THE GRADUATED PAYMENT MORTGAGE AND RENTAL HOUSING

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When CMHC first introduced the Assisted Home Ownership Program, it recognized that during times of inflation, an equal payment mortgage may not be appropriate insofar as payments remain the same in nominal dollars even though income generally increases with inflation. Therefore, CMHC tried to lower the burden of repayment in the initial years. In subsequent years, repayment would rise, hopefully in line with increases in nominal income. The philosophy of ARP when introduced was basically similar, allowing repayment to rise as rent revenues increased.

The transformation of AHOP and ARP assistance to an interest-free repayable loan, and then to an interest-bearing repayable loan, and finally to a graduated payment mortgage, reflected the view that income/rent increases in later years will not only be sufficient to cover the cost of repaying the assistance given in the initial years, but also interest on that assistance.

In 1978 and 1979, a large number of AHOP and ARP accounts of the MIF entered into arrears and many were acquired.* One reason for this was the failure of incomes/

*ARREARS is defined here as failure to make a mortgage payment for up to three months. DEFAULT is failure to make payment past three months. The differentiation is made since CMHC allows a lender to commence legal action after three months. ACQUISITION is the acquiring by the MIF of the property title. This can be done either by voluntary QUIT-CLAIM in which the owner voluntarily gives up title or by FORECLOSURE where the court forces the owner to give up title.

rents to keep pace with the required increases in mortgage payment. With regard to rents, the presence of rent controls in most provinces put downward pressure on rents, even if new projects were exempt. Since the repayment schedule under GPM's is basically similar to the schedule under ARP, the question arises whether high arrears and acquisitions are likely to occur for GPM's as well.

This paper will begin with a general description of the GPM instrument, in comparison to the ARP loan. Section 2 will examine the characteristics of GPM loans that have been given in 1978 and 1979, comparing them both to ARP and other unsubsidized insured loans. Section 3 will look at arrears and defaults in ARP lending in order to identify what have been the major factors affecting arrears and defaults. Section 4 wil compare the risk of GPM's with risk under normal insured lending. Finally, in Section 5 a number of suggestions will be presented on how this risk can be lowered.

1. The Nature of the GPM Investment

The GPM provides for a reduction in monthly payments of $2.25 per $1,000 of loan in the first year of the mortgage. Thereafter, repayment rise each year by 5%. This rise continues until payments reach a level which would be sufficient to amortize the balance outstanding with an equal payment mortgage (EPM). In contrast, ARP (as used in 1976-1977) provided a monthly reduction of up to $100 per month, in the first year; the amount was reduced each year by 1/10 of the original amount, for a period of ten years. At the end of the tenth year, the accumulated ARP loan, without interest, becomes a second mortgage and may be combined with the outstanding first mortgage to form a single mortgage.

The Table 1, the monthly payment schedule and the balance outstanding at year-end for ARP and GPM's are compared, on the assumption that the average loan amount and interest rate were the actual averages for 1979, and that the initial ARP loan would have been $80 per unit per month.

As can be seen, the initial payments under ARP are $14 lower than under GPM's while the balance outstanding at the end of the 10 years is almost $2,000 higher under ARP, resulting in a higher monthly payment in year 11 of $15. An EPM would have a level monthly payment of $329 p.u.p.m.

In Table 2, we calculated the required monthly rent for the unit in order to cover mortgage repayment, maintenance (estimated at $100 p.u.p.m. and expected to grow

TABLE 1

COMPARISON OF ARP AND GPM REPAYMENT SCHEDULES

Year	ARP (1976) Monthly Payment	ARP (1976) Balance Outstanding Year-End: First Mortgage	Second Mortgage	TOTAL	GPM Monthly Payment	GPM Balance O/S at Year-End	Difference in Balance Outstanding ARP-GPM
1	$ 249	$ 29,131	$ 960	$ 30,091	$ 263	$ 29,971	120
2	257	28,940	1,824	30,764	276	30,567	197
3	265	28,723	2,592	31,313	290	31,070	243
4	273	28,477	3,264	31,741	305	31,456	285
5	281	28,196	3,840	32,036	320	31,778	258
6	289	27,816	4,320	32,136	336	31,649	487
7	297	27,513	4,704	32,217	353	31,279	938
8	305	27,100	4,992	32,092	371	30,737	1,355
9	313	26,630	5,184	31,814	380	30,120	1,694
10	321	26,096	5,280	31,376	380	29,418	1,958
11	395				380		

Average Loan Amount, 1979	$29,300
Average Interest Rate, 1979	$13\frac{1}{4}$%
Initial ARP Loan	$80 per unit per month
EPM Monthly Payment	$329 per unit per month

at 10% per annum), and a 10% return on initial equity. As can be seen, the EPM starts at a higher rent but increases at only 2.94% per annum over the first ten years - much less than anticipated inflation. The ARP loan starts lower but increases faster - at 5.01% per annum. If the ARP loan is combined with the outstanding first mortgage, the eleventh year will see a 16.61% increase in rents. The loan can, however, be repaid more gradually. The GPM rent starts somewhat higher than the ARP loan and increases only a bit faster but, by the eleventh year is increasing much slower than the ARP loan since a level of equal repayment has already been reached.

TABLE 2
RENT REQUIRED TO COVER COSTS
ALTERNATIVE MORTGAGE INSTRUMENTS

	Monthly Rent, $		
Year	EPM	ARP	GPM
1	456	376	390
2	466	394	413
3	477	413	438
4	489	433	465
5	502	454	493
6	517	477	524
7	531	501	557
8	551	527	593
9	570	554	621
10	592	584	643
11	615	681	666
- Average Annual % Increase, First 10 Years	2.94	5.01	5.71
- % Increase, 10th to 11th year	3.89	16.61	3.58

ASSUMPTIONS: Maintenance costs begin at $100 p.u.p.m. and increase 10% per year. Mortgage Repayment: See Table 1.

These figures are important for any discussion of the financial risk in GPM's since two of the crucial determinants of risk are net cash flow and loan-to-value ratio. Cash flow is the amount of money generated by actual rents, less all expenditures. CMHC appraisers are supposed to ensure that the current market rents to be charged in a project are sufficient to cover costs, including mortgage repayment. Consequently, comparing two identical projects, the one with lower rents, i.e. the ARP project, is more likely to be approved by CMHC, and if approved is more likely to be rented up quickly. The fact that the GPM rents are somewhat higher raises the probability of GPM projects having initial vacancy problems. Since the rent differential between GPM's and ARP's is so small, this latter factor is not likely to be very significant. Finally, with regard to the loan-to-value ratio, the higher ratio for ARP's means that such projects are more likely to default since the potential loss to the owner is much less.

TABLE 3

DIFFERENCES BETWEEN ARP AND GPM

THAT AFFECT MORTGAGE DEFAULT

Factor	Difference	Effect
Initial rents	higher in GPM	Greater vacancy problem in GPM
Ease of approval	more difficult with GPM	Less chance of approving a marginal project under GPM
Loan-to-Value ratio	lower in GPM	Owner of project less likely to default under GPM because more to lose

Table 3 summarizes the argument: because of higher initial rents, GPM's may face greater initial vacancy problems, thus increasing the probability of default, but because of the greater difficulty in getting approval and the lower loan to value ratio, the probability of default under GPM's is lower than under ARP.

