

**MORTGAGE INDEMNITY GUARANTEE**

**REPORT OF THE PECUNIARY LOSS WORKING PARTY 1993**

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## 1. EXECUTIVE SUMMARY

- 1.1 This paper describes the recent work of the Pecuniary Loss Working Party (PLWP).
- 1.2 Section 2 provides the context for the recent work and describes the decision to maintain concentration on Mortgage Indemnity Guarantee (MIG).
- 1.3 Section 3 contains descriptions of recent product developments, including the use of captives, and of current market practice in reserving based on a specially arranged survey.
- 1.4 The development of the Macro Relationship Model is covered in Section 4. The key conclusion here is that the PLWP has reached the stage where it can point the way ahead but further progress must be made by individuals and organisations with the appropriate resources.
- 1.5 The general evolution of research into a Catastrophe Warning Indicator is described in Section 5. It is hoped that detailed results will be available for presentation at the GIRO conference in October 1993.
- 1.6 Section 6 covers the further development of the Premium Rating and Reserving Model. The key conclusion here is that not only the levels, but also the "shape" and basis of premium rates depends very strongly on the underwriting assumptions made.
- 1.7 Next steps are covered in Section 7.

## 2. INTRODUCTION

### 2.1 Background

The paper presented by the PLWP at the 1992 GIRO conference provoked considerable discussion leaving a number of avenues open for further research. The PLWP has therefore concentrated attention on making progress in these areas, all of which concern MIG. In addition, market developments have been monitored closely.

### 2.2 PLWP Membership

The 1992 PLWP has again benefited from a broad composition as follows :

P. Akers (Chairman)	:	Lender
P. Delbridge	:	Consultant
P. Edmonds	:	Insurer
J. Leigh	:	Consultant
G. Masters	:	Insurer
N. Shah	:	Consultant

### 2.3 Coverage

The PLWP did consider other areas for research but decided that MIG is still currently the topic of most interest. This paper therefore covers UK MIG only.

### 2.4 Methodology

Standard working party methodology has been used throughout, with interested individual members progressing particular elements and submitting their work to group review.

## 2.5 Acknowledgements

The PLWP chairman places on record his thanks :

- to PLWP members for continued enthusiasm;
- to David Davies for informal research support;
- to all support staff at the Institute of Actuaries;
- to Margaret Robinson and Jane Rowell for ongoing secretarial support.

### 3. MARKET DEVELOPMENTS

#### 3.1 Product Developments

The losses suffered by most mortgage indemnity insurers over the past couple of years have led to a number of product developments designed to restrict the losses that the insurers can suffer in the future. This has been allied with substantial premium rate increases. The developments that have been seen include the following innovations:

(i) 80/20 sharing

In this innovation the mortgage indemnity provider shares in 20% of the total losses arising under the insurance.

(ii) Capping

Here there may be a total restriction on the losses that are paid out in respect of any underwriting year. In particular, this may take the form that the maximum loss is limited to, say, 200% of the premium written for any particular underwriting year.

(iii) Restrictions in Loan to Value Amounts

Here the insurer may place limits on the mortgage indemnity such that, for instance, there is a maximum of 5% of loan amounts which may have LTV greater than 95%, or the insurer may insist that creditor insurance is taken out for very high LTV loans. These restrictions have led to the virtual disappearance of 100% loans.

(iv) No Commission

In general the rates quoted in the market have been net of commission. However, this has not stopped the mortgage providers placing an additional amount upon the net premium required by the insurer in the charge to borrowers.

Not surprisingly, these restrictions on the mortgage indemnity product coupled with the premium rises have led mortgage providers to start looking for potential future alternatives. This search for alternatives has generally gone down two routes:

(i) Self Insurance

In this scenario the lender is responsible for losses arising from any defaults. This alternative may well be linked with some form of excess of loss cover rather than going down the full captive route.

(ii) Captives

This encompasses the major legislative change during the past year. Building Societies are now allowed to set up captive insurance companies to take the risk on mortgage indemnity. However, before these captives are approved by the Building Societies Commission, some reinsurance of the captive will be required. This route seems to be attractive to many of the players in the mortgage market. A number of building societies have started work on proposals for setting up captives. It is believed that one medium sized society has been successful in completing this arrangement. The whole idea would be for all of the mortgage

indemnity premium to be passed to the captive. The captive would obtain some sort of reinsurance on a portfolio basis, for instance something along the lines of 200% excess of 200%. The main problem with this approach is the question of the availability of the reinsurance. The major mortgage indemnity insurers in this country do not seem particularly keen to provide quotations in respect of the excess of loss product. It may be that potential captives may have to look overseas for some of the reinsurance cover for the captives.

Generally reinsurance has not been available to any great extent in the British market since the losses on the mortgage indemnity business became apparent. Logic suggests that following the hardening of rating some market may appear in the future. If the captive route does not prove to be a viable alternative, there are other possibilities for future development of the product:

(i) Portfolio-wide Excess of Loss Covers

This has been mentioned in conjunction with the self-insurance alternative above.

(ii) Income Protection Covers

This will be the development of a product which would ensure that the mortgagee would be covered in the event of any loss in income due to any number of circumstances and the income from this insurance would then be used to pay the mortgage.

## 3.2 UK Reserving Practices

### 3.2.1 Background

With a year's more experience, we felt it worthwhile updating last year's section on reserving practices. To this end, a short questionnaire was sent to the ten main domestic MIG insurers, asking about their general methodology in setting MIG reserves.

This took place against the background of a number of significant developments :

- (i) analysts making rough but well reasoned, and high profile, comparisons between insurers as to the strength of their MIG reserves, using market share, repossession and average claim assumptions;
- (ii) the DTI/GAD insisting MIG should appear as a separate accounting class, with an explicit URR. It is no longer sufficient to claim that expected future losses are covered by margins in non-MIG provisions;
- (iii) insurers now have more data with which to work. This is not just on notified claims but many lenders are providing improved regular information on the state of arrears and repossessions for a particular insurer, including factors such as source of loan, reason for arrears or repossession. With the new contract, insurers are beginning to receive exposure details for the first time, with negotiations well under way to settle comprehensive management information arrangements. It is encouraging to report that relations and co-operation between lenders and insurers remain very good;



- (iv) auditors requiring detailed justification of MIG reserves. Weak arguments that future losses are too uncertain are no longer acceptable.

### 3.2.2 Response

We received 4 replies, with thanks to CIS, GRE, CU, and L&G for participating.

The lack of response from the other main players was disappointing. The subject is clearly a sensitive one, but should the profession and industry not be leading and promoting discussion and development of this topic?

The PLWP therefore asks for the 1993 GIRO conference's view on whether it should discontinue its work on MIG reserving, as many insurers are unwilling to share ideas and information in this forum, preferring to develop in isolation or through informal private exchanges of information with other companies.

### 3.2.3 Summary of Replies

Unless otherwise mentioned, references are to the "old" contract and its continued emerging claims experience.

#### 3.2.3.1 Unearned Premium Reserve (UPR)

This was covered in some detail in last year's Report. Premium is earned in a variety of ways over periods ranging from five to eleven years. The bases are reviewed in line with past and expected experience but changes are infrequent and difficult to judge.

Deductions are made in respect of commission and sometimes initial expenses.

### 3.2.3.2 Outstanding Claims Reserves

Insurers currently fall into one of two camps in accounting for claims.

- (i) Claim occurs on the sale of a repossessed property. Here the outstanding claims reserve covers all sold repossessed properties, notified or not (IBNR). Any allowance for future sales falls into UPR/URR.
- (ii) Claim occurs on the repossession of an insured property. Here the outstanding claims reserve covers all sold or unsold repossessed properties, notified or not (IBNR). Any allowance for future repossessions falls into UPR/URR

However the methods for calculating the amounts involved are similar.

For cases sold and notified, individual case estimates can be used. For cases sold but not notified, some lenders can provide sufficient information for further individual case estimates. Others give the number of properties involved to which an average cost (typically £15,000) can be applied. The amounts involved are still large, given backlogs at lenders and insurers. Improving the quality and speed of information exchange has been the key to setting the amounts involved.

All respondents made allowance for properties in possession but not yet sold. Again, the approach depends on the amount of information available. Given full details of each case from a lender, including estimated sale proceeds, case estimates can be made. At the other end of the scale, given the number of repossessions for a lender, an insurer will have to make allowance for :

- the timing of the information;
- the proportion having MIG cover;
- the proportion relating to the particular insurer;
- the proportion leading to a claim;
- the average claim amount

Typical assumptions are :

- 7 - 10%      uninsured
- 5%              no-claim
- £15,000      average claim

### 3.2.3.3 Unexpired Risk Reserve (URR)

The respondents allowing for current repossessions in outstanding claims do not have unexpired risk reserves. It was not considered necessary, allowing for the UPR available and the margins, including investment income, available in other provisions.

The respondents allowing for all future sales in URR/UPR adopted one of two approaches.

- (i) Repossessed but unsold properties - as already described

Cases currently in arrears - certain percentages are applied to cases 12+, 6 to 11 and 3 to 5 months in arrears to give future repossessions, and 93% of 95% (allowing for 7% not insured and 5% not giving rise to a claim) of these will lead to a claim, to which an average amount is applied.

Future arrears cases - the cost of these is assumed to be balanced by the premium to be earned more than 24 months after the accounting date.

Investment income - claims are discounted at a gross rate of interest.

Margins in non-MIG provision - none.

- (ii) Repossessed but unsold properties - as already described

Future repossessions - a model takes assumed future market repossessions, allocates them to year of mortgage, applies factors representing the company's market share, the proportion having MIG cover, the proportion leading to a claim, and the average claim amount, to obtain the cost of future repossessions on business already written. Assumptions are monitored against emerging experience, the results tested for sensitivity to the assumptions and the results given by current arrears (type (i)) calculations.

Investment income - the timing of claims payments is allowed for using a gross rate of interest. Sensitivity to this assumption is also very important.

Margins in non-MIG provisions - not used, but provide "comfort" given the uncertainties involved.

#### 3.2.3.4 Miscellaneous

- (i) Market Share

Respondents represented about 18% of the MIG

market in the crucial 1987-91 years of mortgage.

(ii) New Business

Those still writing MIG business were doing so mainly on the new standard terms. The question "do you feel confident that this is adequately rated" got responses ranging from "yes" to "only reasonably confident" to "no".

(iii) Average Claim

Most respondents reported a relatively static average since the end of 1991.

(iv) Claims Handling Procedures

Developments include tighter checking, the requirement of additional information from lenders, some bulk deals with lenders, more dialogue with lead insurers. The chasing of borrowers by lenders for any debt which remain outstanding after the MIG claim has been paid does not appear to be taking place universally.

(v) Actuarial Involvement

All respondents involve actuaries in setting MIG provisions.

(vi) Reinsurance

One company had used quota-share reinsurance.

### 3.2.4 Conclusion

If the responses are typical of the MIG insurers as a whole, then it can be seen that there are common methods in place to cost claims from properties currently repossessed or sold, refined with better and more timely information from lenders.

The issue of how to use arrears information or judge future repossessions to develop informed views on the expected ultimate claims cost for a particular year of mortgage is developing but remains simplistic or secretive. The uncertainties are great as are the amounts involved; it is to be hoped the "strongly" reserved companies are in for a pleasant surprise over the next few years.

#### 4. MACRO RELATIONSHIP MODEL

##### 4.1 1992 GIRO Discussion

At the 1992 GIRO conference the PLWP's paper included an influence diagram which represented the forces relevant to the larger elements of MIG experience. This Macro Relationship Model was the subject of some debate during which it was suggested that progress could be made by using system dynamics techniques. As a result it was decided to investigate these techniques and associated pc-based tools.

##### 4.2 "ithink"

Research has revealed that there are very few pc packages available to support these techniques. The best package currently available is "ithink", which runs on Apple equipment. There is no IBM pc format version available.

##### 4.3 Requirements

<sup>097</sup>Presentations and demonstrations were made to the PLWP by consultants specialising in the use of these techniques and in "ithink" in particular. It is clear from this that proper use of these tools requires considerable time and funding, both in the preparation of the influence model so that it is in a form suitable for "ithink" evaluation, and in gaining or paying for the expertise needed properly to use the package.

##### 4.5 Key Conclusions

As a result of this education process the PLWP's conclusions are :

4.4.1 that systems dynamics techniques and packages such as "ithink" do represent a feasible means of making progress in the development of a Macro Relationship Model;

4.4.2 that making such progress requires time and funding not available to the PLWP;

4.4.3 that interested individual organisations with these resources offer the best prospect of taking this area of research forward.

#### 4.5 Next Steps

The PLWP intends to continue to monitor developments in this area and actively seek benefits for MIG research.

#### 4.6 Footnotes

4.6.1 Since the 1992 GIRO conference Peter Senghe's book "The Fifth Discipline" has been published, containing an introduction to systems dynamics and its uses in business.

4.6.2 A new pc package will shortly become available, called "Vensim", which is IBM compatible.



## 5. CATASTROPHE WARNING INDICATOR

### 5.1 Direction of Research

The objective of this area of research is to find a practical and relatively simple warning indicator, not to provide precise forecasts of experience but to give a broad indication of the future trend. Following the debate at the 1992 GIRO conference it was decided to restart the search for such an indicator by building from clean data.

