	12,412.27	82.75	1,091.27	1,174.02	0.00	0.00	0.00	0.00	-	(23.17)	1,150.85	190.06
351	11,320.99	75.47	1,098.55	1,174.02	0.00	0.00	0.00	0.00	-	(21.13)	1,152.89	189.42
352	10,222.44	68.15	1,105.87	1,174.02	0.00	0.00	0.00	0.00	-	(19.08)	1,154.94	188.79
353	9,116.57	60.78	1,113.25	1,174.02	0.00	0.00	0.00	0.00	-	(17.02)	1,157.01	188.15
354	8,003.32	53.36	1,120.67	1,174.02	0.00	0.00	0.00	0.00	-	(14.94)	1,159.08	187.52
355	6,882.66	45.88	1,128.14	1,174.02	0.00	0.00	0.00	0.00	-	(12.85)	1,161.18	186.90
356	5,754.52	38.36	1,135.66	1,174.02	0.00	0.00	0.00	0.00	-	(10.74)	1,163.28	186.27
357	4,618.86	30.79	1,143.23	1,174.02	0.00	0.00	0.00	0.00	-	(8.62)	1,165.40	185.66
358	3,475.63	23.17	1,150.85	1,174.02	0.00	0.00	0.00	0.00	-	(6.49)	1,167.54	185.04
359	2,324.77	15.50	1,158.52	1,174.02	0.00	0.00	0.00	0.00	-	(4.34)	1,169.68	184.43
360	1,166.25	7.77	1,166.25	1,174.02	0.00	0.00	0.00	0.00	-	(2.18)	1,171.85	183.82
	262,648.39	160,000.00	422,648.39		24,389.11	20,000.00	44,389.11		0.00	(80,370.50)	386,667.00	180,000.00