2. Characteristics of GPM Rental Loans

In this section we shall describe the characteristics of GPM loans approved for rental accommodation. In section 4, these characteristics will be used to identify the consequent risks associated with the GPM instrument. Appendix "A" presents the data in tabular form.

In the last seven months of 1978, CMHC approved GPM mortgages for 57 projects; in the first 11 months of 1979, 268 projects were approved. Over 1/3 of the projects approved in 1979 (107) were in B.C. and one-quarter in Ontario (77).* In the latter case, however, average project size was 54 units whereas in B.C. the average project was one-half this size. In Alberta, the 16 projects approved had an average size of 66 units while in Manitoba the 10 projects had an average of only 7 units per project. There is, thus, significant variation in the average size of GPM projects across the country.

This variation in project size is reflected in the type of unit being constructed. There were 66 projects involving semi-detached or duplex units, with an average of 4 units per project. The 34 row unit projects had an average of 33 units per project, and the 163 apartment unit projects had an average of 54 units per project.

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*See Appendix "A" for statisticsl tables. All figures in this section refer to 1979 approvals unless otherwise specified.

In terms of size of unit within projects, 2½% were bachelor units, 34% were one-bedroom units and 46% were 2 bedroom units. Only 17% are 3 bedroom and ½% are 4 bedroom or larger. Thus, most of the rental units produced under GPM's are relatively small.

Finally, with regard to type of insurer, banks have aproved only 11 projects for a total of 205 units while trust companies have approved 118 projects (3,579 units). The largest single institutional approved lender is life insurance companies, approving 3,915 units in 53 projects. The relative popularity of GPM's with life insurance companies may be because their policy pay out is expected to rise with inflation, whereas other lending institutions borrow using level payment GIC's and therefore prefer matching these debt instruments with level payment mortgages.

The discussion to this point has focussed on JGPM's in relative isolation. Yet at the same time as GPM's were available, approved lenders also gave out EPM's on 60 projects, for a total of 1,144 units. The average size of an EPM project was only 19 units compared to an average of 38 units per project for GPM's. In terms of project type, 57% of EPM projects were for non-apartment forms, vs 38% for GPM's. However, for both GPM's and EPM's, approximately 40% of the units were small, i.e., either bachelor or one-bedroom units.

Although the average lending value for both GPM's and EPM's was almost the same, i.e., $29,000 per unit, the expected monthly rent for EPM units was $366 per month, compared to $341 per month for GPM's. This may reflect a greater profitability for the smaller projects being financed through EPM's. A second possibility is that, in presenting an application for a GPM, an entrepreneur might enter a low figure for monthly rent to show that he ought to receive a GPM.

The geographic distribution of projects is basically similar for GPM's and EPM's, with most of the units being in Ontario and B.C. The only exception is the large number of EPM projects in Alberta, 34, compared to 16 GPM's. However, the average EPM in Alberta has only 10 units, whereas the average GPM project has 66 units. In Ontario, the corresponding figures are 37 and 54 units per project while, in B.C., EPM projects are somewhat larger than GPM's, with 34 units per projects, compared to 28 units with GPM's.

One interesting comparison of EPM's and GPM's is in terms of the length of the amortization period and term of the initial mortgage. Over one-half of EPM projects have a term of 25 years whereas 90% of GPM's have a term of 35 years. On an average loan of $30,000 at 13½% rate of interest, the lengthening of the mortgage from 25 to 35 years reduces the initial monthly payment from $341 to $332. The ratio of balance outstanding to initial loan after 5 years is 96% for a 25 year mortgage and 99% for a 35 year mortgage.

Apparently, lenders are encouraging applicants for GPM mortgages to first reduce their monthly payment by extending the amortization period and then reducing payments through the GPM. Builders are thus able to pay the least amount possible toward mortgage repayment, a factor which, as we shall see, increases the risk to the MIF.

With regard to the mortgage term, virtually all EPM's are written for five year terms. However, approximately 15% of GPM projects have a ten-year term. The reason for this appears to be a desire on the part of some lenders to match the length of the GPM reduction with that of the mortgage term. The distribution of GPM's by mortgage term is the same for all types of lenders.

A second comparison of interest is between GPM's and ARP's. Such a comparison is more tenuous since conditions have changed in the market between 1977 and 1979. While both GPM's and ARP's were available in 1978, one can argue that GPM's were not sufficiently well-known in that year to justify a comparison with ARP's, yet that is the only year for which comparisons can be undertaken. In that year, there were 201 ARP projects of the interest-free loan variety first introduced in 1976, 100 ARP interest-bearing loans as introduced in 1978, 57 GPM's and 324 regular section 6 projects. The section 6 loans involved an average cost of $34,000 per unit, as compared to $26,000 for both the ARP and GPM projects. Section 6 projects averaged only 18 units per project whereas GPM's averaged 44, ARP-76 averaged 80 units and ARP-78 only 25 units per project. Thus, GPM projects tend to be halfway between the small Section 6 projects, and the very large ARP-76 projects.

Geographically, Alberta and B.C. both approved mainly Section 6 projects, whereas the preponderance of ARP-76 units, 75%, and of GPM projects, 54%, were in Ontario. The low level of rental approvals in Quebec in both 1978 and 1979 was due to the high rate of construction in previous years, which in turn created a surplus in the market. This led to high vacancy rates and consequent defaults for a large number of projects. In the following section, we shall examine in more detail the causes of defaults under ARP.

Summarizing the results of this section, it appears that GPM projects:

- vary significantly across the country in the size of the project;
- have an average project size that is smaller than ARP-76 but larger than the average Section 6 loan;
- include large numbers of apartment units, generally of the one and two bedroom size;
- are concentrated in Ontario and B.C.;
- have a greater preponderance of mortgages with 35 year amortization periods and 10 year terms;
- are financed mainly by life insurance and trust companies, but not banks; and
- have similar lending values, but lower initial rents, than EPM's.

In the next section we shall examine arrears under previous ARP programs. This will be useful in identifying whether any of the characteristics associated with defaults under ARP are also characteristic of GPM-financed projects.

3. Arrears and Acquisitions

Up to the end of November, 1979, CMHC's Mortgage Insurance Fund had records of 66 ARP projects that had been acquired.* A further 77 ARP projects were reported by Mortgage Administration Division to be in a serious default situation, facing the possibility of acquisition in the near future. In this section we shall examine some of the characteristics of projects in arrears or acquired.

In terms of program type, the incidence of arrears and acquisitions is highest for the ARP-75 program, in which assistance was given as a grant. Of 365 approvals, 26 (7.1%) have been acquired already and a similar number have defaulted. Under ARP-76 where the assistance was given as an interest-free loan, the incidence of default and

*See Appendix "B" for a discussion of data sources on default and a tabulation of the data.

acquisition is much lower, 2.9% and 2.2% respectively, although the absolute number is higher because of the higher level of activity-- almost five times as many projects. Furthermore, over 40% of the defaults in the ARP-75 program occurred in 1979, although the approval date was 1976 or 1977. This suggests that there is a long lag between the time that a project is approved and the time that it enters into financial difficulty. In other words, it is possible that the level of defaults in ARP-76 may rise as projects approved in 1977 and 1978 are completed and begin to run into difficulties. These difficulties almost always are associated with high initial vacancy problems once the project has been completed. Of the ARP-76 defaults, only 6 apply to projects approved in 1977 and none to approvals in 1978, even though in the latter two years, 70% of all ARP-76 projects were approved. Thus, in looking at the pattern of defaults, it is important to remember that defaults can occur several years after initial approval. Consequently, many of the projects classified as not in default may soon enter into default.