### 5.2 Data

5.2.1 The available data (with sources) comprises :

- Retail Price Index (CSO)
- Number Unemployed (Department of Employment)
- Workforce (Department of Employment)
- Mortgage Rate (Housing Finance Reports)
- Home Price Inflation (BSA/Department of Environment)
- Divorce Rate (Social Trends Reports)
- Arrears Proportions (Housing Finance Reports)

5.2.2 The PLWP is still seeking an accurate history of lending criteria (maximum earnings multiple) and loan size (maximum loan to value ratio) for the UK

housing market.

### 5.3 Conclusions

The early conclusions of this work have not been overwhelmingly encouraging. Research continues and at the time of writing (August 1993) it is hoped to be able to present full results at the 1993 GIRO conference.

## 6. PREMIUM RATING MODEL

### 6.1 Introduction

Last year, we developed a model to calculate appropriate premium rates which might be used for a predicted economic future. It was intended ultimately to link this to the macroeconomic modelling in order to give appropriate premium rates for the actual predicted economic future. However, these two aspects of modelling are actually independent. Indeed, it is undesirable that there should be thought to be a mechanistic process leading from the collection of past macroeconomic data to premium rates, as the selection of a premium rating basis is a task for the underwriter, in which past data is only one piece of information to be input.

This year we have not developed the model further, except to enable it to run multiple projections on the same economic future. We have used it to try to draw insights about the general "shape" of premium rates which might be appropriate. Our starting assumption, based on general reasoning, was that we expect appropriate premium rates to rise as LTV (loan to value - the proportion of a property's value lent under a mortgage) rises, and as the income of the borrower relative to the size of the mortgage and the value of the property falls.

### 6.2 Assumptions

Last year we demonstrated the model on an economic future which was intended to be extreme, in order to show claims arising. This year we have substituted futures which are intended to be less extreme, although all the ones we have used present a set of circumstances

which will be unfavourable to insurers.

We have shown results based on one economic future. Its principal features are:

- The rise in real wages is modest, and indeed negative in the first two years. Only at the end of the sixth year have they recovered their original level, and at the end of twenty years they are only 15% higher than at the start. This is bad for the experience because it limits people's ability to repay, and makes them more likely to default because their income is inadequate.
- Inflation is modest by the standards of recent years - the average increase in prices over twenty years is 1.11% per annum, or just under 25% over the period. While this may be good news economically, at least compared with the UK's recent performance, it has adverse implications for MIG, since high inflation erodes the real value of mortgages, and makes servicing them easier, even if real incomes have not risen.
- Interest rates start at about 8¾% per annum, but rise to just over 10% in the second year, falling slightly in the third and after that falling to very low real rates. The early rise is bad for MIG experience, since it makes mortgages hard to service. The later fall redresses this to some extent, so that it is a less harsh environment than might have been assumed, but to assume continuing high interest rates even after a prolonged period of low inflation would scarcely have been credible.

The projections start with a tax structure roughly the

same as the United Kingdom tax structure before the introduction of the 20% tax band. However, after just over a year the tax system is altered, and we have shown the effects of three different alterations:

Future 1: There are substantial tax rises on all earners.

Future 2: There is a relative shift of the tax burden from low earners to high earners.

Future 3: There is a relative shift of the tax burden from high earners to low earners. In addition, mortgage interest relief is extended without limit.

In future 1, tax rises bear heavily on everybody. This should make it harder to service mortgages, and results generally should be poor. However, in futures 2 and 3, there is no general rise in tax rates, but rather a shifting of the burden from one group of taxpayers to another. In future 2, we have a "soak the rich" budget, which should mean that it appears that the low loan service ratio mortgages are relatively more vulnerable, since with a fixed initial value of property, these are the ones which are taken out by rich people, who find their income affected more by the tax changes. Under assumption 3, where high earners are favoured at the expense of those with low incomes, we may reasonably expect the reverse to apply.

The actual variables assumed are shown in appendix 1, and on the graph attached.

The projections have been run on a number of loans on a single property. The initial value of the property is assumed to be £60,000. Ten different ratios of mortgagor's income to house value were modelled,

ranging from 25% to 70% in steps of 5%. At each of these, ten different LTV ratios were used, ranging from 77½% to 100%.

### 6.3 Results

A selection of the results is shown in the attached graphs. There are six graphs for each assumption. They show:

- Graph 1: Total losses arising from default in money terms, with LTV measured along the x-axis.
- Graph 2: Total losses arising from default in money terms, with the salary/house price ratio measured along the x-axis.
- Graph 3: Discounted losses as a proportion of the excess of the loan over 75% of the value of the property (i.e. the premium rate), with LTV measured along the x-axis.
- Graph 4: Discounted losses as a proportion of the excess of the loan over 75% of the value of the property (i.e. the premium rate), with the salary/house price ratio measured along the x-axis.
- Graph 5: As chart 3, but the loss restricted to that part paid by the insurer under the current arrangements.
- Graph 6: As chart 4, but the loss restricted to that part paid by the insurer under the current arrangements.

Note that graphs are scaled to show as much detail as possible. Therefore when comparing a graph from one projection with another, care should be taken in interpreting where a different y-axis scale has been used.

In all cases, graph 1 shows that losses rise with the LTV ratio. This is only to be expected, since if we assume a

constant value for the house and for the price at which it can be sold after repossession, the lower the mortgage, the lower the loss to the lender. The actual amount of the losses is higher on assumptions 1 than on either of the others. This is reasonable, since assumptions 1 impose generally higher taxes throughout the income range considered, whereas the others impose more of a shifting of the tax burden. It is also worth noting that in each case, the low salary/price ratio (that is borrowers who have the highest mortgage repayment burden as a proportion of their total income) gives the highest losses. However, under assumptions 2 the difference is negligible. Since this set of assumptions involves a significant shift of the tax burden from low earners to high earners, this is scarcely surprising. It is also interesting that under assumptions 1 the lowest salary/price category has a significantly higher claim cost than the others, but that the others are scarcely separated at all.

Graph 2 sets out the same information as graph 1 but with salary/price ratio along the x-axis. It confirms the result of graph 1 - that the outcome is not unduly sensitive to this measure. Under assumptions 2 it is barely sensitive at all, and presumably if the tax changes had shifted even more of the burden of tax from low earners to high, the relationship would have been the reverse of what we would instinctively expect. On the other hand, under assumptions 3, which shift the burden in the other way, the relationship is made a little more pronounced.

Graph 3 looks at the "premium rate" for the risk. (As well as differing higher values, beware of suppressed zeros when comparing one graph 3 with another. The same applies to the graph 4s.) This is defined as the loss, discounted to the start of the policy, divided by the

excess of the mortgage over 75% of the value of the property. The shape of these graphs is not what we have conventionally been led to expect. The premium rate *falls* as the LTV rises, although in all cases it rises to some extent towards the highest values shown, while received wisdom is that it should rise.

It should be stated that while such a result is instinctively wrong, it is by no means ridiculous. Consider, for example, the case of a house which cost £60,000 at the start of a policy, and was sold after repossession some years later for £48,000. (This may seem to be a very sharp drop, but we are informed that the "dilapidation discount" on the sale of a house can easily be of the order of 20%. This example, then, need not involve any fall in property values whatsoever.) Suppose that the accrued interest to be added to the loan at the time of sale was 16% and that fixed costs of repossession and sale are £2,500. If the mortgage had been for 100% of the value, that is £60,000, then the loss will be  $£60,000 \times 1.16 + £2,500 - £48,000 = £24,100$ . If the mortgage had been only 77½% of the value of the property, that is £46,500, the claim would be only  $£46,500 \times 1.16 + £2,500 - £48,000 = £8,440$ . However, the former loss is 1.6 times a sum insured of £15,000, while the latter is 5.6 times a sum insured of only £1,500. If default were equally likely in both cases, then the 77½% loan would justify a higher premium rate than the 100% loan, although the latter will still produce a higher premium. This suggests that (loan minus 75% of property value) may not be the appropriate "sum insured" on which to base the premium.

Graph 4 shows the premium rate plotted against the salary/price ratio. This shows premium rates falling with the salary/price ratio, which is what we expect instinctively, since for a given mortgage on a given



property (which is what is represented on a line on this graph) the better off the mortgagor, the easier it is to service the mortgage. Since the "sum insured" is constant along each line the level of losses determines the shape of the premium rate. (The reason that the lines slope more sharply than in graph 1 is simply the suppression of the zero on graph 3.) It will be noted that under assumptions 1 the rate actually rises at the highest levels of salary. (This would also be seen on graph 1, but the detail is better visible on this graph.) This happens because, although the proportionate increase in tax taken under these assumptions is roughly the same at all levels of income, it accounts for a higher proportion of the previous take home income for those on higher incomes who were paying proportionately higher taxes before the change in the tax régime. When in a progressive tax régime, all marginal tax rates are increased by the same proportion, average tax rates will rise by the same proportion, but the proportionate cut in higher net incomes will be greater than in lower.

Graph 5 shows the premium rate against LTV for the insurer's loss only under the new conditions introduced in 1992 for this type of cover. At its simplest, this should be a line 80% of graph 3, because of the introduction of the 20% co-insurance. However, because the claim is also limited to the excess of the amount of the mortgage over 75% of the initial value of the property, the amount claimed may be less. In each case, the shapes of graph 3 and graph 5 are different. Under all three assumptions graph 3 showed the premium rate falling as LTV rose from 77½% to about 87½%, but rising slightly thereafter. However, the graph 5s show the very reverse - the premium rate required rises monotonically with LTV, as is generally thought to be normal.

If we consider the conditions, the reason for this becomes clear. With the sharp falls in property prices that has been assumed, many claims are likely to be for the full amount of the sum insured. This increases arithmetically with the size of the mortgage. The total loss does not do so - although the relationship between LTV and loss is fairly linear (see graph 1 for assumptions 1), it looks as if it would reach zero only at around 65%. At 75%, there will be a significant loss but no sum insured, so that the premium rate of the total loss is infinite. But the insured loss is equal to the sum insured in a great many cases, so unless the propensity to default is actually linked to the LTV, the premium rate will not vary with the LTV. However, because having a higher LTV loan does imply a higher mortgage and therefore a greater pressure on net disposable income when prices rise or income is squeezed, that propensity does exist, and causes the curve to be upward sloping.

That is to say that each curve on the graph is upward sloping, as the lines represent an individual with a given income taking mortgages of different sizes. There may be differences between the several lines. That only one line separates from the others under assumption set 1 - and that the line representing those who have taken on a very heavy mortgage burden relative to their income - reflects the model assumption that it is mainly *relative* changes in net real disposable income which affect ability to keep up payment, and that the difference in absolute income between mortgagors who started with net disposable income of £500 per month and £1,000 per month are of a secondary effect only. This may or may not be the case, and requires sociological rather than economic research and assumptions.

If the three graphs 5 are compared, the lines will be seen to be closest together for assumption set 2 and furthest

apart for set 3. This reflects the tax changes which in set 1 were broadly neutral (but generally unfavourable), in set 2 transferred tax from the poor to the rich and thus improved the income (and thus the claims experience) of the low salary/price lines, while assumption set 3 transferred income in the other direction, favourably to the lines which were already lowest, but unfavourably to those on the higher lines.

Graph 6 shows the insurer's pure premium rate plotted against salary/price ratio. This broadly reflects graph 4, but in each case the lines are now much more evenly spaced. This is reasonable - with the limit of the claim to the sum insured, which rises equally between the lines, the amount which can be lost is far more closely related to the items the difference between the lines represents.

Strong warnings must be issued about the results here presented. An underwriter using these as a basis for underwriting would surely come to grief, unless they simply persuaded him not to write this line of insurance. The model requires assumptions about human behaviour and about economic futures. We have simply assumed these, in order to allow a modelling framework to be built up. This is not a deficiency in the model, but the framework exists to allow alternative assumptions to be slotted in. The most important of the behavioural assumptions is what gives rise to default. We have assumed a constant rate of defaults arising from divorce, and another cyclical pattern of defaults arising from unemployment. However, we have assumed that most defaults arise from income loss, and assumed a pattern which takes a default probability of just under 1/20% per month, doubling it for every fall in real take-home income equal to one twelfth of the original amount. The starting point is slightly lower for those on high incomes and higher for those on low incomes. With such a

pattern assumed, it is scarcely surprising that reducing people's incomes should spark more claims. If the difference in starting point between high and low incomes had been greater then the importance of the salary/price ratio on the results would have been greater. If a higher divorce rate had been assumed, the relative effect of the salary would have been less.

Nor are such reservations limited to the values of the parameters. Which parameters to include is also critical. It may be, for example that the absolute value of income or of the property has a significant effect. Does a mortgage on a £250,000 property have a different default probability from one on the same LTV and salary/price ratio on a £50,000 property? There might be differences in socio-economic attitudes which would explain such differences. Those who are happy to borrow 100% of the value of a property may have a type of personality which takes the obligations of debt less seriously than the person who is more conservative in his personal finances. These objections are mere surmises, but a list of the parameters which might possibly be relevant and could reasonably be challenged is very long. We have built a framework to test these assumptions, not one which can tell which assumptions are correct.

We understand that some lenders are conducting research into these relationships, in order to build more sophisticated credit rating procedures than have been used in the past. However, the results are strictly confidential, which is not surprising, since a sophisticated understanding of the appropriate parameters of creditworthiness constitutes a significant competitive advantage in lending. In the past this was of less importance, as the risk could be passed on to insurers. However now, whether a lender continues to be insured but retains the 20% coinsurance upon which insurers now

insist, or whether it takes the options newly allowed by the Building Societies Commission of owning a captive insurer or setting up internal reserve, preventing and managing poor loans will have a far more direct effect on a lender's profitability. If economic times are good (which in this particular context may mean high inflation) then there may be negligible risk from bad loans. If they are bad then losses are likely to be high, and a catastrophe warning indicator may be invaluable in predicting this, but still the lender which has recognised the poor credit risks and declined to lend, or perhaps being more sophisticated has charged an MIG premium or penalty interest rate, will be better protected against loss than the lender which does not differentiate between good and bad risks, except to the extent of declining credit to the worst.

A warning must also be given about the economic variables used. We believe that they are a plausible, if pessimistic view of the future. (It is to be hoped that the tax rises are somewhat fanciful!) However, the "shape" of the results does depend on the assumptions. We could assume rather more danger of default but a more favourable pattern of house price changes, which would result in the same overall amount of losses. However, this would concentrate losses far more at the high LTV bands. In the example used above, if the house price had fallen only 10%, there would be no loss at all below an LTV of 88%. In this case, we would definitely see a rise in premium rate as LTV rose, though it is possible that it could rise with LTV to a certain point, and then fall.

With this particular example, there may be a nil premium rate on the lower LTVs. This is clearly wrong - there is obviously some risk that a loss will occur on an 80% LTV mortgage (and indeed on a 5% LTV mortgage). While this type of approach may be appropriate, it would

be more useful to base actual premium rates on a number of economic futures, each with a probability assigned to it.

Another possible objection which may be made is to the deterministic nature of the price at sale. Clearly, when the mortgage is taken out, there is no variation in the value of houses in the same category. However, if prices rise say 5% over the following year, not all those initially valued at £60,000 for mortgage purposes will now be worth £63,000. It would be possible to build in a stochastic variation in the prices of individual houses which increased as time went by. Further, it may be that the appropriate dilapidation discount varies between different types of mortgage, different LTVs or different absolute values of houses.

Without independent funding and access to data which is reasonably considered confidential, it is unlikely that this particular avenue of research can usefully be further explored. At GIRO we hope to present more results based on alternative assumptions. However, the use of such a model for real underwriting and pricing risk requires not more work of the type which has already been carried out, but research into the nature and measurement of some of the intricate relationships which cause claims and determine their amounts.

## 7. NEXT STEPS

### 7.1 Feedback

The PLWP requests detailed feedback from the 1993 GIRO conference on the work done to date.

### 7.2 Direction

The PLWP needs to develop a clear understanding of what further work will be useful, both for MIG and other product lines.

### 7.3 MIG

Whilst there is clearly a need for the PLWP to monitor MIG developments and report these to GIRO regularly, the PLWP wonders whether it has reached its natural limit for the other areas of research. Feedback on this aspect will be most welcome.

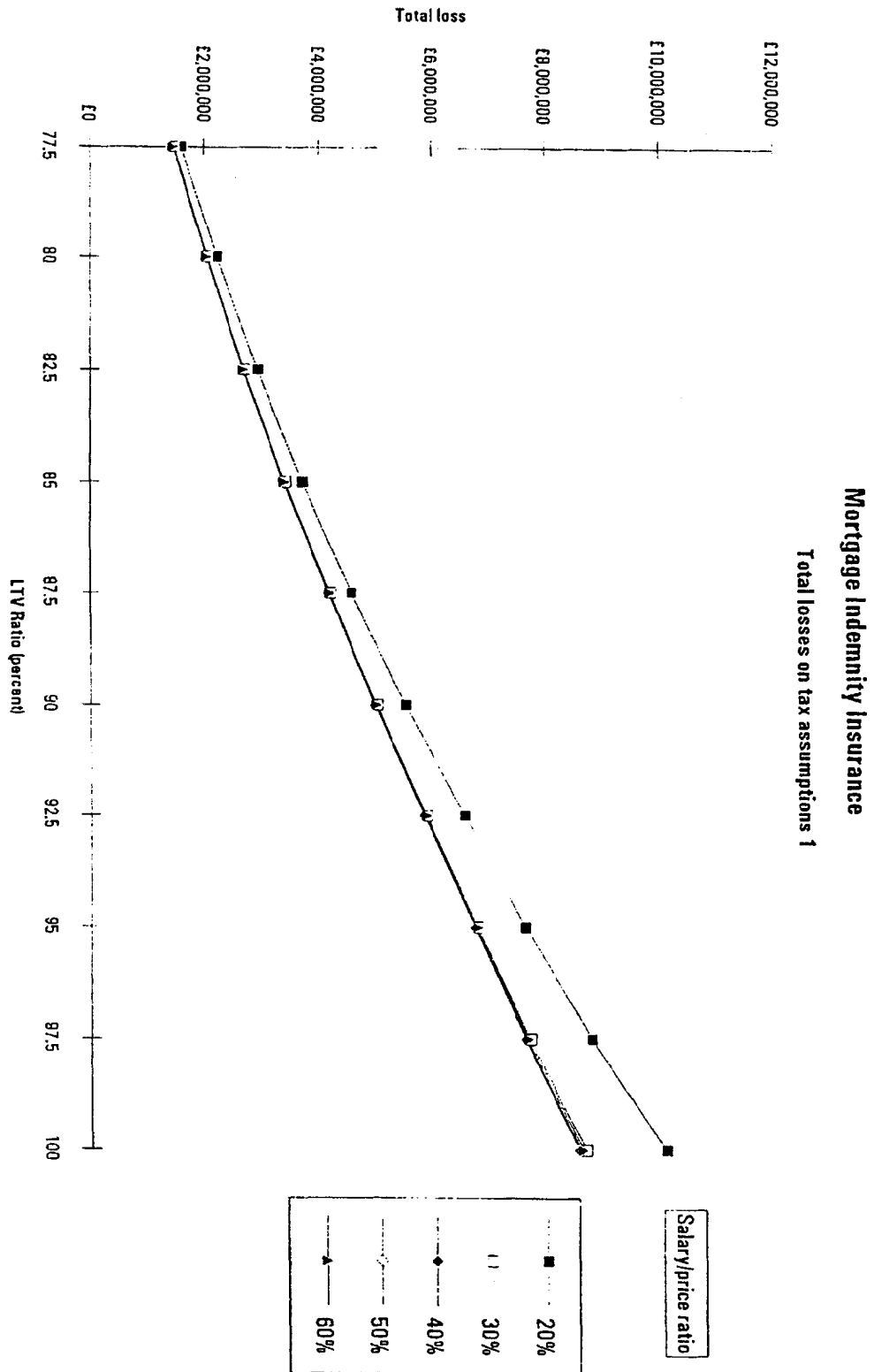
### 7.4 Other Products

Much of the PLWP's recent work has relevance to other product lines, in particular those impacted by economic performance. The PLWP foresees particular relevance if the UK government seeks to introduce private sector insurance-based provision of income protection previously provided by the State (DSS).

### 7.5 Equalisation Reserves

The PLWP intends to consider the DTI's recently published Consultation Document and to feed comments to the Equalisation Reserves Working Party as appropriate.