An important determinant of default appears to be the size of the project. The average project in default had 67 units, while the average of all projects is only 52 units. This, however, may be due to the fact that the average project size has declined since 1975, the year for which defaults were high, to 1978, for which defaults are not yet occurring. Since GPM projects tend to be smaller than regular Section 6 projects, but less than ARP-75 projects, the implication is that GPM's have a higher probability of default than Section 6, but lower than ARP.

One reason for defaults being associated with project size is that an entrepreneur must bear negative cash flow for an entire project. To illustrate, if the average loss per unit per year in the first year of operation is $1,000, it is easier for the entrepreneur to bear a loss of $12,000 if the project has only 12 units, than a loss of $120,000 if there are 120 units. The widescale use of MURB's in 1978-79 can significantly reduce the risk of default on large projects insofar as ownership is divided among several persons. On the other hand, holders of MURBs may not have the necessary cash to finance the negative cash flow as compared to the large entrepreneur. It is thus difficult to say whether project size will have as important an effect on GPM financed projects as on earlier ARP projects.

Geographically, 20% of defaults have occurred in New Brunswick, representing 15% of all approvals in that province. There are no other cases of default in any of the other Maritime provinces, nor in Alberta. Given the relatively low level of income in the former, and the high level in the latter, this would suggest that defaults are not tied to average income levels.

The largest absolute number of defaults has occurred in Quebec, 46 out of the national total of 66. Furthermore, 82% of all cases of arrears are in Quebec. The only other provinces where arrears represent more than 1% of approvals are Ontario (2%) and B.C. (1.1%). Thus, the problem of arrears and defaults are clearly associated with Quebec approvals.

The major reason for these problems appears to be the very high levels of approvals in 1975 and 1976 in Quebec. This has led to high vacancy rates and consequent cash flow problems. In one locality, Port Cartier, the closing of the Rayonnier plan effectively destroyed the demand for new rental housing. There does not, however, appear to be any other instances of one-industry town problems. The default problem is compounded in Quebec because of the existence of a dual housing market, one consisting of new, relatively expensive units, the other consisting of older, and much cheaper, units. The result of this dual market is that, when vacancies arise, they occur primarily in the newer units so that the vacancy rate in new projects is significantly higher than in older projects. The fact that most other areas of Canada do not have this dual market reduces the probability of default under GPM's relative to ARP, even though GPM's tend to be geographically concentrated in Ontario and B.C.

A final aspect of arrears concerns the term of the mortgage. Approximately 70% of all ARP approvals have a five year term, yet 81% of all defaults and 83% of all arrears are on five year term mortgages. One possible explanation is that owners of projects due for interest renewal at higher rates in the next few years, recognize that they will soon be in more serious cash flow problems. If they are already operating at a loss, with no prospect of improvement, the owner is more likely to quit-claim now. While 10 year terms are more common under GPM's than EPM's the fact remains that 85% of GPM's have five year terms. Should interest rates in 1984-85 be significantly higher than the 13% level under which GPM's have been approved, the risk of default will rise substantially.

Summing up, defaults in ARP are concentrated in Quebec and are due primarily to previous over-building and high vacancy rates. Because of the long lag between original approval and eventual default, it is possible that defaults will increase rapidly in other provinces where there has been an excess of building. This is especially the case in light of the five year term mortgage and current very high interest rates. The probability of default under GPM's is less than that under ARP because GPM units tend to be smaller and are not yet common in Quebec, where the dual market raises the risk of default in new projects. On the other hand, the risk of default under GPM's is higher than under EPM's because projects are large, because GPM's are geographically concentrated and because at the end of the five year term, both the increases in rents and the loan-to-value ratio are higher for GPM's than for EPM's. In the next section we shall try to derive a quantitative estimate of risk under GPM's in comparison to EPM's.

4. Estimation of Risk Under GPM

The estimation of risk under GPM's requires a knowledge of what are the determinants of foreclosure. With such information it is then possible to develop a model which would show how risk varies between GPM's and EPM's under alternative scenarios for the future. This risk includes both the risk of default and the resultant financial loss to the MIF. Unfortunately, very little is known in a quantitative sense about the determinants of foreclosure. In the U.S., HUD has sponsored a number of empirical studies into foreclosure, especially in subsidized housing projects.[1] These studies have identified such key factors as the quality of project management, project location and adequacy of HUD screening, while tenant characteristics were not felt to affect risk per se. One study by the Berkeley Planning Associates estimated a regression using as a dependent variable a dummy variable for whether or not the project has foreclosed. The sample consisted of limited dividend housing in the California Region. The major explanatory variables were:

1. % of units vacant in the project;
2. time since initial occupancy, and
3. net revenue in the first period.

Unfortunately the overall explanatory power is very low ($R^2 = 0.14$) and the statistical estimation technique unreliable. There have been one or two other studies that have estimated the probability of foreclosure in multi-family rental projects, but these have used previous

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[1] For a review see Fredland, J. and C.D. MacRae, "FHA Multi-family Financial Failure: A Review of Emperical Studies", Journal of the American Real Estate and Urban Economics Asasoc., Vol. 7 #1, Spring 1979.

mortgage difficulties as an explanatory variable--not useful if one is trying to predict mortgage difficulties at the time of mortgage approval. In any case it is questionable whether U.S. data and results for subsidized housing can be applied to unsubsidized Canadian housing.

In light of this constraint, we have used a simulation model and "best guess" coefficients. The model is described in Appendix "C". Its major outputs are cash flow after taxes, yield and the ratio of balance outstanding to the value of the property. These are the main factors that affect the probability to default. Unfortunately, we have no knowledge of how, in a quantitative sense, these factors affect the risk of default. We have assumed that the probability to default is in fact an additive function of each of these three elements. Specifically, we have assumed that:

a) if cash flow per unit is less than a specified required minimum, the probability to default is equal to a coefficient times the extent of the shortfall;

b) if yeild is below a specified minimum, the probability to default is equal to a coefficient times the size of this shortfall; and

c) if the ratio of balance outstanding to value of the property is greater than a specified maximum, the probability to default is equal to a coefficient times the size of this difference.

In the present simulations, we have used the following equation:

$$P_t = 0.0033 \times (1000 - (FU_t) + 0.3 \times (15 - YD_t) + 16.66 \times (LV_t - 0.75)$$

Subject to: if CFU $>$ 1,000, CFU = 1,000

if YD $>$ 15, YD = 15

if LV $<$ 0.75, LV = 0.75

where: P_t: is the probability of default, in year t;

CFU_t: is cash flow after taxes, per unit, in year t;

YD_t: is net yield of the project to date, in percentage terms, in year t; and

LV_t: is the ratio of the principal outstanding to the total value of the project, in year t.

The selection of these values is entirely arbitrary and can of course be changed in other simulations as better knowledge of the probability of default becomes available. The coefficients were chosen in order to apply equal weight to each factor under reasonable assumptions. Thus, for CFU of $400, YD of 6% and LV of 0.875, each factor contributes aproximately 2 percentage points for an overall probability of default of 5.9%.

Using these assumptions, we can calculate the probability of default under varying sets of input assumptions. Because of the relatively arbitrary nature of the above equation, our focus is on the comparison in the probability of default between EPM's and GPM's. Our base year assumptions are the same as those outlined in Table C-2 in Appendix "C". The relative probabilities of default are given in Table 4.