Graph 1

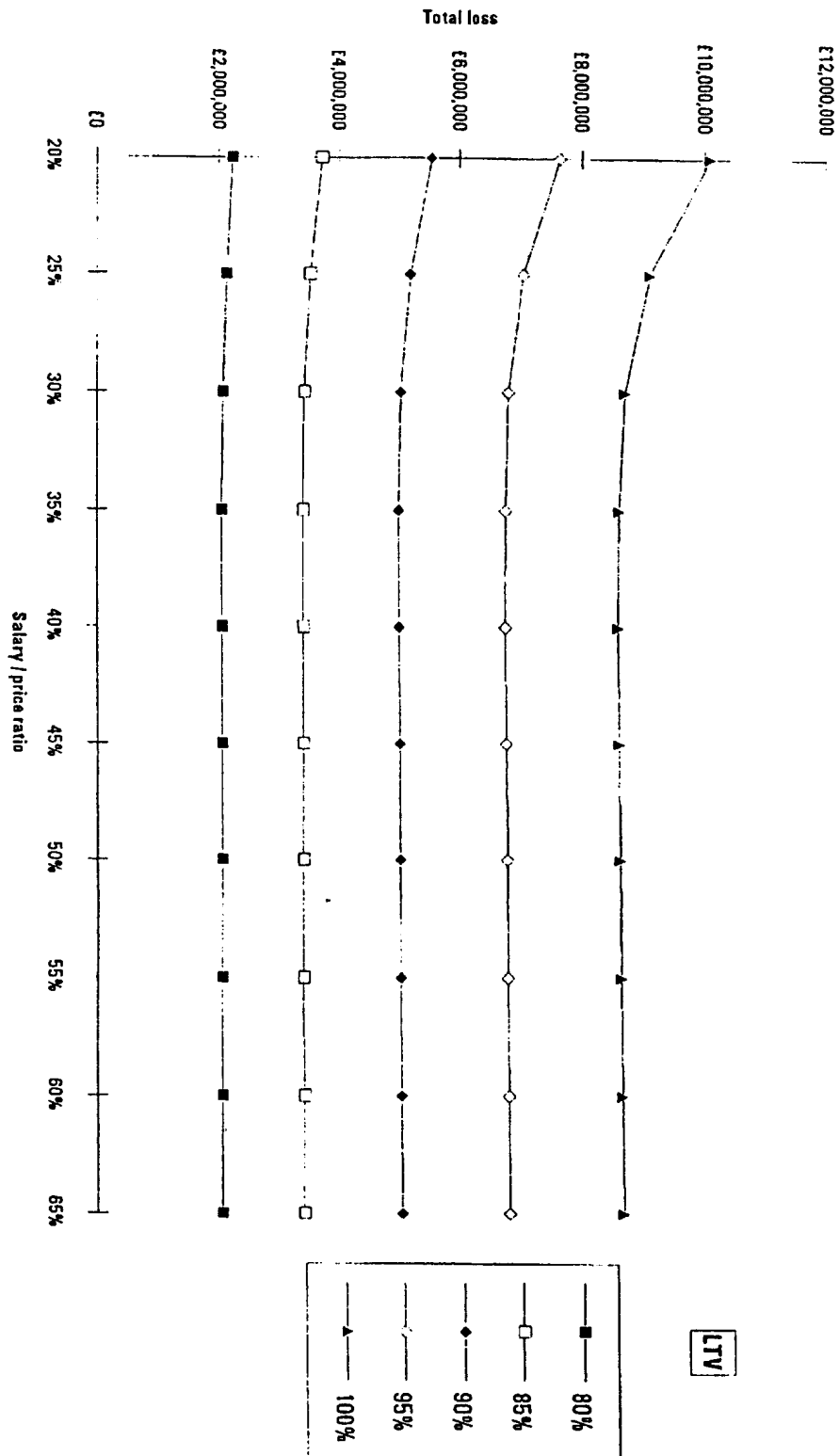




Graph 2

# Mortgage Indemnity Insurance

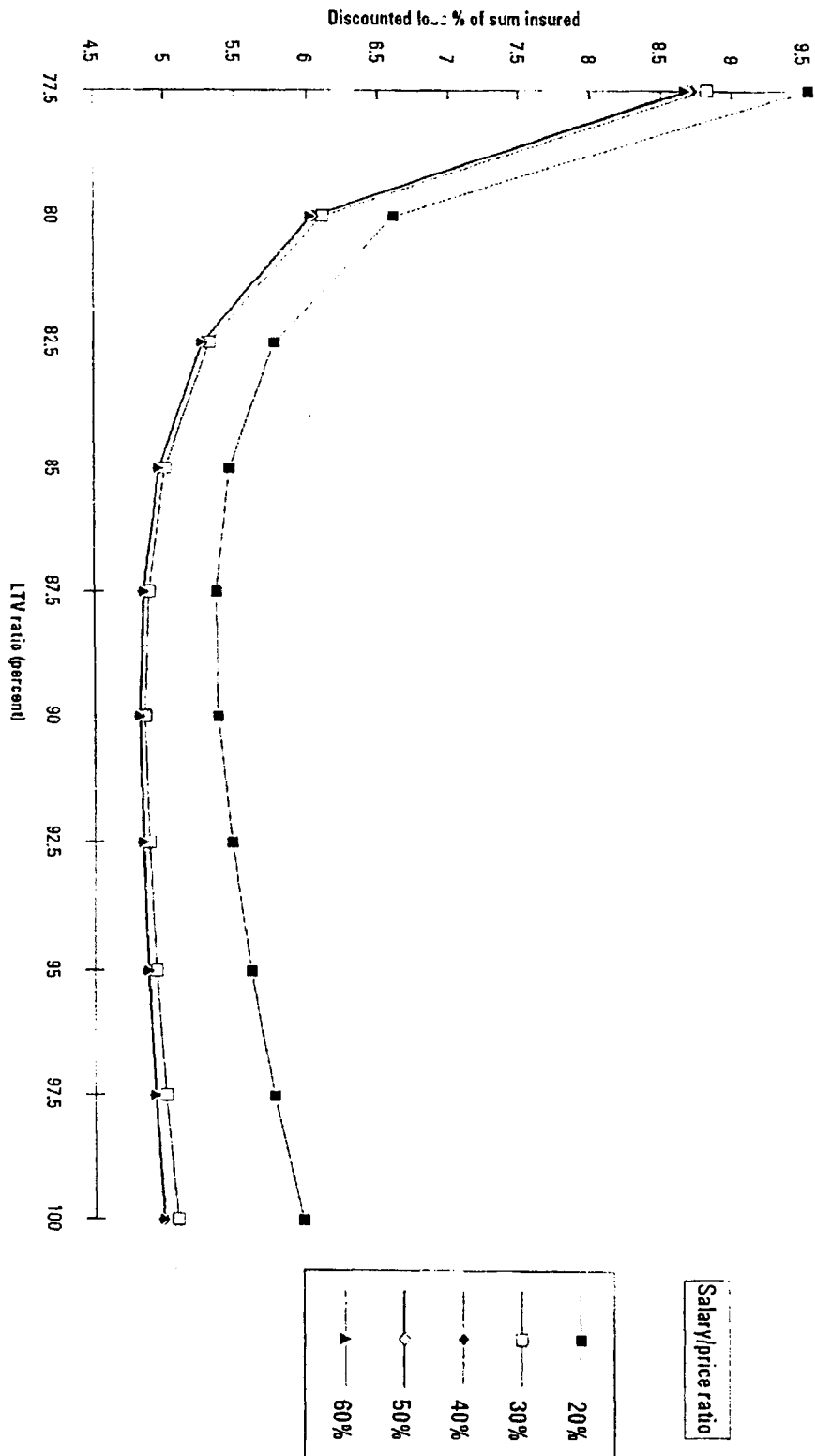
Total losses on tax assumptions 1



Graph 3

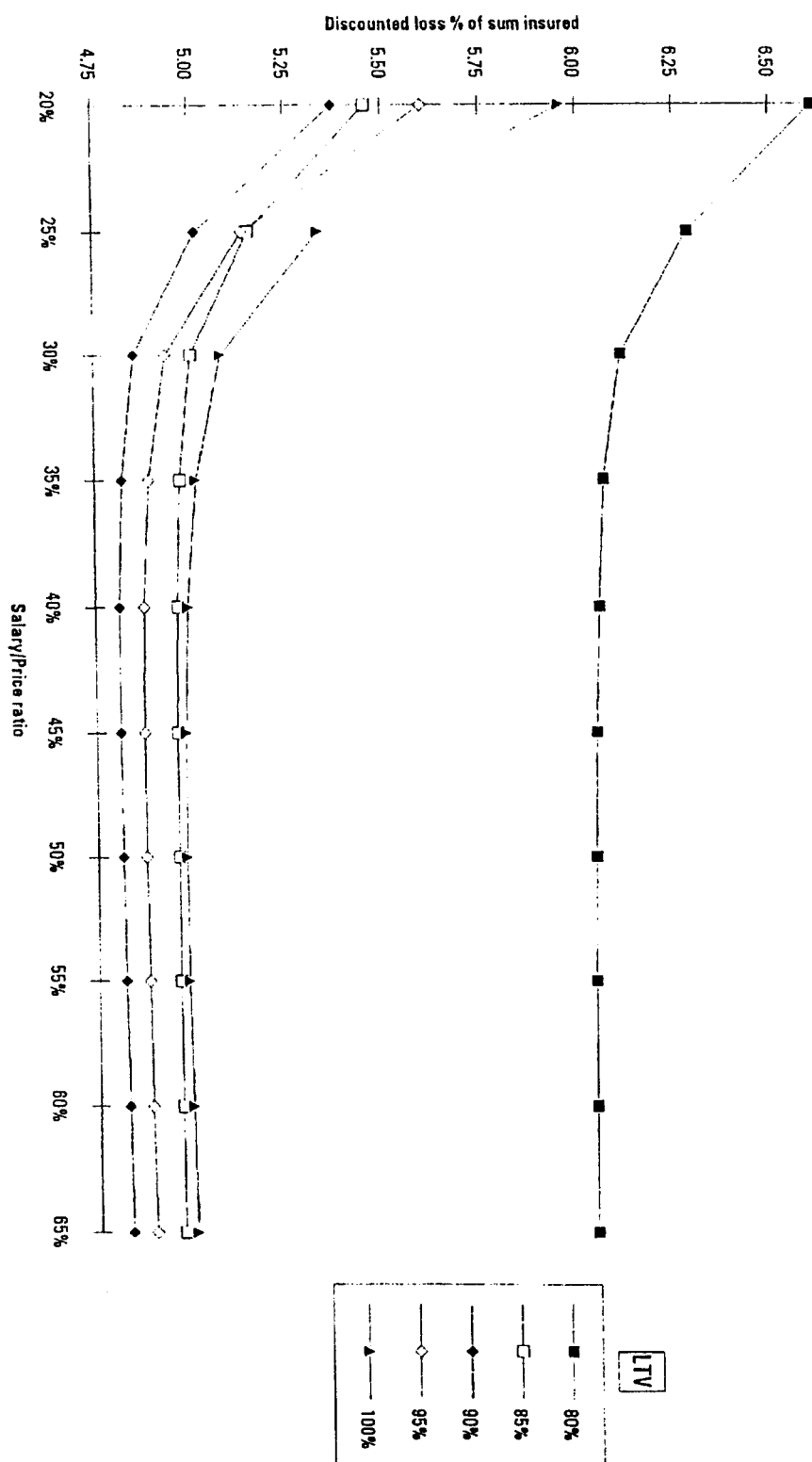
# Mortgage Indemnity Insurance

Total premium rate on tax assumptions 1



Graph 4

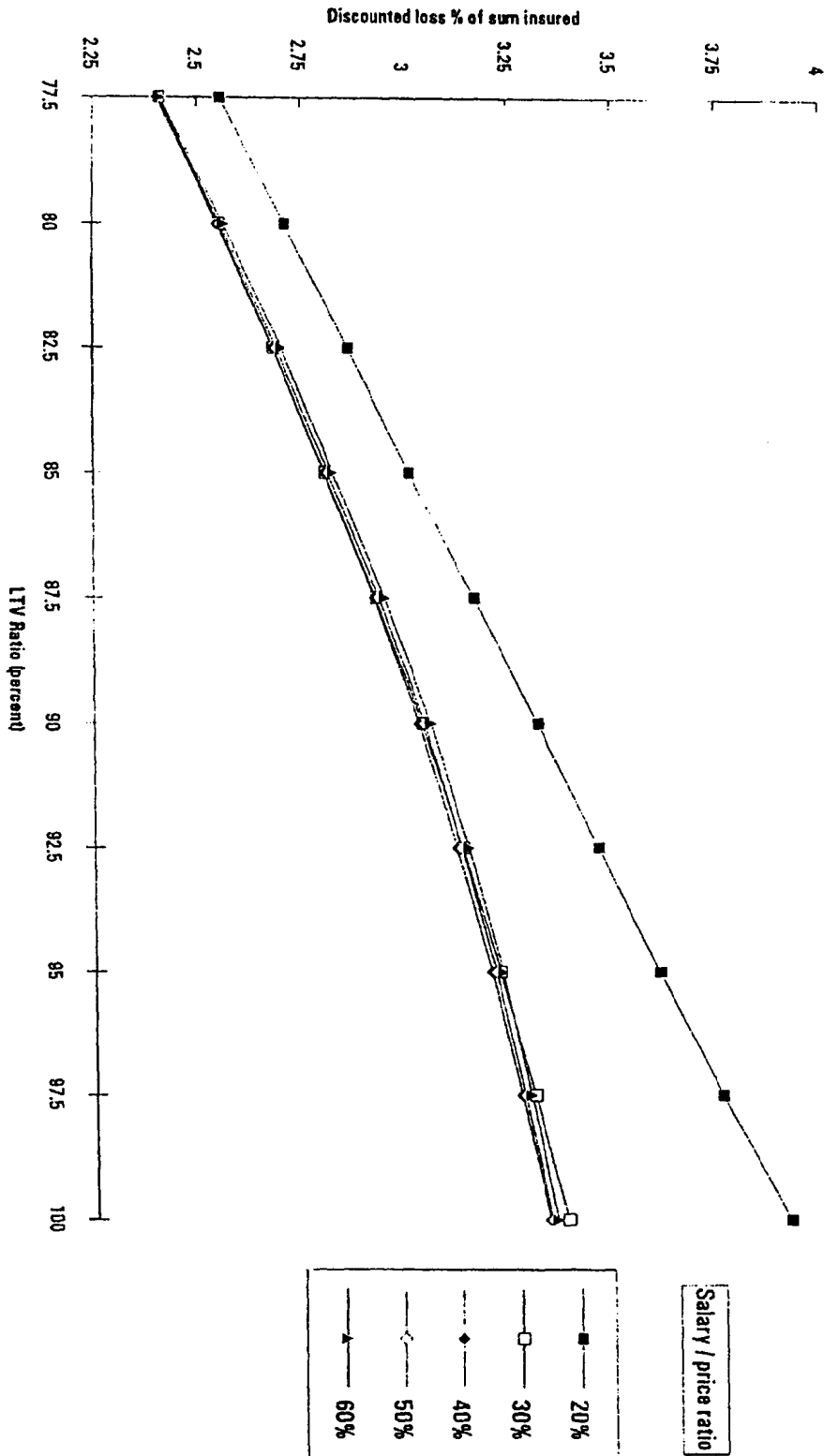
# Mortgage Indemnity Insurance Total premium rate on tax assumptions 1