Given the assumptions and the methodology, the results appear to be reasonable. In the initial years, the risk is higher with an EPM because of the lower cash flow associated with higher mortgage repayment. In later years, however, GPM's have a higher risk since the balance outstanding is higher.

The next stage in the analysis is to see how the probabilities are affected by changes in some of the assumptions. In this section, two such variations shall be discussed. In the first, all the growth rates are reduced.

- growth in rent from 8% to 6% per annum;
- growth in maintenance costs from 10% to 8% per annum;
- increase in the capital value of the property from 4% to 0% per annum;
- increase in land costs from 9% to 5% per annum.

TABLE 4

PROBABILITY OF DEFAULT

At End of Year	EPM Cash Flow After Taxes	EPM Yield	EPM Ratio of Balance to Value	EPM Prob. of Default	GPM Cash Flow After Taxes	GPM Yield	GPM Ratio of Balance to Value	GPM Prob. of Default
1	- 179	23.1	0.88	6.2	720	25.7	0.91	3.6
2	36	24.8	0.84	4.6	788	25.9	0.88	2.9
3	554	22.5	0.79	2.1	1,168	23.2	0.85	1.7
4	1,086	21.6	0.74	0.0	1,600	22.1	0.82	1.2
5	1,276	20.4	0.70	0.0	1,730	21.1	0.79	0.6
6	1,484	19.1	0.65	0.0	1,799	19.9	0.75	0.1
7	1,709	18.0	0.61	0.0	1,874	18.7	0.72	0.0

ASSUMPTIONS: See Appendix "C"

In addition interest rates in the second term, beginning in year 6, rise from 10% to 14%.

In the second simulation, initial vacancy rates are higher:

- in year 1 from 25% to 50%
- in year 2 from 15% to 35%
- in year 3 from 10% to 15%

As can be seen in Table 5, in both simulations the effect is a large increase in the probability of default. However, the same basic pattern of higher risk to EPM in the initial year and lower in the later years holds in both cases.

In the above example, it was assumed that the same project qualifies for either a GPM or an EPM. In many cases, however, an applicant may turn to a GPM because rents are not high enough to justify an EPM. The next simulation involves comparing risk in the base year GPM case with risk under a GPM when initial rents are 8% lower, this being the average difference in initial rents between EPM's and GPM's in 1979.

As expected, the risk of default is higher with the lower rents, though not significantly greater. By the fourth year, the two risks are similar insofar as rents are,

TABLE 5

SIMULATIONS OF VARIATIONS IN ASSUMPTIONS

ON PROBABILITY TO DEFAULT

Year	Base Values		Simulation One Change in Growth Pattern		Simulation Two Change in Vacancy Rate	
	EPM	GPM	EPM	GPM	EPM	GPM
1	6.2	3.6	11.8	8.4	11.8	8.3
2	4.6	2.9	9.1	7.0	8.8	6.4
3	2.1	1.7	7.1	6.1	2.9	2.0
4	0.0	1.2	4.6	5.5	0.0	1.2
5	0.0	0.6	3.5	5.1	0.0	0.6
6	0.0	0.1	5.4	6.6	0.0	0.1
7	0.0	0.0	4.3	8.5	0.0	0.0

TABLE 6

SIMULATION OF LOWER INITIAL RENTS

ON PROBABILITY OF DEFAULT

Year	Base Year		Rents reduced by 6%
	EPM	GPM	GPM
1	6.2	3.6	4.0
2	4.6	2.9	3.8
3	2.1	1.7	2.1
4	0.0	1.2	1.2
5	0.0	0.6	0.6
6	0.0	0.1	0.1
7	0.0	0.0	0.0

by that time, sufficiently high to ensure the project is viable.

In summary, these initial simulations suggest that the use of a GPM shifts the risk relative to an EPM from the initial years to later years. It also raises risk somewhat insofar as projects with lower initial rents are likely to qualify for a GPM but not for an EPM.

The key factors affecting risk, i.e., quality of management and of construction and extent of vacancies in the market, are the same for EPM's and GPM's. The implication is that, in approving GPM's, CMHC officers must continue to exercise caution.

The discussion of risk to this point has been with the risk of default. There is however a second risk, that associated with actual loss to the MIF on resale of the project. It is the risk that the MIF fee is designed to cover. A measure of this risk is the ratio of oustanding principal to the current market value at the time of default. This ratio excludes the various holding and transactions costs associated with the acquisition and resale of a property. Unfortunately, time did not permit a review of previous experience of the MIF to determine the actual costs. A rough estimate of these costs is 20% of the current value, divided roughly as follows: $7\frac{1}{2}$% to acquire (less if by quit claim, more if by acquisition), $7\frac{1}{2}$% to repair and 5% to resell. In dollar terms, the base year simulation generates a loan-to-outstanding-value ratio in year one of 0.88 for an EPM. Since the non-land component of the property increased at 4% and the land component at 9%, the total value of the asset at the end of one year is $36,650, and the value of the balance outstanding is $32,396. After deducting the 20% loss on the property, the estimated loss to the corporation is $3083 should it acquire a property at the end of the first year.

A second loss to the fund is due to the fact that most properties that are acquired have high vacancy rates. Thus, while the average vacancy rate in the first year may be 25%, leading to a probability of default of 3%, those acquired tend to have much higher rates. In the simulation, a vacancy rate of 50% results in a net loss per unit of $1703 per year before taxes.

The third element of loss to the Fund is due to the fact that once an owner sees that his property is likely to go into foreclosure, he stops making payment on his mortgage. Revenues from the property are not taken over by the bank until after 3 months. At an average monthly payment of $292 per month this results in a loss of $878.

Summing these three cost elements results in a loss to the fund of $5664 per unit. How does this figure compare with the current MIF fee? At 1%, the owner of the property would have paid $342. Since the risk of default is 6.1%, one out of 16 units is likely to enter into default. These 16 projects pay $5546 in fees net of expenses. Thus, the estimated loss to the fund is $118 per unit. This type of calculation was applied to each year of the simulation, and the results presented in Table 7.

The comparison between EPM's and GPM's shows that the value of the loss per unit is somewhat lower under GPM than under EPM in the first year, and declines much slower. This is because the balance outstanding on the mortgage is higher. However, because of the higher risk of default under EPM's in the initial years, the loss to the MIF is much higher; after year 3 however, GPM's are riskier, so that the combined effect of risk of default and size of loss results in a higher risk to the Fund.

TABLE 7
FINANCIAL RISK OF DEFAULT

Year	Estimated Loss		Ratio of Loss to fee Payments	
	EPM	GPM	EPM	GPM
1	5664	5484	1.067	0.602
2	3785	4650	0.535	0.413
3	1704	3649	0.115	0.191
4	-348	2460	n.a	0.089

Up to this point, we have examined a hypothetical unit. In this section, we shall apply the model to 4 large urban areas: Montreal, Toronto, Edmonton and Vancouver. The value of the base year assumptions are given in Table 8. The values of the "fixed assumptions" are derived by taking the averages observed in 1979 for actual GPM approvals. The only exception is Montreal where no rental projects were approved so that 1978 values were used. Information on soft costs are not systematically available from the files. Consequently, a figure of $2,000 per unit is assumed for all cities.

With regard to policy variables, the same set of variable values are used for all cities. With regard to values for variable assumptions, the vacancy rate used for year four is the vacancy rates from the vacancy survey of October 1979. The vacancy rate in year one is found by taking the row and apartment units newly completed and unoccupied at Dec., 1979, and dividing it by the total number of starts of row and apartment units during the year. Vacancy rates in years two and three are calculated by multiplying vacancy rates in year one by one-half and one-quarter respectively. Growth in rents and maintenance costs are the actual changes in the shelter and household operation indexes, respectively, taken from the Consumer Price Index. Increases in land and capital value are

TABLE 8
VALUE OF ASSUMPTIONS FOR SIMULATIONS, SELECTED CITIES

	Montreal	Toronto	Edmonton	Vancouver
Fixed Assumptions				
Capital Cost, $	21911	23617	20325	24084
Land Cost, $	1326	7643	12722	9245
Soft Cost, $	2000	2000	2000	2000
Interest Rate, %	11.375	11.375	11.375	11.375
Rent, $ p.u.p.m.	288	339	358	324
Amortization period, years	35	35	35	35
First mortgage term, years	15	15	15	15
Maintenance Costs $ p.u.p.m.	130	100	95	83
Policy Variables				
Permitted Yield, %	5	5	5	5
Marginal Tax Rate, %	35	35	35	35
GPM Reduction, $per $1000	2.25	2.25	2.25	2.25
Increase in Payments, %p.a.	5	5	5	5
Discount rate, % p.a.	12	12	12	12
Variable Assumptions				
Vacancy Rate, Year 1, %	30	23	50	16
Vacancy Rate, Year 2, %	15	11.5	25	8
Vacancy Rate, Year 3, %	7.5	6.0	12.5	4
Vacancy Rate, Year 4, %	4.5	2.5	2.1	1.2
Growth Rate, of Rents % p.a.	8.8	5.8	15.3	5.4
Growth Rate in maintenance % p.a.	9.2	9.6	6.2	5.8
Growth Rate in Capital Value, % p.a.	1.5	2.5	4.0	3.0
Growth Rate in Land Value, % p.a.	3.0	5.0	8.0	6.0
Interest Rate, Second Term, %	12.3	12.3	12.3	12.3
Interest Rate, Third Term, %	10.0	10.0	10.0	10.0
Second Mortgage, Term, Years	5	5	5	5

TABLE 9
SIMULATION EFFECTS ON RISKS SELECTED CITIES

Year	Output Variable	Montreal	Toronto	Edmonton	Vancouver
1	Yield - EPM	4.3	8.3	10.7	13.7
	- GPM	1.9	10.9	13.3	16.2
	Prob. of Default - EPM	11.2	9.1	9.7	7.2
	- GPM	10.4	6.0	6.3	4.2
2	Yield - EPM	7.4	5.7	13.5	10.2
	- GPM	5.7	7.4	15.1	11.8
	Prob. of Default - EPM	11.3	10.9	7.6	9.2
	- GPM	10.9	8.7	5.3	6.9
3	Yield - EPM	6.3	5.5	17.1	9.3
	- GPM	4.7	7.1	18.0	10.8
	Prob. of Default - EPM	10.7	9.9	3.6	8.4
	- GPM	10.9	8.5	2.8	6.8
4	Yield - EPM	4.9	5.6	19.1	8.9
	- GPM	3.2	7.1	19.9	10.3
	Prob. of Default - EPM	10.4	8.9	0.3	7.4
	- GPM	11.3	8.2	1.6	6.6

estimated on the basis of our own expectations regarding the individual markets.

The results of the simulation for each city for each of the four first years are presented in Table 9. Because of the arbitrary nature of the assumption and the model itself, these results should be used with caution. Consistent with previous simulations, risks of default is higher for the EPM's in the initial years and higher for GPM's in later years. Looking across cities, in the first year risk is highest in Montreal mainly because of the low rents. Risk declines most rapidly for Edmonton because of the assumed high growth in the price of land and capital. In both Toronto and Vancouver, the risk of EPM's is greater than the risk of GPM's for each of the first four years as the higher cash flow of the GPM is not fully offset by the lower loan-to-value ratio of the EPM.

5. Summary

This paper set out to determine whether there is a greater risk under the GPM relative to both ARP and a regular EPM instrument. With regard to ARP comparison, we found that risk under the GPM is lower because:

(a) the level of asistance is lower

(b) projects are smaller

(c) approvals are not geographically concentrated, especially not in Quebec.

With regard to the risk under GPM's in comparison to the risk under EPM's we found risk under EPM's to be higher in initial years because of the higher repayment schedule, though lower in later years because of the lower balance-of-loan-to-value ratio. The former factor is however misleading since GPM's are more likely to be approved since the criteria for project approval is ability to earn a profit in initial years.

The implication of these results for policy purposes is that the current MIF fee is probably not sufficient to cover the true risk under GPM's. In times of rapid inflation and high-interest rates, the inability to forecast what will happen to revenues and costs even in the short-run makes the job of approving mortgage insurance much riskier than before. If the MIF is to be run on a purely business basis, then the Corporation should exercise greater caution than before in approving mortgages, whether it be as EPM's or GPM's. If the MIF is to be run as an arm of government policy, approving mortgages as a means of stimulating the economy, then the higher risks should be recognized by government as the cost of this policy.

APPENDIX "A"

CHARACTERISTICS OF GPM APPROVALS

TABLE A-1

DISTRIBUTION OF RENTAL APPROVAL BY AVERAGE PRICE AND COST

	1978 Approvals				1979 Approvals[1]	
	Sec. 6	ARP-76	ARP-78	GPM	Sec. 6	GPM
Total No. of Approvals	324 (5,693)	201 (15,445)	100 (2,513)	57 (2,471)	60 (1,144)	268 (10,114)
Average No. of Units per project	18	80	25	44	20	38
Average Loan per unit	33,891	25,878	23,041	26,053	28,643	29,148
Average Rent per unit per month	371	284	264	294	366	341
Average Land cost per unit	8,893	4,140	2,578	3,566	7,200	6,416
Average estimated expenditure per unit	68	94	82	87	64	80

Note: numbers shown are on a project basis, and those shown in brackets are on a unit basis.

[1] 1979 Approvals is to November.

TABLE A-2

DISTRIBUTION OF RENTAL APPROVALS BY TYPE OF LENDING INSTITUTION

Class of Lender	1978 Approvals								1979 Approvals			
	Sec. 6		ARP-76		ARP-78		GPM		Sec. 6		GPM	
	#	%	#	%	#	%	#	%	#	%	#	%
Chartered Banks	149	46	24	12	20	20	0	-	29	48	11	4
	(788)	(14)	(1,974)	(13)	(255)	(10)	(0)	-	(325)	(28)	(205)	(2)
Trust Co.	72	22	97	48	43	43	38	67	16	27	118	44
	(2,239)	(39)	(6,195)	(40)	(1,126)	(45)	(1,493)	(60)	(377)	(33)	(3,759)	(37)
Loan Co.	66	20	13	6	11	11	2	4	10	17	58	22
	(592)	(10)	(747)	(5)	(289)	(12)	(236)	(10)	(224)	(20)	(1,386)	(14)
Life Ins. Co.	22	7	48	24	18	18	12	21	5	8	53	20
	(1,385)	(24)	(4,554)	(29)	(451)	(18)	(606)	(25)	(218)	(19)	(3,915)	(39)
Mortgage Co.	14	4	16	8	4	4	2	4	0		24	9
	(679)	(12)	(1,927)	(12)	(348)	(14)	(70)	(3)			(687)	(7)
CMHC	2	1	0	0	0		0	-	0		0	
	(10)	-										
Other	0		3	1	4	4	3	5	0		4	1
			(48)	-	(44)	(2)	(66)	(3)			(162)	(21)
TOTAL	324	100	201	100	100	100	57	100	60	100	268	100
	(5,693)	(100)	(15,445)	(100)	(2,513)	(100)	(2,471)		(1,144)	(100)	(10,114)	(100)

Note: numbers shown are on a project basis, and those shown in brackets are on a unit basis.