Graph 5

# Mortgage Indemnity Insurance

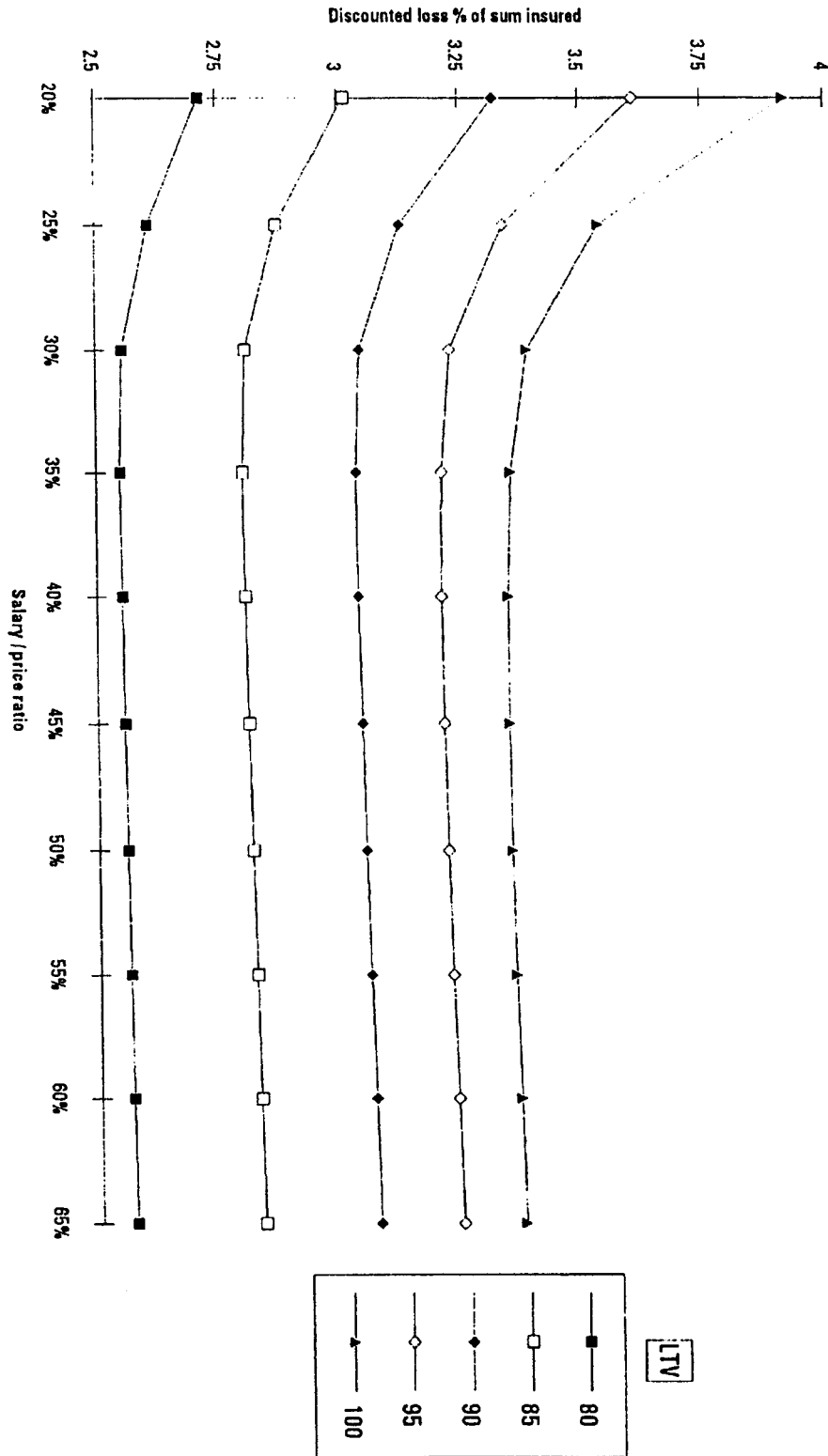
Insurer's loss on tax assumptions 1



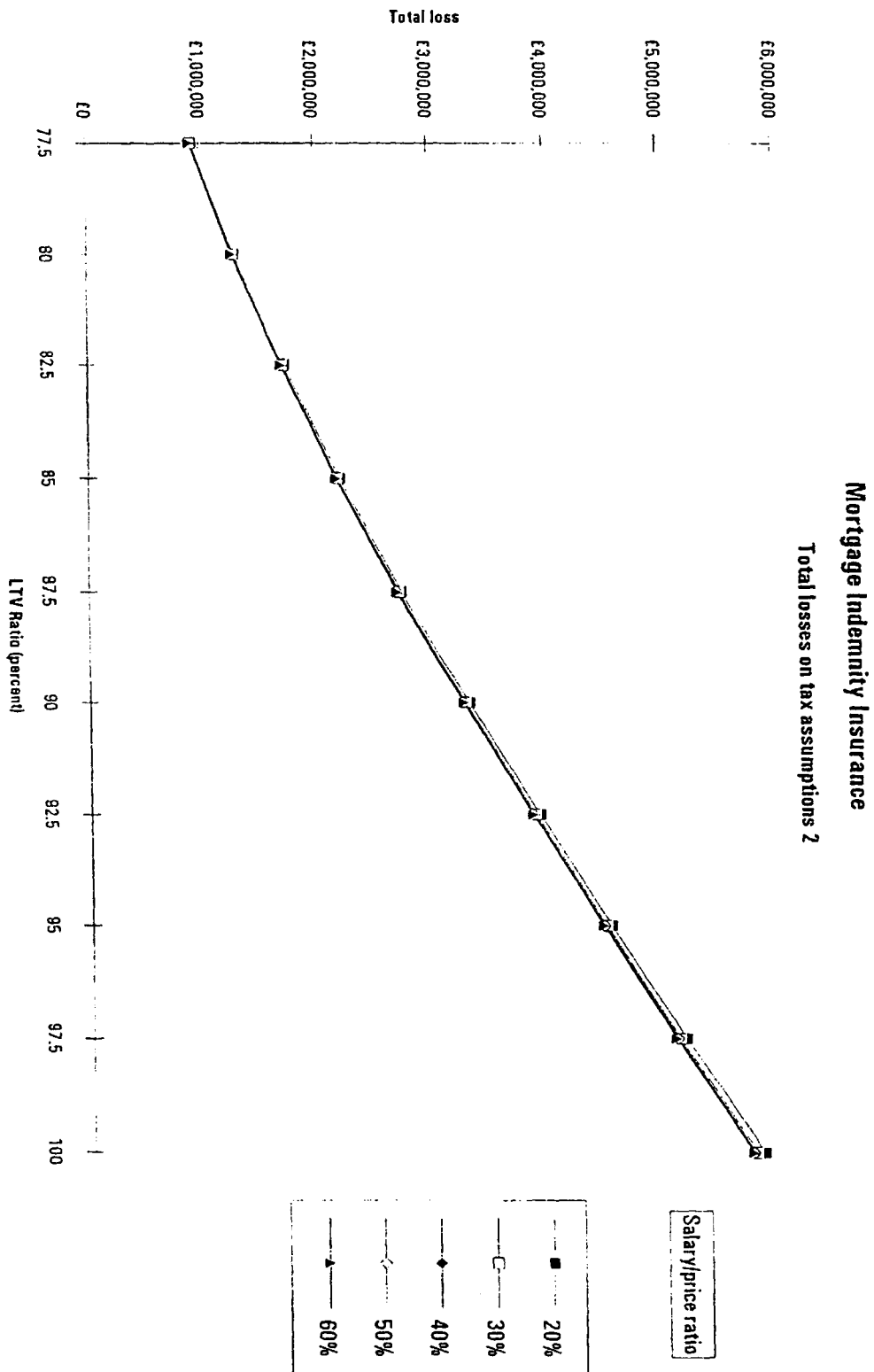
Graph 6

# Mortgage Indemnity Insurance

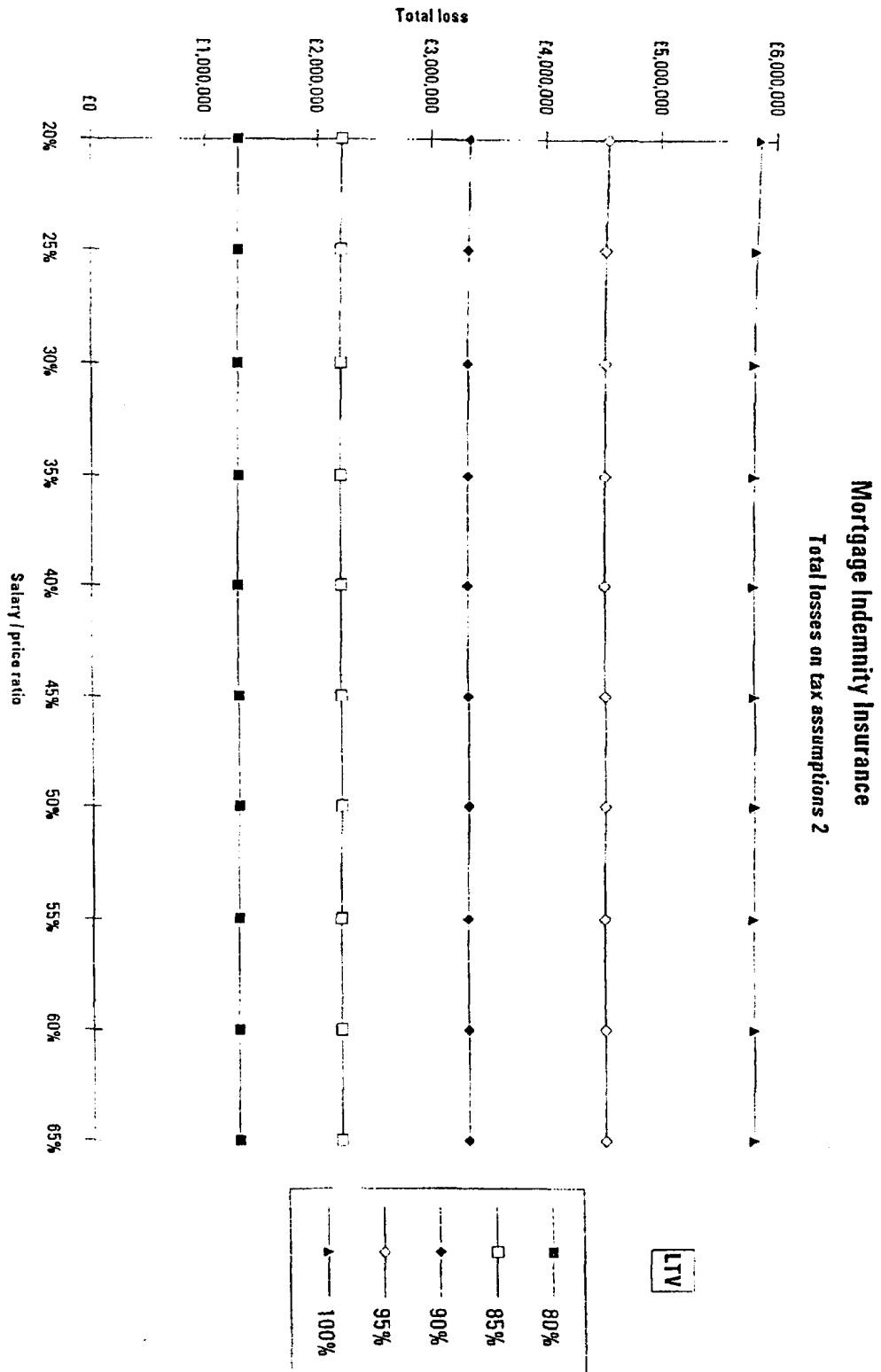
Insurer's loss on tax assumptions 1



Graph 1



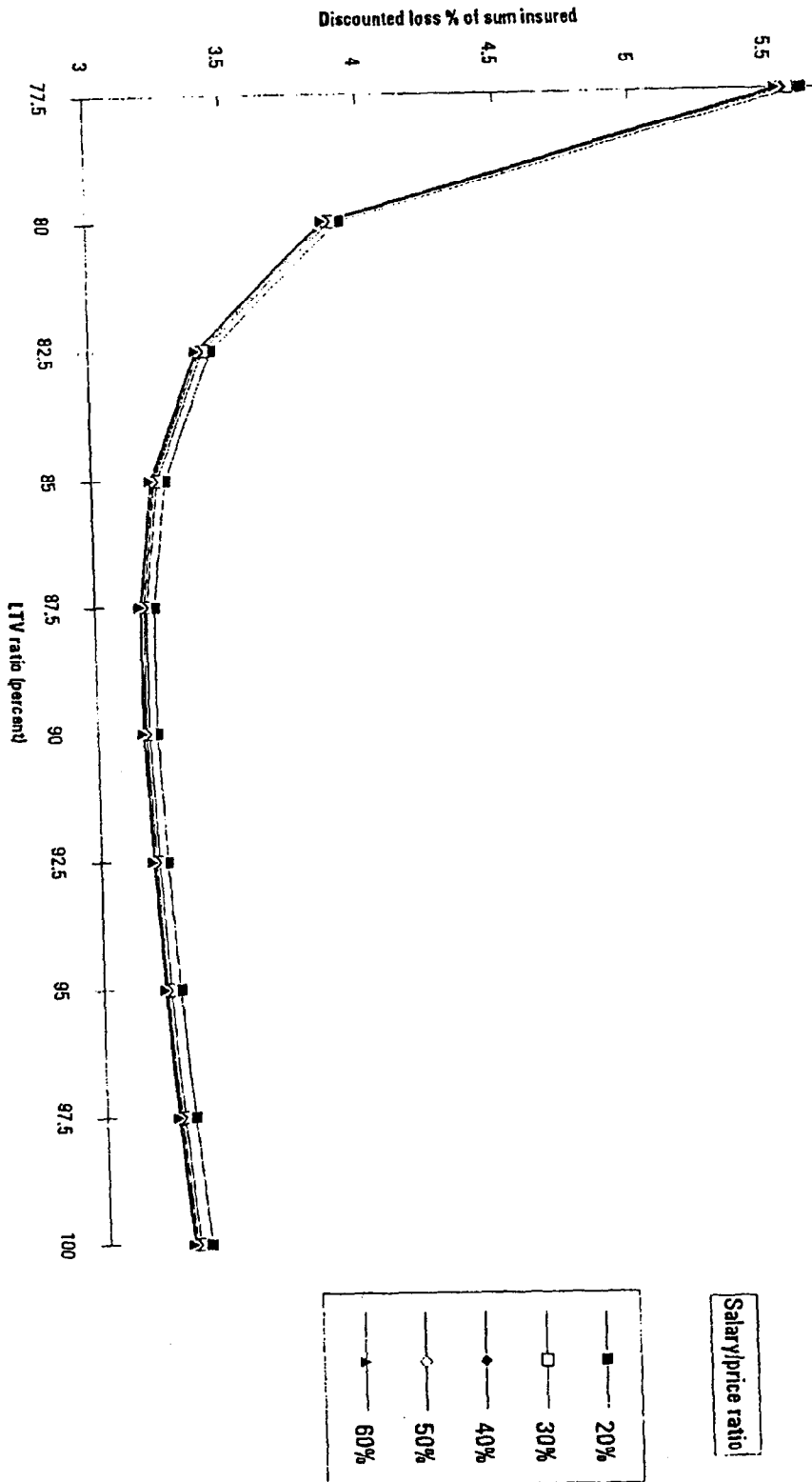