TABLE A-3

DISTRIBUTION OF RENTAL APPROVALS BY REGIONB

Region	1978 Approvals								1979 Approvals			
	Sec. 6		ARP-76		ARP-78		GPM		Sec. 6		GPM	
	#	%	#	%	#	%	#	%	#	%	#	%
NFLD	0		0	-	3	3	1	2	0		1	-
					(124)	(5)	(72)	(3)			(26)	-
PEI	2	1	9	4	1	1	7	12	1	2	4	1
	(56)	(1)	(123)	(1)	(16)	(1)	(90)	(4)	(14)	(1)	(39)	-
NS	5	2	5	2	7	7	0		2	3	2	1
	(138)	(2)	(127)	(1)	(142)	(6)			(27)	(2)	(38)	-
NB	1	-	3	1	9	9	0		0		2	1
	(5)	-	(130)	(1)	(285)	(11)					(97)	(1)
QUE	4	1	36	18	47	47	11	19	1	2	35	13
	(24)	-	(677)	(4)	(598)	(24)	(137)	(6)	(4)	-	(788)	(8)
ONT	11	3	107	53	6	6	23	40	12	20	77	29
	(703)	(12)	(11,599)	(75)	(98)	(4)	(1,333)	(54)	(443)	(39)	(4,163)	(41)
MAN.	143	44	7	3	8	8	2	4	1	2	10	4
	(506)	(9)	(713)	(5)	(456)	(18)	(70)	(3)	(10)	(1)	(68)	(1)
SASK	5	2	2	1	5	5	5	9	0		14	5
	(10)	-	(102)	(1)	(106)	(4)	(305)	(12)			(853)	(8)
ALTA	110	34	14	7	9	9	2	4	34	57	16	6
	(2,464)	(43)	(1,295)	(8)	(439)	(17)	(240)	(10)	(333)	(29)	(1,054)	(10)
BC	43	13	18	9	5	5	6	11	9	15	107	40
	(1,787)	(31)	(661)	(4)	(249)	(10)	(224)	(9)	(313)	(27)	(2,988)	(30)
TOTAL	324	100	201	100	100	100	57	100	60	100	268	100
	(5,693)	(100)	(15,445)	(100)	(2,513)	(100)	(2,475)	(100)	(1,144)	(100)	(10,114)	

Note: numbers shown are on a project basis, and those shown in brackets are on a unit basis.

TABLE A-4

DISTRIBUTION OF RENTAL PROJECT APPROVALS BY TERM AND PERIOD OF MORTGAGE

	1978 Approvals				1979 Approvals	
	Sec. 6	ARP-76	ARP-78	GPM	Sec. 6	GPM
Period, in years						
25	88	4	1	2	29	17
30	139	1	3	0	2	7
31	92	183	96	49	26	224
Other	5	13	0	6	3	20
TOTAL	324	201	100	57	60	268
Term, in years						
5	295	119	84	49	57	215
10	17	51	9	5	0	27
15	3	21	0	2	0	0
Other	9	10	7	1	3	26
TOTAL	324	201	100	57	60	268

TABLE A-5

DISTRIBUTION OF RENTAL APPROVALS BY DWELLING AND CONSTRUCTION TYPE

	1978 Approvals								1979 Approvals			
	Sec. 6		ARP-76		ARP-78		GPM		Sec. 6		GPM	
	#	%	#	%	#	%	#	%	#	%	#	%
Dwelling Type												
Apt.	88	27	162	81	90	90	41	72	22	37	163	61
	(4,917)	(86)	(13,870)	(90)	(2,283)	(91)	(2,027)	(82)	(923)	(81)	(8,738)	(86)
Row	12	4	31	15	6	6	15	26	5	8	34	13
	(470)	(8)	(1,565)	(10)	(222)	(9)	(442)	(18)	(176)	(15)	(1,110)	(11)
Other	224	69	8	4	4	4	1	2	33	35	71	26
	(306)	(5)	(10)	(0)	(8)	(0)	(2)	(0)	(45)	(4)	(266)	(3)
TOTAL	324	100	201	100	100	100	57	100	60	100	268	100
	(5,693)	(100)	(15,445)	(100)	(2,513)	(100)	(2,471)	(100)	(1,144)	(100)	(10,114)	(100)
Exterior Constr.												
Wood frame	310	96	135	67	95	95	47	82	56	93	233	87
	(4,316)	(76)	(7,191)	(47)	(1,552)	(62)	(2,093)	(85)	(902)	(79)	(6,889)	(68)
Solid Masonry	5	2	45	22	3	3	8	14	4	7	28	10
	(160)	(3)	(5,459)	(35)	(596)	(24)	(258)	(10)	(242)	(21)	(2,737)	(27)
Concrete or Steel	9	3	21	10	2	2	2	4	0		7	3
	(1,217)	(21)	(2,795)	(18)	(365)	(15)	(120)	(5)	(0)		(488)	(5)
TOTAL	324	100	201	100	100	100	57	100	60	100	268	100
	(5,693)	(100)	(15,445)	(100)	(2,513)	(100)	(2,471)	(100)	(1,144)	(100)	(10,114)	(100)

Note: numbers shown are on a project basis, and those shown in brackets are on a unit basis.

APPENDIX "B"

ACCOUNTING FOR ARREARS AND ACQUISITIONS UNDER ARP

In developing a data base for comparison of projects in default with those not in default, it was necessary to merge four different data sets. In this Appendix, we shall discuss the procedures used, and their limitations. As well, we shall provide a number of statistical tabulations.

The major source of information on mortgage approvals is the statistical file N951N951. Once a mortgage application has been approved, information on project characteristics as derived from the approval form and the appraisal form are recorded onto the computer file. All projects receive a unique eight digit code. In addition, projects are assigned "borrower codes", depending on whether the projects are ARP, GPM, Section 6 regular or some housing assistance program. This file is the major source of information for the Canadian Housing Statistics. Although cancellations of approved projects are supposed to be recorded, it is not certain that this is generally done. It is thus possible the file contains cancelled projects as well. The extent of this is not however very great.

The second source of data is that on arrears. In their monthly Operations Report, Mortgage Administration

Division records all projects that are in serious arrears, and for which the lender anticipates a claim will be made. These data include project number, name, location and a brief narration describing the immediate cause--usually high initial vacancy rates.

The narrative also records whether the project is an ARP project. All of the 265 anticipated claims from the November 1979 report were coded. These were then matched with data from the Statistics file; however, of the 135 projects recorded as being ARP projects, 38 could not be matched up with the Statistics file. Time did not permit an analysis of why a match could not be made. Similarly we could not determine why 9 projects not classified as ARP in the Operations Report appear as ARP in the Statistics file.

The third source of data is a ledger maintained by MAD of actual claims in ARP. This file includes all claims since the beginning of 1979. The file records 47 claims, though one claim involves 19 projects in Dollard des Armoux, in Montreal. This file was also matched against the Statistics file. Matches were not made for seven claims, one of which was for the 19 projects in Dollard. Again, time did not permit a more thorough investigation.

The fourth source of data is a computer file built by Statistical Services Division under B. Mulvihill. This file is supposed to include all projects that have been acquired by the Mortgage Insurance Fund up to the middle of 1979. Unfortunately, it is not possible to tell from the file alone whether a project was financed under ARP or not. The list of 52 multiple projects generated a total of 28 project number that matched numbers on the Statistical file that were classifed as ARP.

Two projects on this file were also recorded on the ledger file referred to above. Therefore, the total number of claims and acquisitions which we can definitely identify as ARP is (40+28-2=)66. Twenty of the projects from the Operation Report also appear on at least one of the claims files and have, therefore, not been included on the list of anticipated claims.

Summing up, the Statistical file, N951N951, contains 2,240 records. Of these, 68 have been acquired, 77 are in serious arrears, and 2,097 have no mention of arrears or default from the other two files. Table B-1 presents a statistical profile of this data set.

TABLE B-1

DISTRIBUTION OF DEFAULTS AND ARREARS IN ARP

		Claims in	Serious Arrears	No record Default	Total
1.	TOTAL	68	77	2,097	2,240
2.	Distribution By Province				
	NFLD	0	0	30	30
	PEI	0	0	20	20
	NS	0	0	69	69
	NB	13	0	75	88
	Que.	46	63	816	925
	Ont.	4	8	400	412
	Man.	0	1	85	86
	Sask.	0	1	133	134
	Alta.	0	0	127	127
	BC	7	4	342	349
3.	Amortization Period				
	25	0	0	15	15
	30	0	0	37	37
	35	65	76	2,006	2,147
	37	0	0	1	1
	40	1	1	38	40
4.	Term of Mortgage				
	5	53	64	1,444	1,561
	10	10	4	391	405
	15	2	7	156	165
	25	1	1	73	75
	Other	0	1	43	44
5.	Year of Approval				
	1975	26	26	311	363
	1976	34	21	536	591
	1977	6	28	967	1,001
	1978	0	2	283	285
6.	Type of ARP Assistance				
	Grant	26	26	313	365
	Interest-Free Loan	40	51	1,686	1,777
	Interest-Bearing Loan	0	0	98	98
7.	Average Loan Per Unit	20,409	19,699	22,843	22,663
	Average Rate of Interest	13.4	12.7	13.0	13.0
	Average No. of Units Per Project	69.3	51.5	51.7	52.2

APPENDIX "C"

A SIMULATION MODEL OF YIELDS IN RENTAL HOUSING

The purpose of this model is to simulate the cash flow of a rental project under varying assumptions about the future. As illustrated in figure 1, the model begins with a set of independent forecasts of the growth in prices and costs. The figures are fed into the model to calculate the cash flow to the owner before and after taxes. As well, a summary statistic that calculates the yield on equity invested is also presented.

INPUT ⟶ MODEL ⟶ OUTPUT

Forecasts of Prices and Interest Rates

Cash Flow and Yield on Equity

Fig. 1
Simple Scheme of Model

The model itself is primarily an accounting system that calculates the difference between revenues and expenditures. It replicates the calculation that should be made by an entrepreneur. Its major benefit is its ability to take into account numerous different assumptions about the future and quickly calculate the expected yield. The model calculates the cash flow for equal payment as well as graduated payment mortgages. In addition it calculates the yield for a MURB program and for a rent supplement - guarantee program. The model can be expanded to incorporate other programs if desired.

1. Input Variables

The input variables fall into three categories. The first set describes the values of rent and interest rates in the initial period. The second set describes the expected future time path of variables. The third set describe policy parameters, such as the rate of increase in graduated payment mortgages.

Base Year Value

The model divides costs into three different categories: capital, land and soft costs. This division is necessary because of the different tax treatments for each of these costs. Thus, soft costs can be deducted as early as possible, while capital costs can be depreciated.

Conditions of the mortgage, i.e., interest rates, term and amortization are all incorporated as input by the user as is initial rent paid by the tenant. Two types of maintenance cost figures are included, one on a per unit basis, the other on a per occupied unit basis. In the simulations reported here, only the former is used.

The final input variable is the marginal tax rate of the owner. This is obviously necessary in calculating after tax yields.

Growth Values

The current procedure is to attach annual growth rates to rent and maintenance costs, with rents increasing every 12th month while maintenance costs increase every month. This procedure can be modified to allow for different growth rates at different periods in the life of the project.

The mortgage period is divided into three terms. Interest rates and term lengths for the first term are set as base year values. Forecasts for the remaining two interest rates and term lengths must also be made. In this manner, it is possible to simulate the effect of an increase or decrease in mortgage rates.

Separate vacancy rate forecasts are required for each of the initial four years. The figure for the fourth year is then assumed to persist for the remainder of the life of the project.

The final set of growth values is for the increase in the value of the structure and of the land. These rates are required in calculating the remaining value of the asset at the end of the period being studied, and the amount of capital cost allowance that might have to be recaptured.

Policy Variable

The GPM instrument has with it two possible parameters, one establishing the initial reduction, the other providing for the annual percentage increase in principal and interest repayments.

To calculate the yield, it is necessary to have both a time horizon and a discount rate. The former establishes how many years into the future the entrepreneur plans on holding onto the project or just with how many years he is concerned with. The discount rate establishes the rate at which future cash flows are discounted to arrive at a net present value.

The last policy parameter is the rent supplement guarantee. This parameter is to simulate the effect of what would happen to cash flow if the government undertook to rent out a fixed percentage of the units upon completion of the project. In this manner high early vacancy rates are reduced by this amount, but not below the floor vacancy rate assumed for the fourth year. Three other variables which might be considered in housing policy are the mortgage insurance fee, the allowable depreciation rate for capital cost allowance purposes, and allowable yields; the latter is used for calculating the loan value under some circumstances.

TABLE C-1

LIST OF INPUT VARIABLE

1. Base Year Values

- Costs - Land
  - Capital
  - Soft

- Mortgage - Period
  - Initial Interest Rate
  - Initial Term

- Rent

- Maintenance Costs - Per Unit Type
  - Per Occupied Unit Type

- Marginal Tax Rate

2. Growth Values

- Growth Rates in - Rents
  - Maintenance Costs

- Mortgage - Second Term - Length
  - Interest Rate
  - Third Term - Interest Rate

- Vacancy Rate - Year - One
  - Two
  - Three
  - Four and thereafter

- Growth Rate in - Price of Land
  - Price of Structure

3. Policy Variables

- GPM - Initial Reduction
  - Rate of Increase in Repayments

- Discount Rate
- Time Horizon
- Rent Supplement Guarantee
- Mortgage Insurance Fee
- Depreciation Rate for CCA
- Allowable Yield

2. The Model

Once rent and maintenance costs are calculated for each month over the time horizon of interest, the model proceeds to calculate the loan amount. There are currently two procedures in use at CMHC. The first, termed the ratio method, calculates loan amount as:

90% of first $60,000 of lending value

plus

75% of next $20,000 of lending value

plus

50% of the remainder

The second method, termed the formula method, reduces lending value if it is felt that rents are not sufficient to ensure that the mortgage can be covered by value in case of default.