Graph 2



Graph 3

# Mortgage Indemnity Insurance

Total premium rate on tax assumptions 2

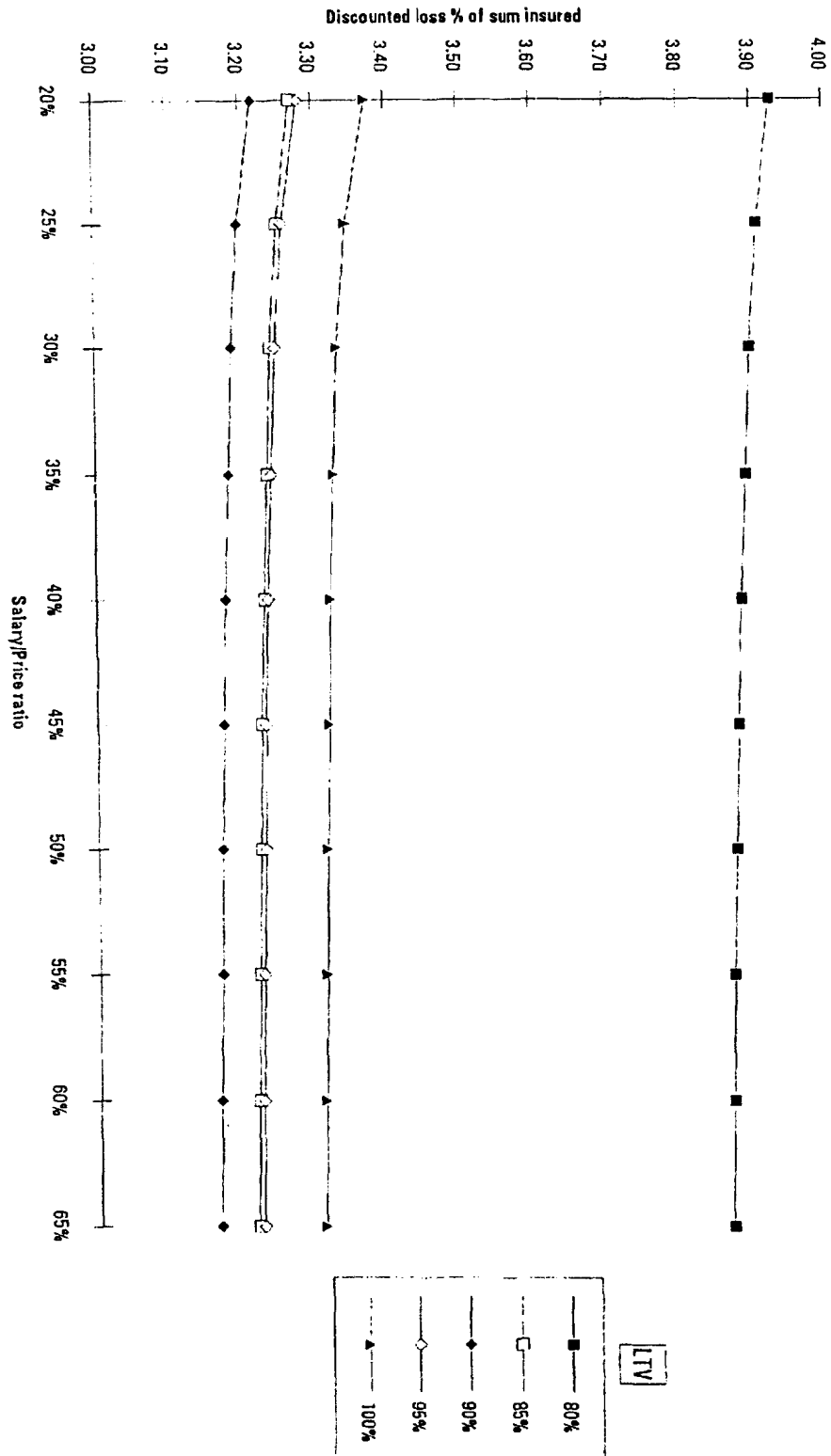




Graph 4

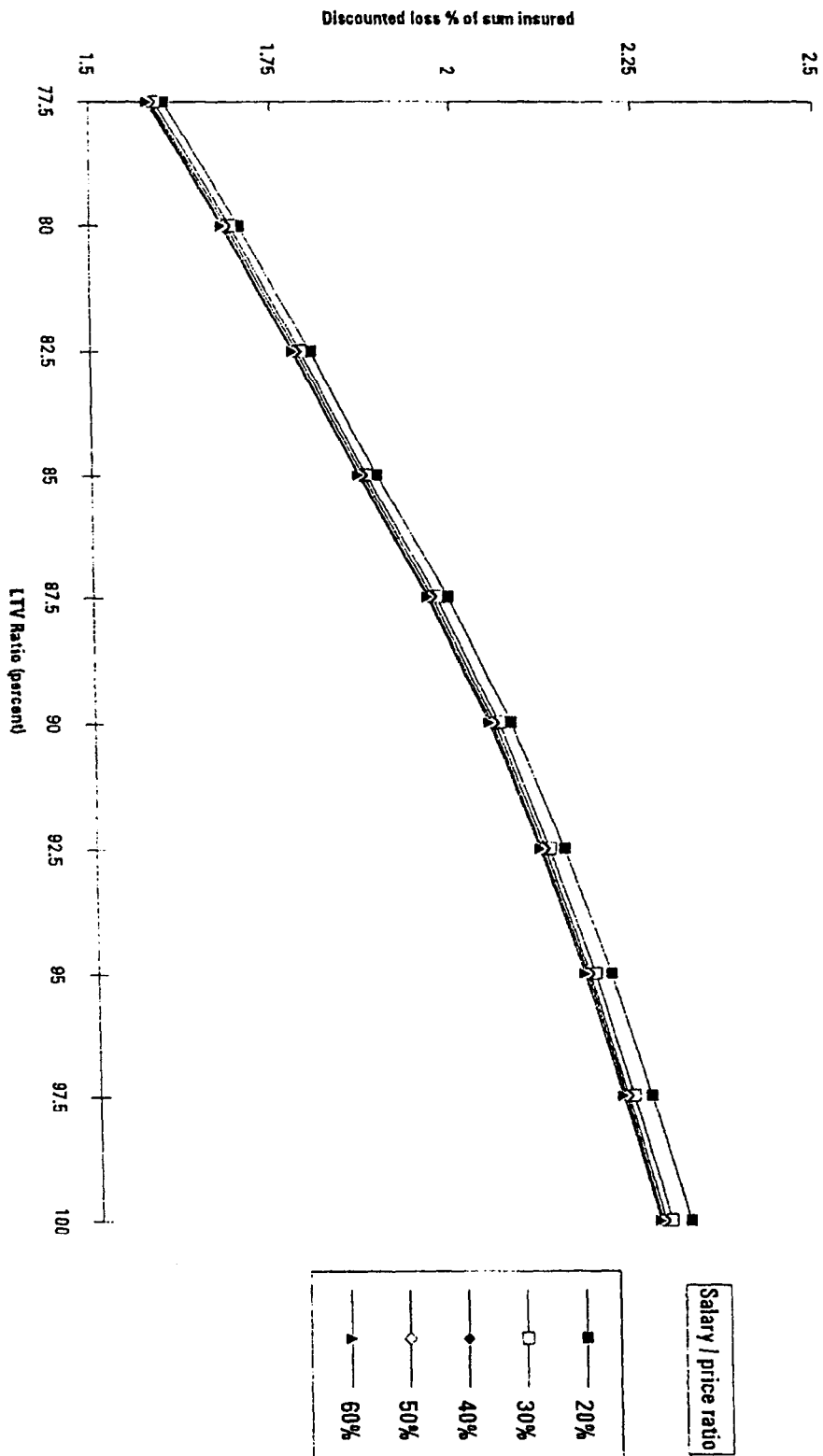
# Mortgage Indemnity Insurance

Total premium rate on tax assumptions 2



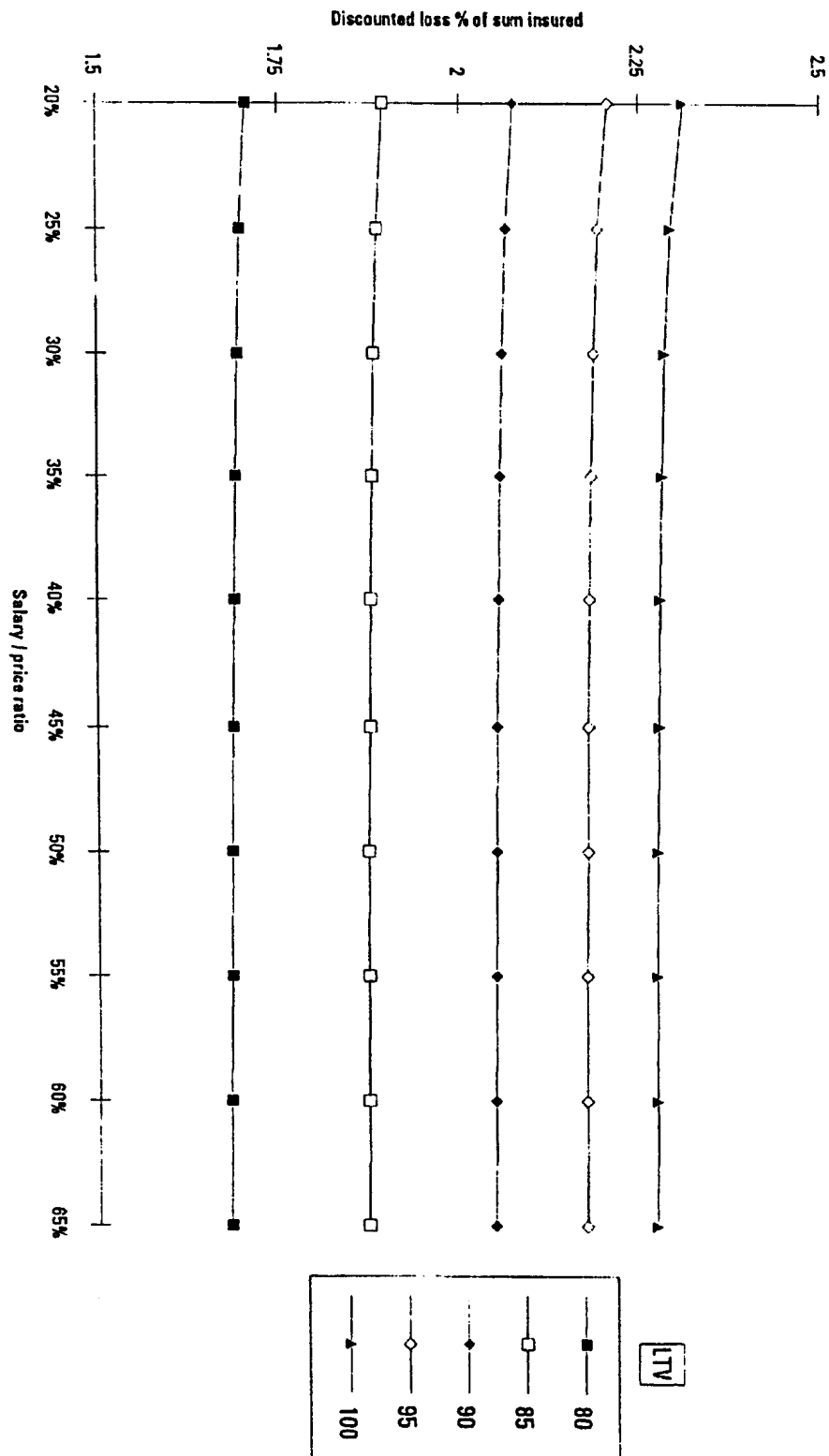
Graph 5

**Mortgage Indemnity Insurance**  
Insurer's loss on tax assumptions 2

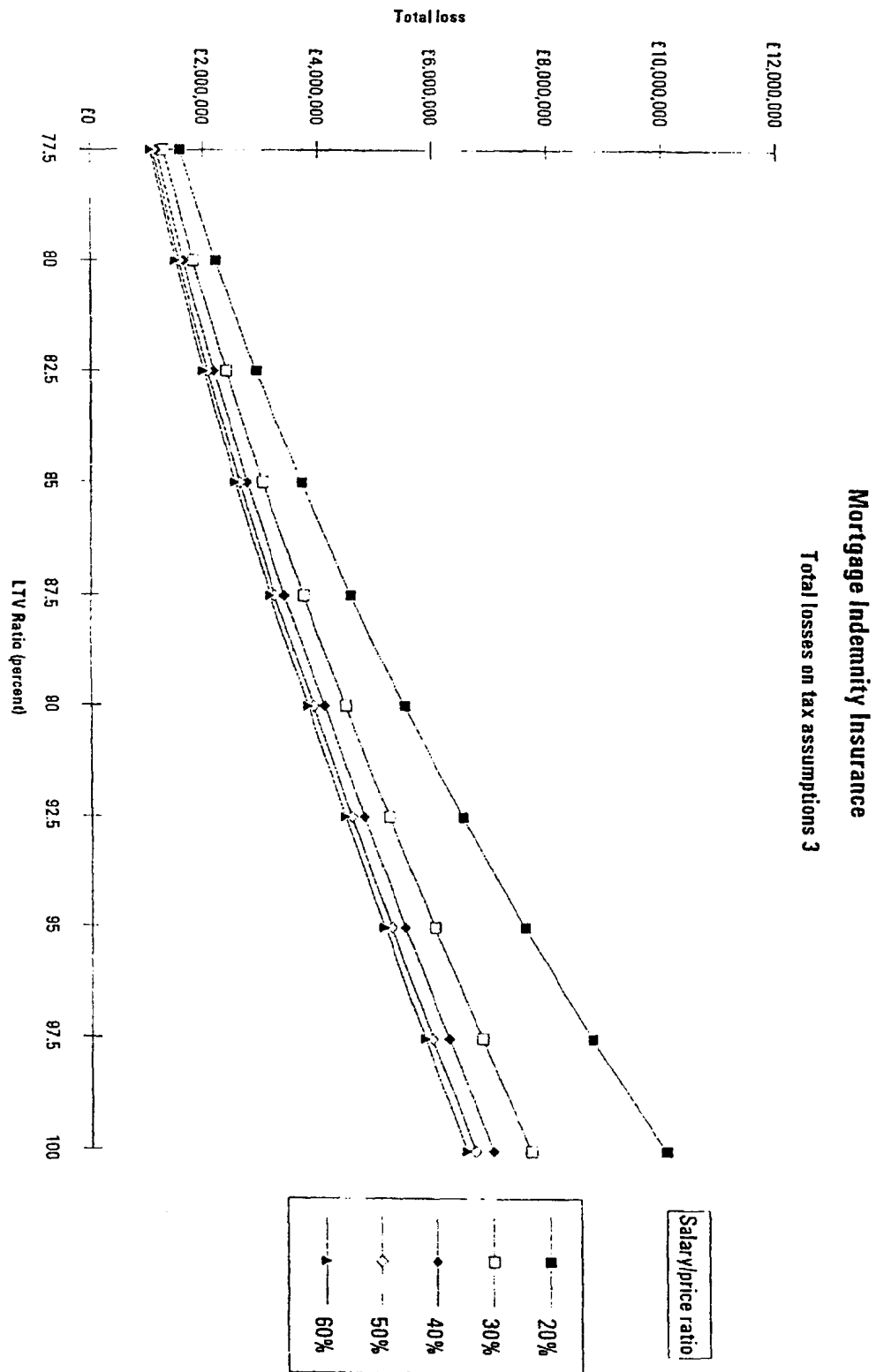


Graph 6

**Mortgage Indemnity Insurance**  
**Insurer's loss on tax assumptions 2**

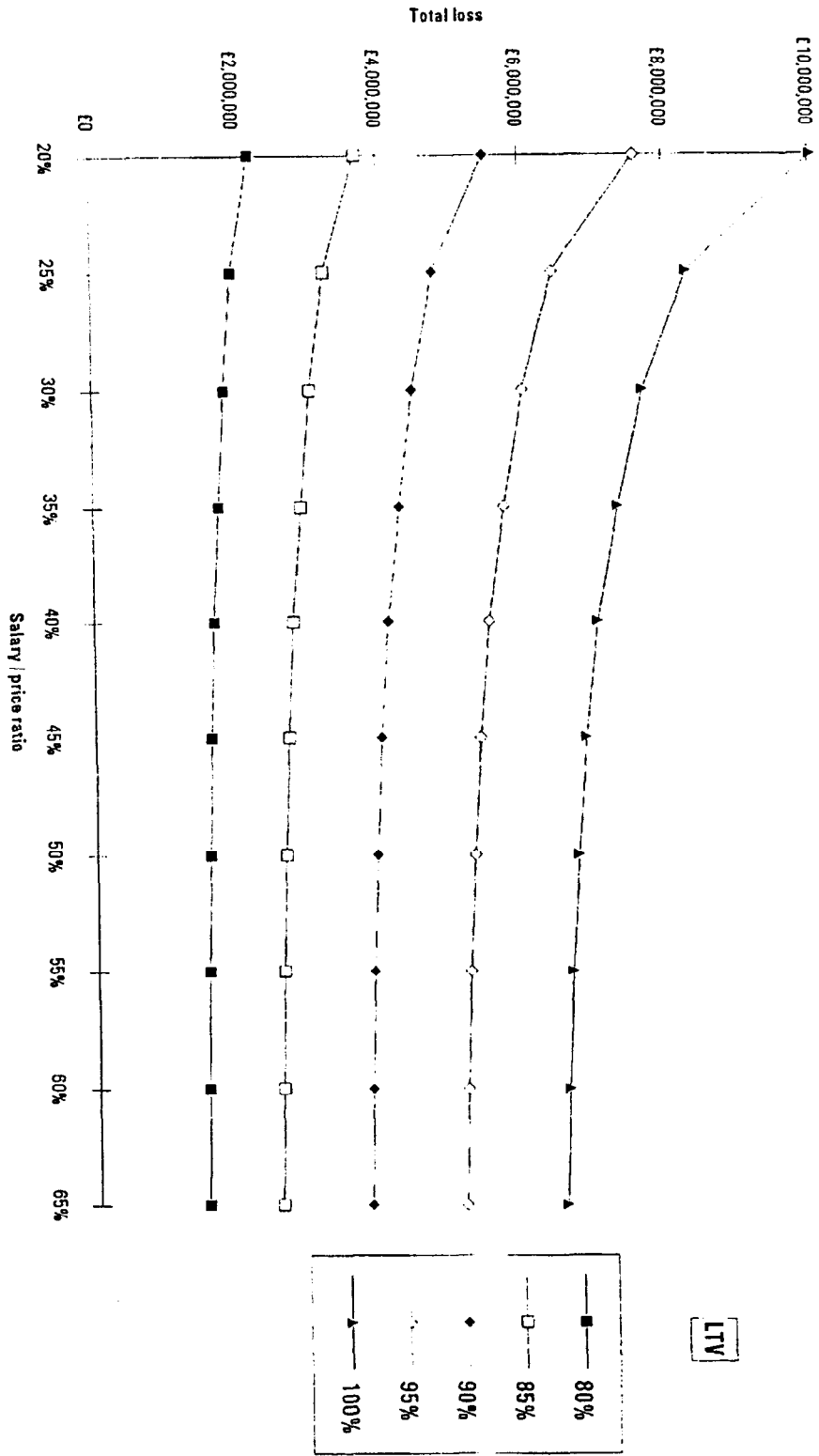


Graph 1



Graph 2

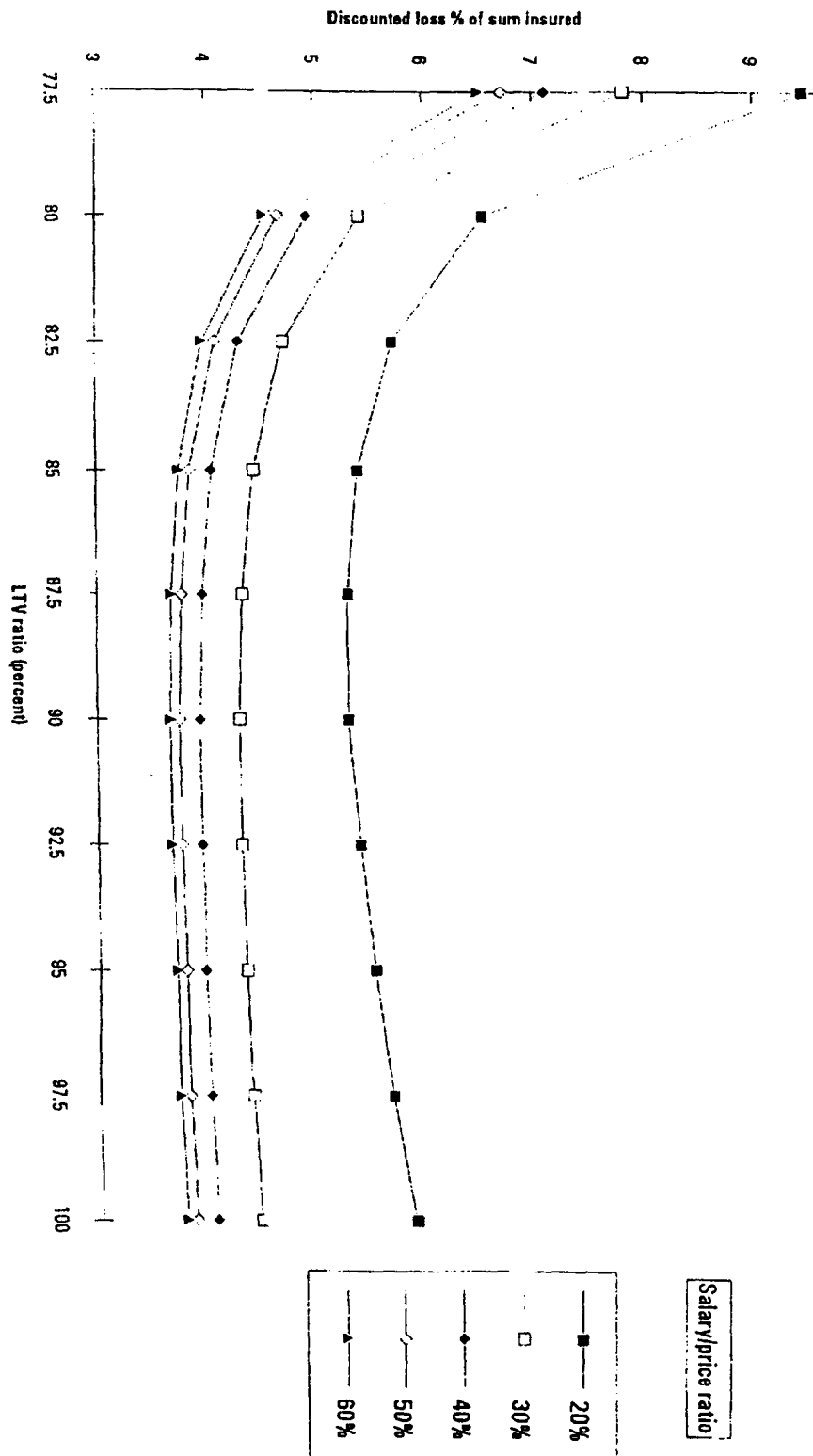
# Mortgage Indemnity Insurance Total losses on tax assumptions 3