The formula used is:

$$\text{LOAN} = \frac{\text{RENT - MAINT COSTS - YLD * TOTAL COST}}{\text{MTGE FACTOR - YLD}}$$

where YLD is the allowable yield, as input into the program and MTGE FACTOR is the monthly blended P & I payment per dollar of loan.

Actual mortgage payments are then calculated on the basis of this loan amount, to which has been added the MIF fee. One set of calculations is made for an equal payment mortgage, and a second for a graduated payment mortgage.

With these data, it is possible to calculate the annual cash flow to the owner of the building. It is simply rent less maintenance cost per occupied unit, both adjusted for the vacancy rate, less other maintenance costs and less mortgage payments.

The next stage in the analysis is to calculate the cash flow after taxes. To do this, it is first necessary to calculate the amount of money that is subject to tax. On the one hand, cash before taxes is supplemented by the amount of money paid toward principal repayment. In the case of the GPM, full interest payments are deducted from taxable income, even though only a portion of the interest owed is actually paid, the remainder being allowed to accumulate as part of the principal.

With regard to taxable deductions, soft costs and losses can be deducted against income from other sources.

It is assumed that these offsets are completely used in the first year. In contrast, capital cost allowances can only be used to offset income from the property once soft costs have been deducted. Unused depreciation is carried forward to the next year. To illustrate, assume net income, including principal repayment is $1,000, soft costs $1,500, and the value of the structure is $30,000, with a 5% depreciation rate. In this case, soft costs of $500 could be deducted against other income and no depreciation can be used. If rent were $2,000, then no income tax would be paid and only $500 of depreciation used, leaving $29,500 to be depreciated in later years.

If a MURB - type program is in use, full depreciation can be used to offset income from other sources. In the first example above, this would result in $2,000 of "losses" available to offset other income whereas in the second example, a $1,000 loss could be used.

The next stage is to calculate the present value of the cash flows. The initial calculation is to apply a discount rate to each period's cash flow. Because cash is spread out over the year, only one-half of the discount rate is applied for the first year, one and one-half for the second, and so forth.

To this must be added the change in the value of the project and the sum of principal repaid at the end of the horizon, discounted backward to the base year. This is then added to the equity and the sum divided by initial equity. To get a yield per year over the horizon, this figure is taken to the root of the horizon and reduced by 1. To illustrate, if equity is \$1,000 and present value over 10 years is \$2,500, the annual yield is:

$$= \frac{(2,500 + 1,000)}{1,000}^{1/10} - 1$$

$$= 13.39\%$$

In the calculation of the present value for after - tax purposes, it is necessary to reduce present value by the tax paid, if any, on capital gain and the amount of recaptured CCA, both discounted back to the initial year. Yield is then calculated on the basis of this revised present value.

AN EXAMPLE OF A SIMULATION

Table C-2, shows a set of input variables for which the model has been tested. These values are entirely arbitrary, and used only for illustrating the model.

Rents in the first year are \$380 per month, and grow by 8% per annum. Maintenance costs of each type is \$25, and both grow by 10% p.a., or 0.8% per month. Vacancy rates in the first year are 25%. Consequently net revenue before mortgage repayment in the first month is:

$$(380 - 27) \times 0.75 - 27 = \$237.75$$

On average, revenue over the first year is \$239.50 per month.

The total value of the property is the sum of capital (\$30,000) land (\$5,000) and soft cost, (\$1,000) i.e., \$36,000. With a 90% mortgage and a 1% MIF fee, the total loan is \$32,724. An equal payment, 25 year mortgage requires monthly payments of \$8.94 per \$1,000 of loan; in the example the P & I would be \$292.80. A GPM mortgage based on a reduction of \$2.25 per \$1,000 would have initial monthly payments of \$219.20.

TABLE C-2

LIST OF INPUT VARIABLE UNITS

1. Base Year Values

- Costs	- Land	\$ 5,000
	- Capital	\$30,000
	- Soft	\$ 1,000

- Mortgage - Period	25 years
- Initial Interest Rate	10%
- Initial Term	5 years
- Rent	$380 p.m.
- Maintenance Costs - Per Unit Type	$ 25 p.m.
- Per Occupied Unit Type	$ 25 p.m.
- Marginal Tax Rate	35%

2. Growth Values

- Growth Rates in - Rents	8% p.a.
- Maintenance Costs Per Unit Type	10% p.a.
- Maintenance Costs Per Occupied Unit Type	10% p.a.
- Mortgage - Second Term - Length	5 years
- Interest Rate	10%
Third Term - Interest Rate	10%
- Vacancy Rate - Year - One	25%
- Two	15%
- Three	10%
- Four and Longer	5%
- Growth Rate in - Price of Land	9% p.a.
- Price of Structure	4% p.a.

3. Policy Variable

- GPM - Initial Reduction	$2.25 per $1,000
- Rate of Increase in Repayments	5% p.a.
- Discount Rate	12%
- Time Horizon	6 years
- Rent Supplement Guarantee	25%
- Mortgage Insurance Fee	1%
- Depreciation Rate for CCA	5%
- Allowable Yield	5%

Returning to the EPM, cash flow after taxes is revenue minus P & I or:

$239.50 - $292.80 = -$53.30

On an annual basis, the loss would be $641.

To calculate taxable income, it is first necessary to reduce the loss by the amount of principal repaid, in this case $321. This loss, together with soft costs of $1,000 can be used to offset other income. At a marginal tax rate of $35%, this loss of $1,321 results in a reduction of tax payments of $462.40. Thus actual loss on the project in the first year after taxes is only:

-$640.10 + $462.40 = -$178.55

In this case no capital cost allowance could be used. However, with a MURB, at 5%, the full capital cost allowance of ($30,000 x .05) = $1,500 can be used. This reduces tax paid by $525. The result is a positive cash flow of:

-$178.55 + $525.00 = $346.45

This same procedure is applied to each year under consideration, bearing in mind that depreciation is calculated only on the balance of capital value outstanding.

To calculate the present value of the cash flow before taxes, the discount rate of 12% must be used. The example here uses a 6 year horizon. Remember that the first year cash flow is discounted only at ½ of the rate since the stream of payments are spread over the entire year. Thus, the value of the cashflow is:

$$\frac{-641}{1.06}+\frac{36}{1.08\text{X}1.12}+\frac{554}{1.06\text{X}1.12^{2}}+\frac{1,131}{1.06\text{X}1.12^{3}}+\frac{1,486}{1.06\text{X}1.12^{4}}+\frac{1,866}{1.06\text{X}1.12^{5}}=2,491$$

In addition to this, there is the increase in the value of the land, 9% p.a. or $5,386 and in the structure, 4% or $7,960. Discounting these back to the base year gives a total of $5,748. The third element is the total value of principal repaid in the first six years, in this case $2,161, which when discounted is $1,085. Then the total net present value is:

$2,491 + $5,748 + $853 = $9,313

To calculate the present value for after tax purposes, the same procedure is used except that tax paid on the capital gain in land and structure, plus tax paid on repayment of unused capital cost allowance must be deducted from income. Should selling price of structure be less than original value but greater than depreciated value, the owner would only have to pay back the tax on the difference between selling price and depreciated value. If selling price is less than depreciated value, he can claim a loss for income tax purposes against other income.

The yield variable is calculated on the present values according to the formula described above. In the pre-tax case, yield on \$3,600 of equity is:

$$\left(\frac{\$9,313 + \$3,600}{\$3,600}\right)^{1/6} - 1 = 23.7\% \text{ per annum}$$