Graph 3

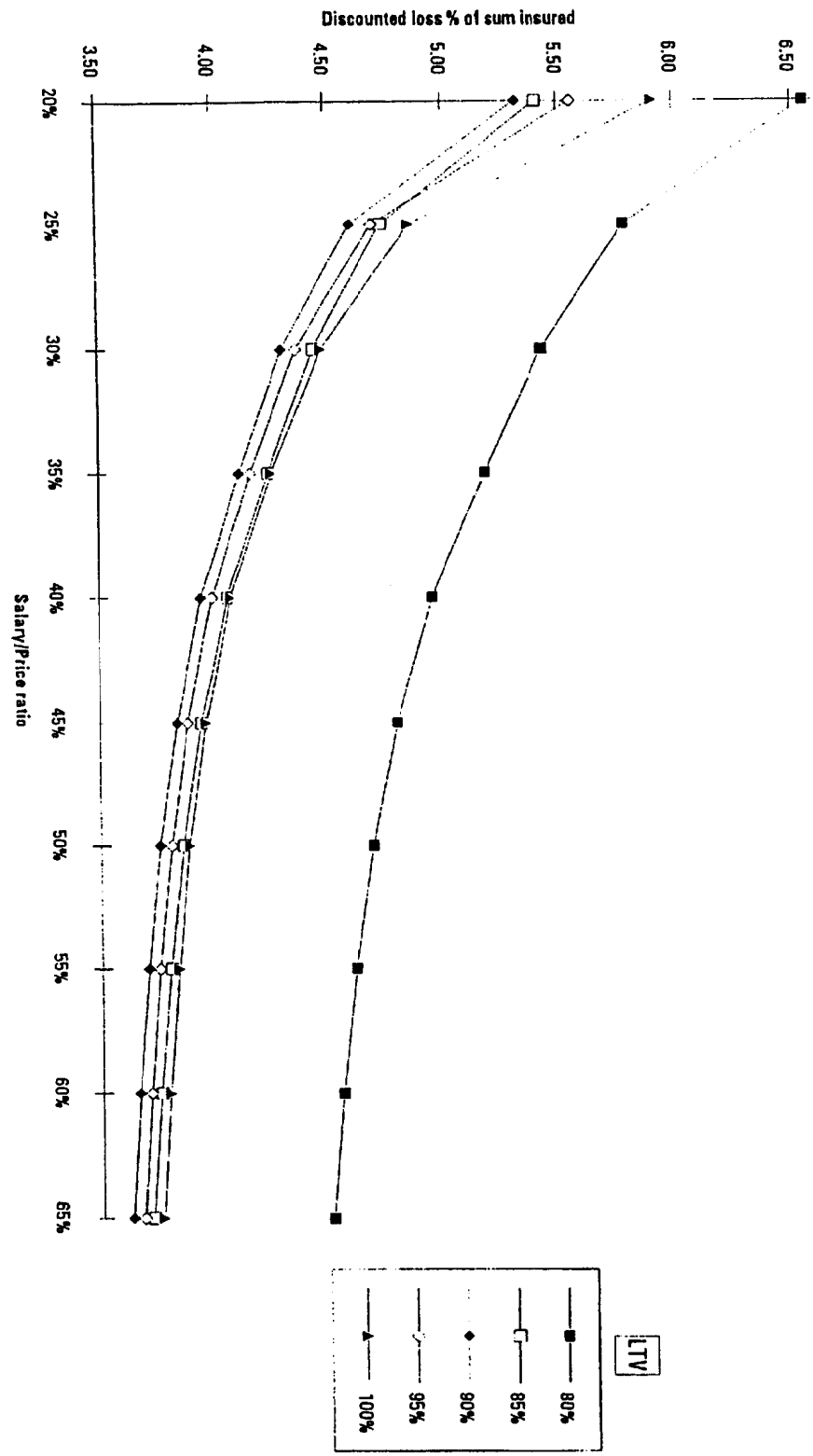
# Mortgage Indemnity Insurance

Total premium rate on tax assumptions 3



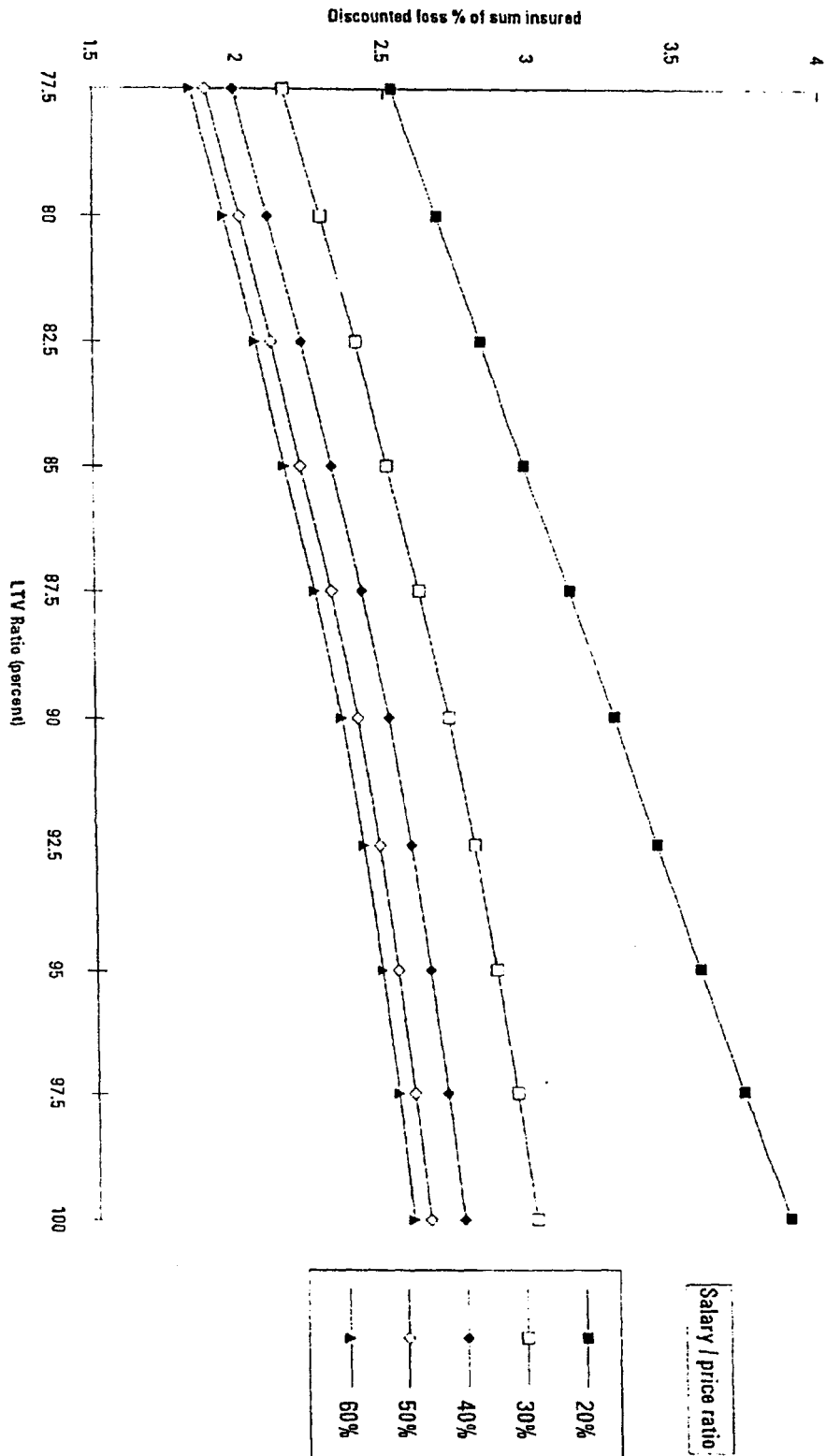
Graph 4

**Mortgage Indemnity Insurance**  
**Total premium rate on tax assumptions 3**



Graph 5

# Mortgage Indemnity Insurance Insurer's loss on tax assumptions 3

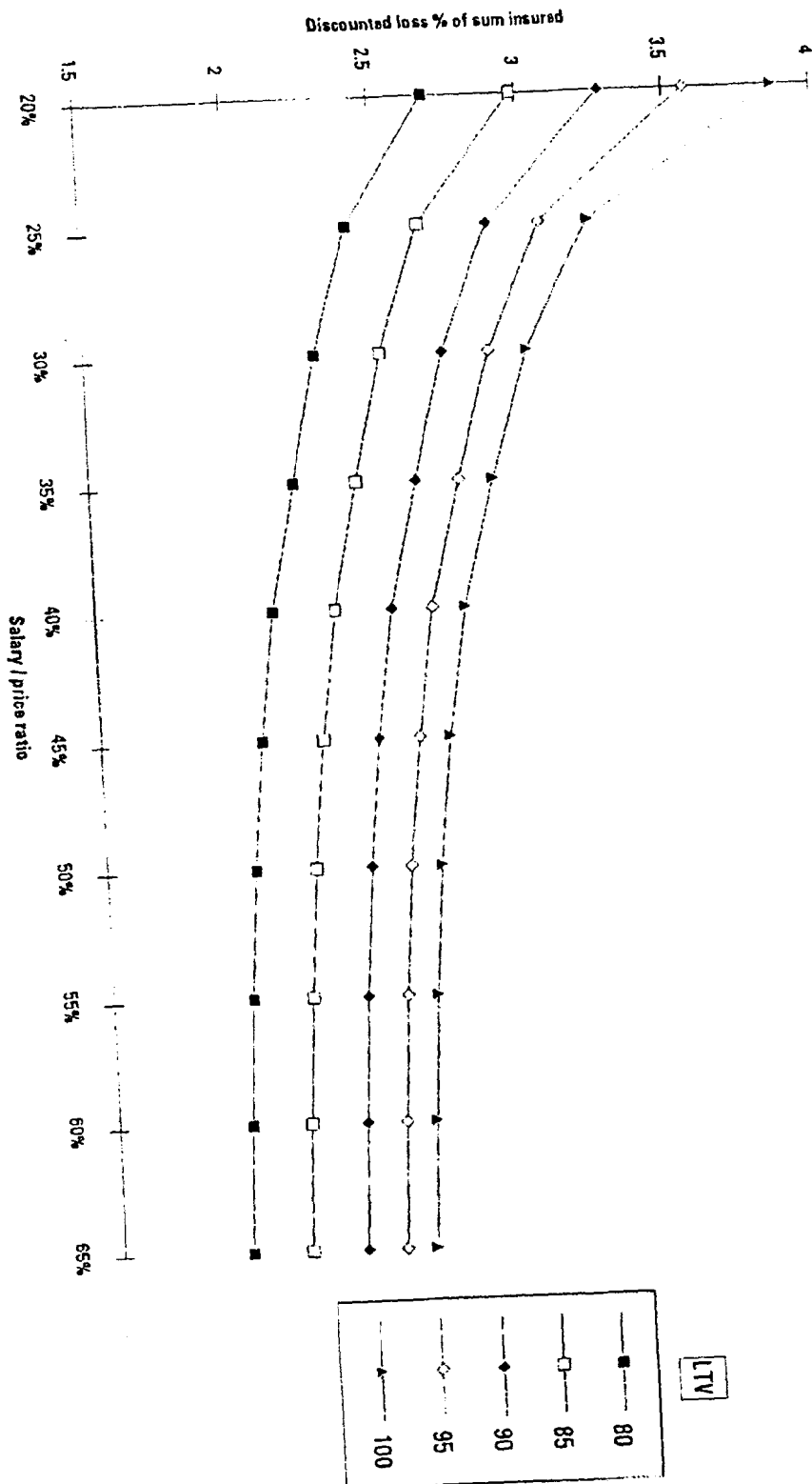




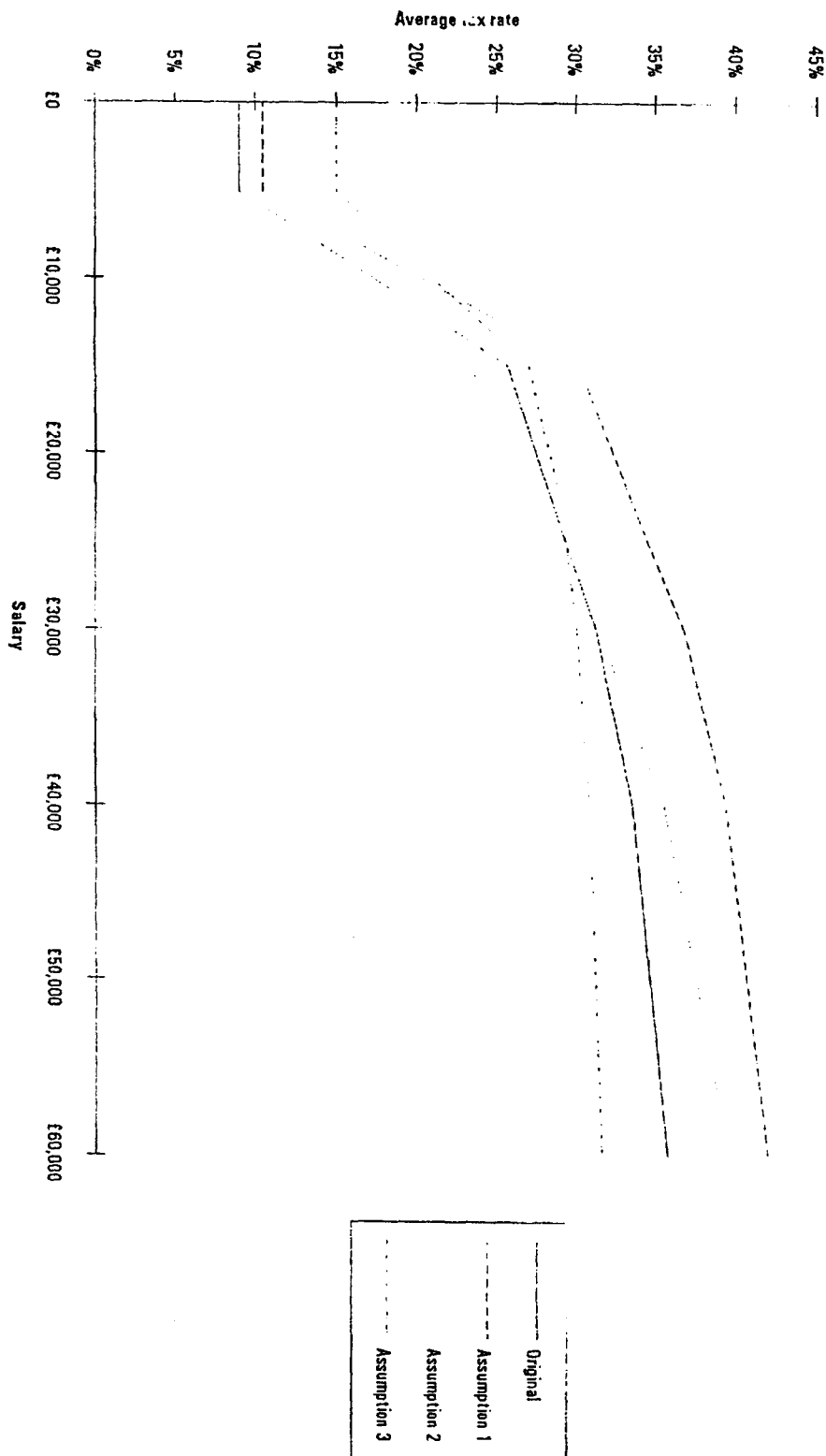
Graph 6

# Mortgage Indemnity Insurance

Insurer's loss on tax assumptions 3



# **Mortgage Indemnity Simulations** **Tax rates under each assumption**



## Appendix 1

Income tax structures used in projections.

	Common initial structure	First alternative	Second alternative	Third Alternative
Rate of relief on mortgage interest	25%	25%	25%	25%
Maximum mortgage for relief	£30,000	£30,000	£30,000	No maximum
Income band	Marginal income tax rate			
0 to £5,000	9%	10½%	5%	15%
£5,001- £23,000	34%	40%	32½%	33%
Above £23,000	40%	47%	47½%	33%

A graph of average tax rates is attached.